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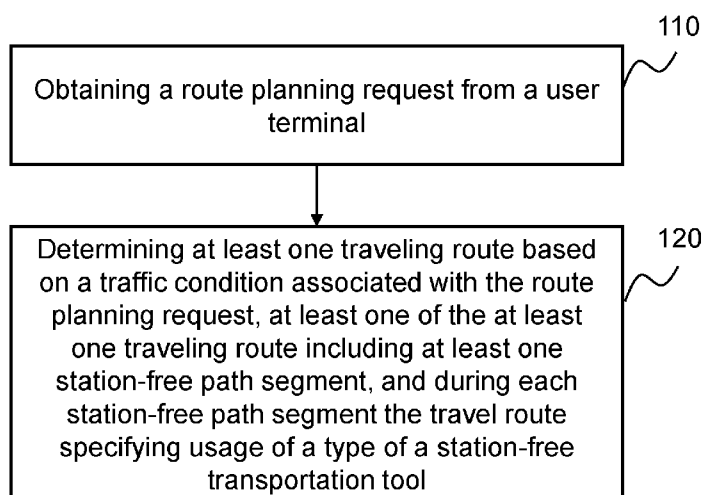


FIG. 1

(57) Abstract: Systems and methods for route planning are provided. A method includes: obtaining a route planning request from a user terminal; determining at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; in response to determining the at least one traveling route, generating electronic signals including information of the at least one traveling route; and sending the electronic signals to the user terminal to direct the user terminal to display the at least one traveling route.



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SYSTEMS AND METHODS FOR ROUTE PLANNING

CROSS-REFERENCE TO THE RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 201710405384.9, filed on June 1, 2017, the contents of which are hereby incorporated by reference.

TECHNICAL FIELD

[0001] The present disclosure generally relates to a technical field of navigation, and more particularly, systems and methods for route planning.

BACKGROUND

[0002] In general, map navigation applications are heavily used for route guidance. Map navigation applications are updated frequently to provide suggestions for faster, more convenient, and lower traveling cost routes for users. However, exiting map navigation applications often provide routes involving only a single traveling mode for users. For example, exiting map navigation applications provide routes involving only public transportation services (including a public bus service, a subway service, or a combination thereof), only walking routes, only biking routes, only routes involving private vehicles, etc.

[0003] In modern society, station-free transportation tools are becoming increasingly widespread. Station-free transportation tools, e.g., shared bicycles, are low cost, low carbon-emission, efficient, and flexible. Accordingly, it is desirable to provide systems and methods for route planning that combines the station-free transportation tools with other transportation modes.

SUMMARY

[0004] An aspect of the present disclosure introduces a system of one or more electronic devices for route planning. The system may include at least one network interface to communicate with a user terminal of a user and at least one processor

operably coupled to the at least one network interface. The at least one processor may be directed to: detect an application executing on a user terminal, the application automatically communicating with a network service of the system over a network; communicate with the application executing on the user terminal of the user with respect to a route planning request; wherein the at least one processor communicates with the application by: providing first data to the application executing on the user terminal to generate a presentation, on a display of the user terminal of the user, the presentation providing a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one processor, a determination process to determine at least one traveling route in response to the route planning request; receiving, from the user terminal of the user, the route planning request once the user interacts with the user interface feature, the route planning request including a start location and a destination; in response to receiving the route planning request, initiate the determination process by programmatically determining second data including at least one traveling route according to the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; encrypt the second data to be provided to the application executing on the user terminal; and provide the encrypted second data to the application executing on the user terminal to cause the presentation to depict the one or more traveling routes on the display of the user terminal.

[0005] In some embodiments, the traffic condition may include at least one of a congestion index or a service time of a public transportation service with fixed stations.

[0006] In some embodiments, the route planning request may be a request for using public transportation, and to determine the second data including the at least one traveling route, the at least one processor may be further directed to: determine at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition; for each of the at least

one candidate route, identify at least one path segment intersecting a fixed station of a public transportation service in the candidate route; and for each of the at least one path segment intersecting a fixed station of a public transportation service, determine an estimated congestion index of the path segment; identify a service time of the corresponding public transportation service; assess whether the estimated congestion index exceeds a congestion threshold or that the corresponding public transportation service is out of the service time; and determine, based on the assessment, whether to designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment.

[0007] In some embodiments, the at least one processor may be further directed to: obtain the at least one traveling route based on the at least one candidate route; for each of the at least one traveling route, identify at least one path segment type in the traveling route, each of the at least one path segment type including at least one of: a transfer path segment, a path segment intersecting a fixed station of a public transportation service, or a station-free path segment, and the transfer path segment connecting two public transportation services; and determine an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type; and rank the at least one traveling route based on at least one of the at least one estimated total traveling time or the at least one estimated total walking distance of the at least one traveling route.

[0008] In some embodiments, the at least one processor may be further directed to: determine a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route.

[0009] In some embodiments, to determine the second data including the at least one traveling route, the at least one processor may be further directed to: for each of the at least one station-free path segment, identify a start area of a type of the station-free transportation tool corresponding to the station-free path segment; obtain a distribution of station-free transportation tools of the corresponding type available at the start area; and determine whether to generate the traveling route including the at least one station-free path segment based on the distribution.

[0010] In some embodiments, the at least one processor may be further directed to: identify a plurality of origins and destinations of the at least one station-free path segment, wherein each of the at least one station-free path segment includes an origin and a destination; identify two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments; merge the identified two station-free path segments; obtain a first count of station-free transportation tools of the corresponding type available at the start area of the merged station-free path segment at the time of receipt of the route planning request; and obtain a historical usage record of each of the transportation tools of the corresponding type available at the start area, wherein the distribution includes the first count and the historical usage record of each of the transportation tools of the corresponding type available at the start area.

[0011] In some embodiments, to determine whether to generate the at least one traveling route, the at least one processor may be further directed to: estimate a second count of station-free transportation tools of the corresponding type at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record; determine that the second count exceeds a count threshold; and in response to a determination that the second count exceeds the count threshold, generate the at least one traveling route including the merged station-free path segment.

[0012] In some embodiments, the at least one processor may be further directed to: generate and push a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a transportation tool of a type different from the corresponding type.

[0013] In some embodiments, a distance of each station-free path segment of the at least one station-free path segment may be not greater than five kilometers.

[0014] In some embodiments, the type of the station-free transportation tool may include at least one of: a shared bike, a shared electric bicycle, a shared motorcycle, a shared scooter, or a shared car.

[0015] In some embodiments, the distribution may be a real-time distribution of the station-free transportation tools of the corresponding type available at the start area when a user of the user terminal arrives at the start area.

[0016] In some embodiments, the real-time distribution may be obtained based on GPS data of the station-free transportation tools of the corresponding type associated with the start area.

[0017] According to another aspect of the present disclosure, a computer-implemented method for operating one or more servers for route planning may include: detecting an application executing on a user terminal, the application automatically communicating with a network service of a system over a network; communicating with the application executing on the user terminal of the user with respect to a route planning request; wherein communicating with the application includes: providing first data to the application executing on the user terminal to generate a presentation, on a display of the user terminal of the user, the presentation providing a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one servers, a determination process to determine at least one traveling route in response to the route planning request; receiving, from the user terminal of the user, the route planning request once the user interacts with the user interface feature, the route planning request including a start location and a destination; in response to receiving the route planning request, initiating the determination process by programmatically determining second data including at least one traveling route according to the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; encrypting the second data to be provided to the application executing on the user terminal; and providing the encrypted second data to the application executing on the user terminal to cause the presentation to depict the one or more traveling routes on the display of the user terminal.

[0018] In some embodiments, the traffic condition may include at least one of a

congestion index or a service time of a public transportation service with fixed stations.

[0019] In some embodiments, the route planning request may be a request for using public transportation, and the determining the second data including the at least one traveling route may include: determining at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition; for each of the at least one candidate route, identifying at least one path segment intersecting a fixed station of a public transportation service in the candidate route; and for each of the at least one path segment intersecting a fixed station of a public transportation service, determining an estimated congestion index of the path segment; identifying a service time of the corresponding public transportation service; assessing whether the estimated congestion index exceeds a congestion threshold or that the corresponding public transportation service is out of the service time; and determining, based on the assessment, whether to designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment.

[0020] In some embodiments, the method may further include: obtaining the at least one traveling route based on the at least one candidate route; for each of the at least one traveling route, identifying at least one path segment type in the traveling route, each of the at least one path segment type including at least one of: a transfer path segment, a path segment intersecting a fixed station of a public transportation service, or a station-free path segment, and the transfer path segment connecting two public transportation services; and determining an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type; and ranking the at least one traveling route based on at least one of the at least one estimated total traveling time or the at least one estimated total walking distance of the at least one traveling route.

[0021] In some embodiments, the method may further include: determining a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route.

[0022] In some embodiments, the determining of the at least one traveling route may include: for each of the at least one station-free path segment, identifying a start area of a type of the station-free transportation tool corresponding to the station-free path segment; obtaining a distribution of station-free transportation tools of the corresponding type available at the start area; and determining whether to generate the traveling route including the at least one station-free path segment based on the distribution.

[0023] In some embodiments, the method may further include: identifying a plurality of origins and destinations of the at least one station-free path segment, wherein each of the at least one station-free path segment includes an origin and a destination; identifying two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments; merging the identified two station-free path segments; obtaining a first count of station-free transportation tools of the corresponding type available at the start area of the merged station-free path segment at the time of receipt of the route planning request; and obtaining a historical usage record of each of the transportation tools of the corresponding type available at the start area, wherein the distribution includes the first count and the historical usage record of each of the transportation tools of the corresponding type available at the start area.

[0024] In some embodiments, the determining whether to generate the at least one traveling route may include: estimating a second count of station-free transportation tools of the corresponding type at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record; determining that the second count exceeds a count threshold; and in response to a determination that the second count exceeds the count threshold, generating the at least one traveling route including the merged station-free path segment.

[0025] In some embodiments, the method may further include: generating and pushing a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a

transportation tool of a type different from the corresponding type.

[0026] In some embodiments, a distance of each station-free path segment of the at least one station-free path segment may be not greater than five kilometers.

[0027] In some embodiments, the type of the station-free transportation tool may include at least one of: a shared bike, a shared electric bicycle, a shared motorcycle, a shared scooter, or a shared car.

[0028] In some embodiments, the distribution may be a real-time distribution of the station-free transportation tools of the corresponding type available at the start area when a user of the user terminal arrives at the start area.

[0029] In some embodiments, the real-time distribution may be obtained based on GPS data of the station-free transportation tools of the corresponding type associated with the start area.

[0030] According to still another aspect of the present disclosure, a non-transitory computer readable medium, comprising at least one set of instructions for route planning, wherein when executed by at least one processor of one or more electronic device, the at least one set of instructions may direct the at least one processor to: detect an application executing on a user terminal, the application automatically communicating with a network service of a system over a network; communicate with the application executing on the user terminal of the user with respect to a route planning request; wherein communicating with the application includes: providing first data to the application executing on the user terminal to generate a presentation, on a display of the user terminal of the user, the presentation providing a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one servers, a determination process to determine at least one traveling route in response to the route planning request; receiving, from the user terminal of the user, the route planning request once the user interacts with the user interface feature, the route planning request including a start location and a destination; in response to receiving the route planning request, initiate the determination process by programmatically determining second data including at least one traveling route according to the route

planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; encrypt the second data to be provided to the application executing on the user terminal; and provide the encrypted second data to the application executing on the user terminal to cause the presentation to depict the one or more traveling routes on the display of the user terminal.

[0031] According to still another aspect of the present disclosure, a system of one or more electronic devices for route planning may include: at least one storage device including an operation system and a set of instructions compatible with the operation system for route planning; and at least one processor in communication with the storage device, wherein when executing the set of instructions. The at least one processor may be directed to: obtain a route planning request from a user terminal; determine at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; in response to determining the at least one traveling route, generate electronic signals including information of the at least one traveling route; and send the electronic signals to the user terminal to direct the user terminal to display the at least one traveling route.

[0032] According to still another aspect of the present disclosure, a method for route planning, implemented on one or more electronic devices, may include: obtaining a route planning request from a user terminal; determining at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; in response to determining the at least one traveling route, generating electronic signals including information of the at least one traveling route; and sending the electronic signals to the user terminal to direct the

user terminal to display the at least one traveling route.

[0033] According to still another aspect of the present disclosure, a non-transitory computer readable medium, comprising at least one set of instructions for route planning, wherein when executed by at least one processor of one or more electronic device, the at least one set of instructions may direct the at least one processor to: obtain a route planning request from a user terminal; determine at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool; in response to determining the at least one traveling route, generate electronic signals including information of the at least one traveling route; and send the electronic signals to the user terminal to direct the user terminal to display the at least one traveling route.

[0034] According to still another aspect of the present disclosure, a system for route planning may include: an obtaining module configured to obtain a route planning request from a user terminal; and a determining module configured to determine at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool.

[0035] Additional features will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following and the accompanying drawings or may be learned by production or operation of the examples. The features of the present disclosure may be realized and attained by practice or use of various aspects of the methodologies, instrumentalities and combinations set forth in the detailed examples discussed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] The present disclosure is further described in terms of exemplary

embodiments. These exemplary embodiments are described in detail with reference to the drawings. These embodiments are non-limiting exemplary embodiments, in which like reference numerals represent similar structures throughout the several views of the drawings, and wherein:

[0037] FIG. 1 is a flowchart illustrating an exemplary process for route planning according to some embodiments of the present disclosure;

[0038] FIG. 2 is a flowchart illustrating an exemplary process for determining whether to designate a path segment intersecting a fixed station of a corresponding public transportation service with fixed stations as a station-free path segment according to some embodiments of the present disclosure;

[0039] FIG. 3 is a flowchart illustrating an exemplary process for determining whether to designate a path segment intersecting a fixed station of a corresponding public transportation service with fixed stations as a station-free path segment according to some embodiments of the present disclosure;

[0040] FIG. 4 is a flowchart illustrating an exemplary process for determining a ranking or display sequence of traveling routes according to some embodiments of the present disclosure;

[0041] FIG. 5 is a flowchart illustrating an exemplary process for determining whether to generate a traveling route including at least one station-free path segment according to some embodiments of the present disclosure;

[0042] FIG. 6 is a flowchart illustrating an exemplary process for merging two station-free path segments according to some embodiments of the present disclosure;

[0043] FIG. 7 is a flowchart illustrating an exemplary process for determining whether to generate at least one traveling route including a merged station-free path segment according to some embodiments of the present disclosure;

[0044] FIG. 8 is a block diagram illustrating an exemplary route planning device according to some embodiments of the present disclosure;

[0045] FIG. 9 is a schematic diagram illustrating an exemplary traveling route according to some embodiments of the present disclosure;

[0046] FIG. 10 is a schematic diagram illustrating an exemplary traveling route according to some embodiments of the present disclosure;

[0047] FIG. 11 is a schematic diagram illustrating an exemplary traveling route according to some embodiments of the present disclosure;

[0048] FIG. 12A is a schematic diagram illustrating an exemplary system for route planning according to some embodiments of the present disclosure;

[0049] FIG. 12B is a schematic diagram illustrating an exemplary system for route planning according to some embodiments of the present disclosure;

[0050] FIG. 13 is a schematic diagram illustrating exemplary hardware and software components of a computing device according to some embodiments of the present disclosure;

[0051] FIG. 14 is a schematic diagram illustrating exemplary hardware and/or software components of an exemplary mobile device according to some embodiments of the present disclosure;

[0052] FIG. 15 is an exemplary user interface of a user terminal for presenting at least one traveling route according to some embodiments of the present disclosure; and

[0053] FIG. 16 is a flowchart illustrating an exemplary process for route planning according to some embodiments of the present disclosure.

DETAILED DESCRIPTION

[0054] The following description is presented to enable any person skilled in the art to make and use the present disclosure, and is provided in the context of a particular application and its requirements. Various modifications to the disclosed embodiments will be readily apparent to those skilled in the art, and the general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the present disclosure. Thus, the present disclosure is not limited to the embodiments shown but is to be accorded the widest scope consistent with the claims.

[0055] The terminology used herein is for the purpose of describing particular

example embodiments only and is not intended to be limiting. As used herein, the singular forms “a,” “an,” and “the” may be intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms “comprises,” “comprising,” “includes,” and/or “including” when used in this disclosure, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0056] These and other features, and characteristics of the present disclosure, as well as the methods of operations and functions of the related elements of structure and the combination of parts and economies of manufacture, may become more apparent upon consideration of the following description with reference to the accompanying drawing(s), all of which form part of this specification. It is to be expressly understood, however, that the drawing(s) are for the purpose of illustration and description only and are not intended to limit the scope of the present disclosure. It is understood that the drawings are not to scale.

[0057] The flowcharts used in the present disclosure illustrate operations that systems implement according to some embodiments of the present disclosure. It is to be expressly understood, the operations of the flowcharts may be implemented not in order. Conversely, the operations may be implemented in inverted order, or simultaneously. Moreover, one or more other operations may be added to the flowcharts. One or more operations may be removed from the flowcharts.

[0058] An aspect of the present disclosure relates to systems and methods for route planning. The systems and methods may determine a traveling route allowing usage of a combination of a station-free transportation tool and another kind of transportation tool, such as a public transportation tool. The systems and methods may also use positioning technology in combination with real-time and/or projected usage/planning information of station-free transportation tools, real-time or projected traffic condition, etc., to estimate real-time and/or projected distribution of the station-free transportation tools at a start area where a user begins to use such a station-

free transportation tool, to assess whether there are enough station-free transportation tools at the start area to support the planned traveling route for the user. The systems and methods thereof may improve user's traveling efficiency and improve user experiences.

[0059] It should be noted that the route planning service is a newly emerged service rooted only in post-Internet era. It provides the technical solutions to service requesters that could rise in post-Internet era. In pre-Internet era, it is impossible to determine a traveling route based on real-time information via a network for a user. The determination of the traveling route also combines historical information. Therefore, the present solution is deeply rooted in and aimed to solve a problem only occurred in post-Internet era.

[0060] FIG. 1 is a flowchart illustrating an exemplary process 100 for route planning according to some embodiments of the present disclosure. The process 100 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 100 illustrated in FIG. 1 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 100 illustrated in FIG. 1 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 100 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 1 and described below is not intended to be limiting.

[0061] As shown in FIG. 1, the process for route planning according to some embodiments of the present disclosure may include:

[0062] In 110, at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may obtain a route planning request from a user terminal. In some embodiments, the user terminal may include an application, via which a user of the user terminal may send out the

route planning request. For example, the application may communicate with the online-to-offline system over a network concerning a network service. When the user interacts with a user interface feature of the user terminal and sends out the route planning request, the at least one processor or the server may obtain the route planning request over the network.

[0063] In some embodiments, the route planning request may include a start location, a destination, a start time, a traveling mode, a user preference for route planning, or the like, or any combination thereof. The start time may include a time specified by the user or by default the time of receipt of the route planning request. The traveling mode may include a driving mode, a public transportation mode, a riding mode (e.g., riding a bicycle, a scooter, a motorcycle, etc.), a walking mode, or the like, or any combination thereof. The user preference may include a frequently used traveling mode of the user, a favorite traveling habit that the user sets, or the like, or any combination thereof.

[0064] In 120, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine at least one traveling route based on a traffic condition associated with a route planning request. In some embodiments, at least one of the at least one traveling route may include at least one station-free path segment. In some embodiments, at least one of the at least one traveling route does not include any station-free path segment. For each station-free path segment, the travel route may specify the usage of a type of a station-free transportation tool.

[0065] In some embodiments, the traffic condition associated with a route planning request may include a congestion index or a service time of a public transportation service with fixed stations associated with the route planning request. For example, after obtaining the start location and the destination in the route planning request from the user, the at least one processor may preferably adopt routes with low congestion indexes, so as to improve the traveling efficiency of the user. As another example, the at least one processor may also consider the service time of the public transportation service that the user probably takes in an adopted route, to

ensure that the user may take the corresponding public transportation service, such as a bus or subway in the service time.

[0066] In some embodiments, each of the at least one traveling route may include a plurality of path segment types according to different transportation tools that the user uses during traveling following the traveling route. It should be noted that a traveling route is defined according to difference travel modes, rather than difference locations. In terms of types, a path segment type may include a station-free path segment, a path segment intersecting a fixed station of a public transportation service, a transfer path segment, a walking path segment, or the like, or any combination thereof. A station-free path segment may include a path segment that the user uses a station-free transportation tool. In some embodiments, when using a station-free transportation tool, the user does not start at, stop at, or pass by any fixed stations of a public transportation service. For example, the station-free transportation tools may include a shared electric bicycle, a shared bike, a shared motorcycle, a shared scooter, a shared car, or the like, or any combination thereof. A path segment intersecting a fixed station of a public transportation service may include a path segment that the user uses a public transportation service. In some embodiments, when using a public transportation service, the user may start and/or stop at a fixed station, and/or pass by at least one fixed station of the public transportation service. For example, the public transportation services may include a public bus, subway, a light rail, a train, or the like, or any combination thereof. As a further example, a transfer path segment may include a path segment connecting two path segments of a same type (e.g., two path segments along two different bus lines, two path segments along two different subway lines, etc.) or different types (e.g., a path segment along a bus line with fixed stations and a station-free path segment, a path segment along a bus line and a path segment along a subway line, etc.).

[0067] In some embodiments, the at least one traveling route determined based on the traffic condition combines the station-free transportation tools with other transportation tools, thus improving the traveling efficiency of the user.

[0068] FIG. 2 is a flowchart illustrating an exemplary process 200 for determining whether to designate a path segment intersecting a fixed station of a corresponding public transportation service with fixed stations as a station-free path segment according to some embodiments of the present disclosure. The process 200 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 200 illustrated in FIG. 2 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 200 illustrated in FIG. 2 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 200 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 2 and described below is not intended to be limiting.

[0069] In some embodiments, the route planning request may be a request for using a public transportation service. In 210, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition. For example, each candidate route may include at least one path segment intersecting a fixed station of a public transportation service and at least one transfer path segment. A transfer path segment may include a path segment from the start location of the route planning request to a first fixed station of a first public transportation service, a path segment from a fixed station of a public transportation service to the destination of the route planning request, a path segment connecting two fixed stations of two public transportation services, for example, between a fixed station (e.g., a destination station) of a first public transportation service and a fixed station (e.g., an origin station) of a second public transportation service, or the like, or any combination thereof.

[0070] In 220, for each of the at least one candidate route, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may identify at least one path segment intersecting a fixed station of a public transportation service in the candidate route. In some embodiments, the at least one processor may further identify the corresponding traffic condition and/or corresponding public transportation tool of the at least one path segment intersecting the fixed station of the corresponding public transportation service. For example, the at least one processor may identify a time when the user arrives at each start location.

[0071] In 230, for each of the at least one path segment intersecting a fixed station of a public transportation service, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine whether to designate the path segment intersecting the fixed station of the corresponding public transportation service with fixed stations as a station-free path segment. In some embodiments, the at least one processor may determine whether to designate the path segment intersecting the fixed station of the corresponding public transportation service with fixed stations as a station-free path segment based on the traffic condition, such as a congestion index, a service time of the corresponding public transportation service of the at least one path segment intersecting the fixed station of the corresponding public transportation service, or the like, or a combination thereof. More descriptions of determining whether to designate the path segment intersecting the fixed station of the corresponding public transportation service with fixed stations as a station-free path segment may be found elsewhere in the present disclosure (e.g., FIG. 3 and the descriptions thereof).

[0072] FIG. 3 is a flowchart illustrating an exemplary process 300 for determining whether to designate a path segment intersecting a fixed station of a corresponding public transportation service with fixed stations as a station-free path segment according to some embodiments of the present disclosure. The process 300 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 300 illustrated in

FIG. 3 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 300 illustrated in FIG. 3 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 300 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 3 and described below is not intended to be limiting.

[0073] In 310, for each of the path segment intersecting the fixed station of the corresponding public transportation service, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine an estimated congestion index of the path segment. In some embodiments, the congestion index may be a value that reflect a degree of traffic jam. The greater the congestion index, the more congested the road. In some embodiments, the at least one processor may obtain a real-time congestion index at the time of receipt the route planning request to determine the estimated congestion index of the path segment intersecting the fixed station of the corresponding public transportation service at the time the user actually uses the corresponding public transportation service. For example, the at least one processor may use a congestion model trained by a plurality of historical road conditions and the real-time congestion index at the time of receipt the route planning request to determine the estimated congestion index at the time the user uses the corresponding public transportation service. In some embodiments, the at least one processor may acquire a plurality of dynamic or real-time GPS information of a plurality of vehicles in the traffic network to estimate the congestion index at the time the user uses the corresponding public transportation service.

[0074] In 320, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may identify a service time of a corresponding public transportation service. In some embodiments, each

public transportation service may include a corresponding service time. The service time may show an earliest time and a last time on a specific day that a user can use the public transportation service at an origin station of the corresponding public transportation service or at a specific fixed station of the public transportation service. For example, the service time of a bus No. 1 is 7:00 AM-22:30 PM. The earliest bus No. 1 departs from the origin station of the bus No. 1 at 7:00 AM, and the last bus No. 1 departs from the origin station of the bus No. 1 at 22:30 PM. In some embodiments, the at least one processor may further identify a service time of a corresponding public transportation service at the time when the user arrives at the user's start location or a specific fixed station (e.g., different from the origin station of the corresponding public transportation service). For example, the user uses the bus No. 1 from the sixth station from the origin station of the corresponding public transportation service. The at least one processor may identify that the service time of the corresponding public transportation service at the time when the user arrives at the user's sixth station is 7:20 AM-22:40 PM based on the schedule or service time of the bus and the traffic condition.

[0075] In 330, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may assess whether the estimated congestion index exceeds a congestion threshold or the corresponding public transportation service is out of the service time. In some embodiments, the assess result may indicate whether the user can travel along the corresponding path segment smoothly without traffic jams or whether the corresponding public transportation service is still in service so that the user can use the corresponding public transportation service. In some embodiments, the congestion threshold may be determined by the at least one processor according to different application scenes, or by the user thereof. For example, the congestion threshold may be a minimum congestion index of a congested road or a maximum congestion index of an uncongested road. If the congestion index of a road exceeds the minimum congestion index of a congested road, the road may be deemed congested. If the congestion index of a road is below the maximum congestion index of a

uncongested road, the road may be deemed uncongested. As another example, the user may set the congestion threshold to make sure that the path segment is selected only if the corresponding path segment is not jammed. In some embodiments, the at least one processor may compare the estimated congestion index with the congestion threshold. In some embodiments, the at least one processor may identify the time when the user arrives a fixed station of a public transportation service in the path segment and whether the corresponding service is out of service time at the time.

[0076] If the estimated congestion index exceeds the congestion threshold or the corresponding public transportation service is out of the service time, in 340, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment. For example, the at least one processor may advise the user to use a station-free transportation tool instead of the public transportation service for the path segment by specifying so regarding the path segment in the travelling route.

[0077] If the estimated congestion index is lower than the congestion threshold and the corresponding public transportation service is in the service time, in 350, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may maintain the path segment intersecting the fixed station of the public transportation service. For example, the at least one processor may advise the user to use the public transportation service for the path segment by specifying so regarding the path segment in the travelling route.

[0078] In some embodiments, in response to a determination that the estimated congestion index exceeds the congestion threshold or that the corresponding public transport is out of the service time, the path segment intersecting a fixed station of a public transportation service may be designated as a station-free path segment. For a congested path segment, the traveling efficiency of station-free path segment

may be higher than that of using the public transportation service. In addition, if the public transportation service is out of service time, the user has to take a station-free transportation tool or to reserve another transportation tool, e.g., taxi. If the walking distance is less than a threshold, e.g., 5 Km, the user may prefer to use a station-free transportation tool considering a cost, a travel time, and the chance of success or acceptance of the user's request for the corresponding transportation tool (e.g., the station-free transportation tool, the taxi).

[0079] FIG. 4 is a flowchart illustrating an exemplary process 400 for determining a ranking or display sequence of traveling routes according to some embodiments of the present disclosure. The process 400 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 400 illustrated in FIG. 4 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 400 illustrated in FIG. 4 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 400 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 4 and described below is not intended to be limiting.

[0080] In 410, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may obtain at least one traveling route based on the at least one candidate route. In some embodiments, the at least one traveling route may be obtained after it is determined whether to designate the path segment intersecting the fixed station of the corresponding public transportation service in the corresponding candidate route as a station-free path segment, or to remain the corresponding public transportation service as illustrated in FIG. 3 in the present disclosure.

[0081] In 420, for each of the at least one traveling route, the at least one processor

(e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may identify at least one path segment type in the traveling route. In some embodiments, a path segment type may include a transfer path segment, a path segment intersecting a fixed station of a public transportation service, a station-free path segment, or the like, or any combination thereof. The transfer path segment may include a path segment from the start location of the route planning request to a first fixed station of a first public transportation service, a path segment from a fixed station of a public transportation service to the destination of the route planning request, a path segment connecting two fixed stations of two public transportation services, for example, between a fixed station (e.g., a destination station) of a first public transportation service and a fixed station (e.g., an origin station) of a second public transportation service, or the like, or any combination thereof. In some embodiments, during the transfer path segment, the user may use a station-free transportation tool. Alternatively, during the transfer path segment, the user may walk.

[0082] In 430, for each of the at least traveling route, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type. In some embodiments, the at least one processor may determine an estimated sectional traveling time of each path segment, and sum all the estimated sectional traveling time in one traveling route together to obtain the estimated total traveling time of the corresponding traveling route. In some embodiments, the at least one processor may determine an estimated sectional walking distance of each transfer path segment, and sum all of the estimated sectional walking distances in one traveling route together to obtain the estimated total walking distance of the corresponding traveling route.

[0083] In some embodiments, the at least one processor may further determine an estimated total cost of each of the at least one traveling route. For example, the at least one processor may determine an estimated sectional cost of each path

segment, and sum all the estimated sectional cost in one traveling route together to obtain the estimated total cost of the corresponding traveling route.

[0084] In 440, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may rank the at least one traveling route based on at least one of the at least one estimated total traveling time, the at least one estimated total cost, or the at least one estimated total walking distance of the at least one traveling route. In some embodiments, the at least one processor may rank the at least one traveling route according to an ascending order of the corresponding estimated total traveling time. In some embodiments, the at least one processor may rank the at least one traveling route according to an ascending order of the corresponding estimated total walking distance. In some embodiments, the at least one processor may rank the at least one traveling route according to an ascending order of the corresponding estimated total cost. In some embodiments, the user may specify one or more criteria for ranking the at least one traveling route and the at least one processor may rank the at least one traveling route accordingly. For instance, the user may specify a single factor to be considered in the ranking. As another example, the user may specify multiple factors to be considered in the ranking. As a further example, the user may specify multiple factors and provide the weighting factor for each of the multiple factors to be considered in the ranking. In some embodiments, the at least one processor may rank the at least one traveling route according to an algorithm according to a default setting (e.g., a default setting of the system 1200), an algorithm acquired by machine learning based on data relating to a group to which the user belongs. For instance, the group may be determined based on the preference of the user, the profile of the user and other users (e.g., including age, locations frequently travelled, occupation, gender, etc.).

[0085] In 450, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route. In some embodiments, the at least one processor

may select a number/count of traveling routes to be displayed on the user terminal. For example, the at least one processor may select two top-ranked traveling routes according to the estimated total traveling time and two top-ranked traveling routes according to the estimated total walking distance. The at least one processor may determine a display sequence of the four traveling routes according to a certain rule. For example, the display sequence may be determined according to a user preference, a most popular traveling route of a plurality of users, or the like, or any combination thereof. In some embodiments, the at least one processor may further display the corresponding estimated total cost (or referred to as a reference total cost or reference cost) of the corresponding traveling route.

[0086] In some embodiments, with the ranking and/or the determination of the display sequence, the user may be provided with information to balance the traveling time and the walking distance and select a suitable traveling route. In addition, a reference total cost may also be provided to the user, which may also help the user to balance the traveling time, the walking distance, and the traveling cost so as to determine a final route.

[0087] FIG. 5 is a flowchart illustrating an exemplary process 500 for determining whether to generate a traveling route including at least one station-free path segment according to some embodiments of the present disclosure. The process 500 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 500 illustrated in FIG. 5 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 500 illustrated in FIG. 5 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 500 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 5 and described below is not intended

to be limiting.

[0088] In 510, for each of at least one station-free path segment, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may identify a start area of a type of the station-free transportation tool corresponding to the station-free path segment. In some embodiments, the start area may be an area within a certain distance from a start location of the corresponding station-free path segment. The distance may be determined according to different types of station-free transportation tool, different types of road of the corresponding station-free path segment, a user preference, or the like, or any combination thereof. For example, for a shared bike, the start area may be an area within 200 meters from the start location of the corresponding station-free path segment. For a shared car, the start area may be an area within 500 meters from the start location of the corresponding station-free path segment.

[0089] In 520, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may obtain a distribution of station-free transportation tools of the corresponding type available at the start area. In some embodiments, the distribution of the station-free transportation tools may include a real time distribution. For example, the distribution may include a parking location of a station-free transportation tool, a parking time of a station-free transportation tool at a location, the length of time a station-free transportation tool has parked at a location without being used, the number/count of a type of station-free transportation tools parked within a range of the start location of the station-free path segment, whether a station-free transportation tool is in working condition, or the like, or any combination thereof. In some embodiments, the distribution may include a historical distribution. For example, the distribution may include a usage frequency of a station-free transportation tool, a historical usage record of a station-free transportation tool, or the like, or any combination thereof. In some embodiments, the at least one processor may further obtain a billing rate and/or record of the station-free transportation tools of the corresponding type at the same time of obtaining the

distribution. In some embodiments, the at least one processor may obtain the distribution based on a positioning function. For example, each station-free transportation tool may be installed with a positioning module (e.g. a GPS module) to provide location information (e.g., GPS data) such that the at least one processor may obtain the real-time location information of the station-free transportation tools.

[0090] In some embodiments, the at least one processor may use the distribution of the station-free transportation tools to estimate whether there is a station-free transportation tool at the start area for the user to use at the time when the user arrives at the start location. For example, the at least one processor may determine an estimated number/count of station-free transportation tools available when the user arrives at the start location based on the number/count of a type of station-free transportation tools parked within a range of the start area of the path segment at the time of receipt the route planning request and corresponding historical usage record of the type of station-free transportation tools. For example, if the number/count of parked station-free transportation tools of the type at the time of receipt the route planning request is almost the same (e.g., the difference being lower than a threshold, e.g., within a predetermined percentage) as a historical average number/count of the same time, the at least one processor may determine the corresponding historical average number/count of the station-free transportation tools at a historical time the same as the time when the user arrives at the start location as the estimated number/count of station-free transportation tools when the user arrives at the start location. As another example, the at least one processor may determine the estimated number/count based on real-time GPS data of station-free transportation tools associated with the start area alone or in combination with corresponding travelling routes of users of the station-free transportation tools. For example, the at least one processor may obtain real-time GPS data of a plurality of station-free transportation tools via a GPS module installed on the station-free transportation tools and/or real-time GPS data of a plurality of users via a GPS module installed in the corresponding user terminals. When a user checks out or uses a station-free transportation tool, the at least one processor may link the

identification of the user or a user terminal the user uses to check out the corresponding station-free transportation tool. The at least one processor may determine where the user will probably return or park the station-free transportation tool according to the corresponding traveling route of the user determined by the at least one processor. The at least one processor may determine the estimated number/count of station-free transportation tools available when the user arrives at the start location accordingly.

[0091] In 530, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may determine whether to generate the traveling route including the at least one station-free path segment based on the distribution. In some embodiments, the at least one processor may compare the estimated number/count of station-free transportation tools available when the user arrives at the start location with a count threshold. For example, if the estimated number/count is lower than the count threshold, the at least one processor may not generate the traveling route including the at least one station-free path segment. In some embodiments, the at least one processor may further consider the length of time the station-free transportation tool has parked and/or the use frequency of the station-free transportation tool to determine whether to generate the traveling route including the at least one station-free path segment. For example, if the station-free transportation tool parks at the start area for a long time (e.g., longer than 1 month) or the use frequency is low (e.g., only once a week), it is highly likely that the corresponding station-free transportation tool does not work and/or an issue with the corresponding station-free transportation tool has not been reported to, e.g., the at least one processor. In order to improve the reliability of the route planning of the present disclosure, the corresponding station-free transportation tool may not be considered or counted in the route planning.

[0092] In some embodiments, the determination of whether to generate the traveling route including the at least one station-free path segment based on the distribution may combine the use of such a station-free transportation tool with other transportation mode to improve the traveling efficiency of the user and reduce the

walking distance of the user. In addition, since the distribution of the station-free transportation tools is based on positioning function, the determination of whether there are sufficient station-free transportation tools to support the route planning at the start location of the station-free path segment may be accurately determined. Therefore, the reliability of the route planning and the user experience may be improved.

[0093] For example, a distance of a determined public bus path segment (the user may take No. 1 bus) may be 2.7 Km. However, the time when the user travels is in peak hours or out of the service time of the public bus. The at least one processor may remind the user to use station-free transportation tools instead of the public bus. According to the route planning solution of the present disclosure, the distribution of station-free transportation tools within a start area of the station-free path segment may be obtained, and whether the station-free transportation tools are available when a user of the user terminal arrives at the start area may be estimated based on the distribution of the station-free transportation tools.

[0094] FIG. 6 is a flowchart illustrating an exemplary process 600 for merging two station-free path segments according to some embodiments of the present disclosure. The process 600 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 600 illustrated in FIG. 6 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 600 illustrated in FIG. 6 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 600 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 6 and described below is not intended to be limiting.

[0095] In 610, the at least one processor (e.g., the server 1210 or a portion thereof,

the at least one processor 1320 of the computing device 1300) may identify a plurality of origins and destinations of the at least one station-free path segment. In some embodiments, each of the at least one station-free path segment includes an origin and a destination.

[0096] In 620, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may identify two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments. For example, after designating a path segment intersecting the fixed station of the corresponding public transportation service with fixed stations as a station-free path segment, the corresponding traveling route may include a plurality of station-free path segments. The at least one processor may identify two connecting station-free path segments if an origin of one of the two station-free path segments is the same as (or within a predetermined distance from) the destination of the other of the two station-free path segments. Such two station-free path segments may be referred to as connecting station-free path segments.

[0097] In 630, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may merge the identified two station-free path segments. For example, the identified two adjacent station-free path segments may be merged into one station-free path segment. In some embodiments, providing of the merged station-free segment including the two connecting station-free path segments may be more directly and concisely than providing of the two connecting station-free path segments separately to the user.

[0098] In 640, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may obtain the number/count (or referred to as the first count for brevity) of station-free transportation tools of the corresponding type available at the start area of the merged station-free path segment at the time of receipt of the route planning request. In some embodiments, the start area of the merged station-free path segment may be an area within a certain distance from the first origin of a leading

station-free path segment of the two separate station-free path segments. In some embodiments, the first count may be the number/count of station-free transportation tools available at the start area of the merged station-free path segment at the time of receipt the route planning request. For example, the first count may be the number/count of station-free transportation tools in working condition available at the start area of the merged station-free path segment at the time of receipt the route planning request.

[0099] In 650, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may obtain a historical usage record of each of the transportation tools of the corresponding type available at the start area. In some embodiments, the historical usage record may include a historical use frequency, a historical use time, a historical number/count of a type of station-free transportation tools available at a certain area and/or at a certain time, or the like, or any combination thereof. For example, the at least one processor may obtain the average number/count of the corresponding type of station-free transportation tools at the same time with the time of receipt the route planning request in the history, an average historical number/count of at the same time with the time of arriving at the start area in the history, or any historical number/count available at any time, or the like, or any combination thereof.

[0100] In some embodiments, the at least one processor may obtain the distribution of station-free transportation tools of a type at the start area of the merged path segment at the time of receipt the route planning request (or at the time the user arrives at the start area of the merged path segment) to determine whether to generate at least one traveling route including a merged station-free path segment. The distribution may include the first count and the historical usage record of each of the transportation tools of the corresponding type available at the corresponding start area described in FIG. 5 and the descriptions thereof.

[0101] FIG. 7 is a flowchart illustrating an exemplary process 700 for determining whether to generate at least one traveling route including a merged station-free path segment according to some embodiments of the present disclosure. The process

700 may be implemented on a server (e.g., a server 1210 as illustrated in FIG. 12A or FIG. 12B). In some embodiments, one or more operations of process 700 illustrated in FIG. 7 may be implemented on the online-to-offline system 1200 illustrated in FIG. 12A or FIG. 12B. For example, the process 700 illustrated in FIG. 7 may be stored in a storage device (e.g., a storage device in the server 1210, a ROM 1330, a RAM 1340) in the form of instructions, and invoked and/or executed by at least one processor (e.g., the processor 1320 of the computing device 1300 as illustrated in FIG. 13). In some embodiments, the process 700 may be accomplished with one or more additional operations not described and/or without one or more of the operations discussed. Additionally, the order in which the operations of the process as illustrated in FIG. 7 and described below is not intended to be limiting.

[0102] In 710, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may estimate the number/count (or referred to as the second count for brevity) of station-free transportation tools of the corresponding type at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record. In some embodiments, the at least one processor may compare the first count with the average historical count at the time of receipt the route planning request to determine the second count. For example, if the first count at the time of receipt the route planning request is almost the same (e.g., the difference being lower than a threshold, e.g., within a predetermined percentage of the first count) as the historical average number/count of the same time in the history, the at least one processor may determine the corresponding historical average number/count of the station-free transportation tools at a historical time the same as the time when the user arrives at the start location as the second count. As another example, if the first count is quite different (e.g., the difference exceeding a threshold, e.g., larger than a predetermined percentage of the first count) from the historical average number/count of the same time in the history, the at least one processor may select a historical date having the same or similar distributions (e.g., the difference being

lower than a threshold) at the time of receipt the route planning request, and determine a historical number/count of the station-free transportation tools at a historical time the same as the time when the user arrives at the start location as the second count on the selected historical date.

[0103] In 720, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may assess whether the second count exceeds a count threshold. For example, the at least one processor may compare the second count with the count threshold. In some embodiments, the count threshold may be predetermined according to different start areas, different types of station-free transportation tools, different time, or the like, or any combination thereof. For example, at peak hours, the count threshold of shared bikes is 30. In off-peak hours, the count threshold of the shared bikes is 15.

[0104] If the second count exceeds the count threshold, in 730, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may generate the at least one traveling route including the merged station-free path segment.

[0105] If the second count is lower than the count threshold, in 740, the at least one processor (e.g., the server 1210 or a portion thereof, the at least one processor 1320 of the computing device 1300) may generate and push a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a transportation tool of a type different from the corresponding type. For example, if the second count of shared bikes is lower than the count threshold, the at least one processor may remind the user to reserve a shared electric bicycle, a shared motorcycle, a shared scooter, a shared car, a taxi, or the like, or any combination thereof. In some embodiments, the prompt message may improve the traveling efficiency of the user.

[0106] In some embodiments, a distance of each station-free path segment of the at least one station-free path segment is not greater than a threshold (e.g., five kilometers). In some embodiments, the distance of each station-free path segment is set to be not greater than five kilometers so as to optimize the route planning. In

addition, a station-free path segment may be set to be greater than a threshold (e.g., 300 meters). For example, if the traveling path segment is less than 300 meters, a default path segment may be a walking path segment, and may not be replaced with a station-free path segment.

[0107] FIG. 8 is a block diagram illustrating an exemplary route planning device 800 according to some embodiments of the present disclosure. The route planning device 800 may include a generating module 802, an obtaining module 804, a determining module 806, a first estimating module 808, a detecting module 810, a merging module 812, a count module 814, a second estimating module 816, a prompting module 818, a third estimating module 820, and a display module 822.

[0108] The generating module 802 may be configured to determine at least one traveling route based on a traffic condition associated with a route planning request in response to the route planning request. In some embodiments, one or more of the at least one traveling route may include at least one station-free path segment. During each station-free path segment, the travel route specifies usage of a type of a station-free transportation tool.

[0109] The obtaining module 804 may be configured to obtain information relating to the route planning. For example, the obtaining module 804 may be configured to obtain a distribution of station-free transportation tools of the corresponding type available at a start area of the station-free path segment. As another example, the obtaining module 804 may be configured to obtain a route planning request from a user terminal. In some embodiments, the route planning request may be a request for using a public transportation service. As still another example, the obtaining module 804 may be configured to obtain a historical usage record of each of the station-free transportation tools available at the start area.

[0110] The determining module 806 may be configured to determine or identify result or information during the route planning. For example, the determining module 806 may be configured to determine whether to generate a traveling route including at least one station-free path segment based on the distribution obtained from the obtaining module 804. As another example, the determining module 806

may be configured to identify at least one path segment type in a traveling route. A path segment type may include a transfer path segment, a path segment intersecting a fixed station of a public transportation service, a station-free path segment, a walking path segment, or the like, or any combination thereof. As still another example, the determining module 806 may be configured to determine whether a second count (the estimated number/count) of the station-free transportation tools available at the start area when a user of the user terminal arrives at the start area exceeds a count threshold. In response to a determination that the second count exceeds the count threshold, the determining module 806 may be further configured to generate at least one traveling route including a station-free path segment or a merged station-free path segment.

[0111] The first estimating module 808 may be configured to determine an estimated congestion index of the path segment. In some embodiments, the congestion index may be a value that reflects a degree of traffic jam. The greater the congestion index, the more congested the road.

[0112] The detecting module 810 may be configured to determine whether the estimated congestion index exceeds a congestion threshold or that a corresponding public transportation service is out of the service time. In response to a determination that the estimated congestion index exceeds the congestion threshold or that the corresponding public transport is out of the service time, the detecting module 810 may be further configured to designate the path segment intersecting a fixed station of a public transportation service as a station-free path segment.

[0113] The merging module 812 may be configured to identify two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments, and merge the identified two station-free path segments.

[0114] The count module 814 may be configured to obtain a first count of station-free transportation tools available at the start area of the merged station-free path segment. In some embodiments, the first count may be the number/count of station-free transportation tools available at the start area of the merged station-free

path segment at the time of receipt the route planning request.

[0115] The second estimating module 816 may be configured to estimate a second count (the estimated number/count) of the station-free transportation tools available at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record. The prompting module 818 may be configured to in response to a determination that the second count is lower than the count threshold, generate a prompt message to notify the user of the user terminal to reserve a station-free transportation tool at the start area or to reserve a transportation tool of a type different from the corresponding type.

[0116] The third estimating module 820 may be configured to determine an estimated total traveling time, an estimated total walking distance of each traveling route, an estimated total cost of each traveling route, or the like, or any combination thereof. The display module 822 may be configured to display the at least one traveling route based on at least one of the estimated total traveling time, the estimated total walking distance, or the estimated total cost of the at least one traveling route.

[0117] The modules in the route planning device 800 may be connected to or communicate with each other via a wired connection or a wireless connection. The wired connection may be a metal cable, an optical cable, a hybrid cable, or the like, or any combination thereof. The wireless connection may be a Local Area Network (LAN), a Wide Area Network (WAN), a Bluetooth, a ZigBee, a Near Field Communication (NFC), or the like, or any combination thereof. Two or more of the modules may be combined into a single module, and any one of the modules may be divided into two or more units. For example, the first estimating module 808 and the second estimating module 816 may be combined as a single module which may both determine an estimated congestion index of the path segment and estimate a second count of the station-free transportation tools at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record. As another example, the route planning device 800 may include a storage module (not shown) used to store data and/or information relating to the

route planning.

[0118] FIG. 9 is a schematic diagram illustrating an exemplary traveling route according to some embodiments of the present disclosure. As shown in FIG. 9, a first traveling route may include:

[0119] A Walking Path Segment 1 between No. X, North Road, Forestry University and Station A. The corresponding estimated total walking distance is 0.6 kilometers and the estimated total traveling time is 8 minutes.

[0120] A Public Bus Path Segment 1 between Station A and Station B. There are 5 fixed stations. The estimated total traveling distance is 3.2 kilometers. The estimated total traveling time is 16 minutes. The corresponding public bus runs from 5:00 AM to 21:40 PM.

[0121] A Transfer Path Segment 1 between Station B and Station C. The estimated total walking distance is 0.3 kilometers, time: and the estimated total traveling time is 4 minutes.

[0122] A Subway Path Segment 1 between Station C and Station D. The estimated total traveling distance is 1.5 kilometers. The estimated total traveling time is 4 minutes. The corresponding subway runs from 5:00 AM to 11:30 PM.

[0123] A Walking Path Segment 2 between Station D and the Bird's Nest. The corresponding estimated total walking distance is 0.6 kilometers and the estimated total traveling time is 8 minutes.

[0124] The above first traveling route may be optimized according to the method for route planning described in the present disclosure as follows:

[0125] In response to a detection that the distribution of station-free transportation tools at No. X, North Road, Forestry University meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles may be 15 in off-peak hours, and there are 50 available shared bicycles at No. X, North Road, Forestry University), the Walking Path Segment 1 may be replaced with a Station-free Path Segment 1. The corresponding estimated total riding distance is 0.6 kilometers and the estimated total traveling time is 2 minutes.

[0126] In response to a detection that the distribution of station-free transportation

tools at Station A meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles may be 15 in off-peak hours, and there are 45 available shared bicycles at Station A), although the traveling time of Station-free Path Segment 4 is 11 minutes, the Public Bus Path Segment 1 may not be replaced with Station-free Path Segment 4 due to a traffic condition that the public transportation service is in service time and the time is not in peak hours.

[0127] In response to a detection that the distribution of station-free transportation tools at Station B does not meet a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles may be 15 in off-peak hours, and there are 10 available shared bicycles at Station B), although the traveling time of Station-free Path Segment 2 is 1 minute, the Transfer Path Segment 1 may not be replaced with a Station-free Path Segment 2.

[0128] In response to a detection that the distribution of station-free transportation tools at Station C does not meet a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles may be 15 in off-peak hours, and there are 2 available shared bicycles at Station C), and a traffic condition is that the subway service is in its service time. Although the traveling time of Station-free Path Segment 5 is 1 minute, the Subway Path Segment 1 may not be replaced with a Station-free Path Segment 5.

[0129] In response to a detection that the distribution of station-free transportation tools at Station D meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles at may be 15 in off-peak hours, and there are 15 available shared bicycles at Station D), the Walking Path Segment 2 may be replaced with a Station-free Path Segment 3.

[0130] FIG. 10 is a schematic diagram illustrating an exemplary traveling route according to some embodiments of the present disclosure. As shown in FIG. 10, a second traveling route may include:

[0131] A Walking Path Segment 3 between No. X, North Road, Forestry University and Station E. The corresponding estimated total walking distance is 1.2 kilometers and the estimated total traveling time is 14 minutes.

[0132] A Subway Path Segment 2 between Station E and Station F. The corresponding estimated total traveling distance is 2.7 kilometers. The estimated total traveling time is 6 minutes. The corresponding subway runs from 5:00 AM to 11:30 PM.

[0133] A Walking Path Segment 4 between Station F and the Bird's Nest. The corresponding estimated total walking distance is 1.5 kilometers and the estimated total traveling time is 18 minutes.

[0134] The above second traveling route may be optimized according to the method for route planning described in the present disclosure as follows:

[0135] In response to a detection that the distribution of station-free transportation tools at No. X, North Road, Forestry University meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles may be 15 in off-peak hours, and there are 50 available shared bicycles at No. X, North Road, Forestry University), the Walking Path Segment 3 may be replaced with a Station-free Path Segment 6. The corresponding estimated total riding distance is 0.6 kilometers and the estimated total traveling time is 4 minutes.

[0136] In response to a detection that the distribution of station-free transportation tools at Station E meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles at may be set to 15 in off-peak hours, and there are 22 available shared bicycles at Station E), and the traveling time of Station-free Path Segment 8 is 9 minutes. The Subway Path Segment 2 may be replaced with a Station-free Path Segment 8.

[0137] In response to a detection that the distribution of station-free transportation tools at Station F meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles at may be 15 in off-peak hours, and there are 26 available shared bicycles at Station F), and the traveling time of Station-free Path Segment 7 is 6 min. The Transfer Path Segment 4 may be replaced with a Station-free Path Segment 7.

[0138] FIG. 11 is a schematic diagram illustrating an exemplary traveling route according to some embodiments of the present disclosure. As shown in FIG. 11, a

third traveling route may include:

[0139] A Walking Path Segment 5 between No. X, North Road, Forestry University and Station G. The corresponding estimated total walking distance is 0.5 kilometers and the estimated total traveling time is 7 minutes.

[0140] A Public Bus Path Segment 2 between Station G and Station H. There are 9 fixed stations. The estimated total traveling distance is 4.2 kilometers. The estimated total traveling time is 20 minutes. The corresponding public bus runs from 5:00 AM to 21:40 PM.

[0141] A Walking Path Segment 6 between Station H and the Bird's Nest. The corresponding estimated total walking distance is 1 kilometers and the estimated total traveling time is 14 minutes.

[0142] The above third route may be optimized according to the method for route planning described in the present disclosure as follows:

[0143] In response to a detection that the distribution of station-free transportation tools at No. X, North Road, Forestry University meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles may be 15 in off-peak hours, and there are 50 available shared bicycles at No. X, North Road, Forestry University), the Walking Path Segment 5 may be replaced with a Station-free Path Segment 9. The corresponding estimated total traveling time is 2 minutes.

[0144] In response to a detection that the distribution of station-free transportation tools at Station G does not meet a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles at may be 15 in off-peak hours, and there are 3 available shared bicycles at Station G), and the traveling time of Station-free Path Segment 11 is 14 minutes. The Public Bus Path Segment 2 may not be replaced with Station-free Path Segment 11 due to a traffic condition that the public transportation service is in service time and the time is not in peak hours.

[0145] In response to a detection that the distribution of station-free transportation tools at Station H meets a usage requirement (as shown in FIGs. 12A-12B, the count threshold of shared bicycles at may be 15 in off-peak hours, and there are 19

available shared bicycles at Station F), and the traveling time of Station-free Path Segment 10 is 3 minutes. The Walking Path Segment 6 may be replaced with a Station-free Path Segment 10.

[0146] FIG. 12A is a schematic diagram illustrating an exemplary system 1200 for route planning according to some embodiments of the present disclosure. In some embodiments, the system 1200 may be an online platform including a server 1210 and a user terminal 1220. In some embodiments, the system 1200 may further include a storage device and a network (not shown).

[0147] The server 1210 may be configured to process information and/or data relating to a route planning request. For example, the server 1210 may determine at least one traveling route based on a traffic condition associated with the route planning request. In some embodiments, the server 1210 may be a single server, or a server group. The server group may be centralized, or distributed (e.g., server 1210 may be a distributed system). In some embodiments, the server 1210 may be local or remote. For example, the server 1210 may exchange information with the user terminal 1220 and/or a storage device via the network. In some embodiments, the server 1210 may be implemented on a cloud platform. Merely by way of example, the cloud platform may be a private cloud, a public cloud, a hybrid cloud, a community cloud, a distributed cloud, an inter-cloud, a multi-cloud, or the like, or any combination thereof. In some embodiments, the server 1210 may be implemented on a computing device 1300 having one or more components illustrated in FIG. 13 in the present disclosure.

[0148] In some embodiments, the server 1210 may include a processing device (not shown). The processing device may process information and/or data relating to the route planning request to perform one or more functions described in the present disclosure. For example, the processing device may determine at least one traveling route based on a traffic condition associated with the route planning request. In some embodiments, the processing device may include one or more processing devices (e.g., single-core processing device(s) or multi-core processor(s)). Merely by way of example, the processing device may be one or

more hardware processors, such as a central processing unit (CPU), an application-specific integrated circuit (ASIC), an application-specific instruction-set processor (ASIP), a graphics processing unit (GPU), a physics processing unit (PPU), a digital signal processor (DSP), a field programmable gate array (FPGA), a programmable logic device (PLD), a controller, a microcontroller unit, a reduced instruction-set computer (RISC), a microprocessor, or the like, or any combination thereof.

[0149] The user terminal 1220 may be a mobile device used by a user to request for planning a traveling route. In some embodiments, the user terminal 1220 may be a mobile device, a tablet computer, a laptop computer, a built-in device in a motor vehicle, or the like, or any combination thereof. In some embodiments, the mobile device may be a wearable device, a smart mobile device, a virtual reality device, an augmented reality device, or the like, or any combination thereof. In some embodiments, the wearable device may be a smart bracelet, a smart footgear, a smart glass, a smart helmet, a smart watch, a smart clothing, a smart backpack, a smart accessory, or the like, or any combination thereof. In some embodiments, the smart mobile device may be a smartphone, a personal digital assistant (PDA), a gaming device, a navigation device, a point of sale (POS) device, or the like, or any combination thereof. In some embodiments, the virtual reality device and/or the augmented reality device may be a virtual reality helmet, a virtual reality glass, a virtual reality patch, an augmented reality helmet, an augmented reality glass, an augmented reality patch, or the like, or any combination thereof. For example, the virtual reality device and/or the augmented reality device may be a Google Glass™, a RiftCon™, a Fragments™, a Gear VR™, etc. In some embodiments, built-in device in the motor vehicle may be an onboard computer, an onboard television, etc.

[0150] In some embodiments, the user terminal 1220 may be a device with a positioning component for locating the position of the user and/or the user terminal 1220. Exemplary positioning technologies involved may be a global positioning system (GPS), a global navigation satellite system (GLONASS), a compass navigation system (COMPASS), a Galileo positioning system, a quasi-zenith satellite system (QZSS), a wireless fidelity (WiFi) positioning technology, or the like, or any

combination thereof. One or more of the above positioning technologies may be used interchangeably in the present disclosure. In some embodiments, the user terminal 1220 may be implemented on a computing device 1300 having one or more components illustrated in FIG. 13, or a mobile device 1400 having one or more components illustrated in FIG. 14 in the present disclosure.

[0151] The network (not shown) may facilitate exchange of information and/or data. In some embodiments, one or more components of the system 1200 (e.g., the server 1210, the user terminal 1220, and the storage device) may transmit information and/or data to other component(s) in the system 1200 via the network. For example, the server 1210 may receive a route planning request from the user terminal 1220 via the network. In some embodiments, the network may be any type of wired or wireless network, or combination thereof. Merely by way of example, the network may be a cable network, a wireline network, an optical fiber network, a tele communications network, an intranet, an Internet, a local area network (LAN), a wide area network (WAN), a wireless local area network (WLAN), a metropolitan area network (MAN), a wide area network (WAN), a public telephone switched network (PSTN), a Bluetooth network, a ZigBee network, a near field communication (NFC) network, or the like, or any combination thereof. In some embodiments, the network may include one or more network access points. For example, the network may include wired or wireless network access points such as base stations and/or internet exchange points, through which one or more components of the system 1200 may be connected to the network to exchange data and/or information between them.

[0152] The storage device (not shown) may store data and/or instructions. For example, the storage device may store data obtained from the user terminal 1220. As another example, the storage device may store data and/or instructions that the server 1210 may execute or use to perform exemplary methods described in the present disclosure. In some embodiments, the storage device may be a mass storage, a removable storage, a volatile read-and-write memory, a read-only memory (ROM), or the like, or any combination thereof. Exemplary mass storage may

include a magnetic disk, an optical disk, a solid-state drive, etc. Exemplary removable storage may include a flash drive, a floppy disk, an optical disk, a memory card, a zip disk, a magnetic tape, etc. Exemplary volatile read-and-write memory may include a random-access memory (RAM). Exemplary RAM may include a dynamic RAM (DRAM), a double data rate synchronous dynamic RAM (DDR SDRAM), a static RAM (SRAM), a thyristor RAM (T-RAM), and a zero-capacitor RAM (Z-RAM), etc. Exemplary ROM may include a mask ROM (MROM), a programmable ROM (PROM), an erasable programmable ROM (EPROM), an electrically erasable programmable ROM (EEPROM), a compact disk ROM (CD-ROM), and a digital versatile disk ROM, etc. In some embodiments, the storage device may be implemented on a cloud platform. Merely by way of example, the cloud platform may be a private cloud, a public cloud, a hybrid cloud, a community cloud, a distributed cloud, an inter-cloud, a multi-cloud, or the like, or any combination thereof.

[0153] FIG. 12B is a schematic diagram illustrating an exemplary system 1200 for route planning according to some embodiments of the present disclosure. In some embodiments, the system 1200 may be an online platform including a server 1210, a user terminal 1220, and a station-free transportation tool 1230. In some embodiments, the system 1200 may further include a storage device and a network (not shown). Descriptions of the server 1210, the user terminal 1220, the network and the storage device may be found elsewhere in the present disclosure (e.g., FIG. 12A and the descriptions thereof).

[0154] The station-free transportation tool 1230 may be a vehicle, using which the user may not start at, stop at, or pass by any fixed stations. For example, the station-free transportation tools may include a shared car 1230-1, a shared bike 1230-2, a shared electric bicycle 1230-3, or the like, or any combination thereof. In some embodiments, the station-free transportation tool 1230 may be a vehicle with positioning technology for locating the position of the station-free transportation tool 1230 or a user thereof. The positioning technology used in the present disclosure may be a global positioning system (GPS), a global navigation satellite system

(GLONASS), a compass navigation system (COMPASS), a Galileo positioning system, a quasi-zenith satellite system (QZSS), a wireless fidelity (WiFi) positioning technology, or the like, or any combination thereof. One or more of the above positioning technologies may be used interchangeably in the present disclosure.

[0155] FIG. 13 is a schematic diagram illustrating exemplary hardware and software components of a computing device 1300 on which the server 1210, and/or the user terminal 1220 may be implemented according to some embodiments of the present disclosure. For example, the processing device may be implemented on the computing device 1300 and configured to perform functions of the processing device disclosed in this disclosure.

[0156] The computing device 1300 may be used to implement the system 1200 for the present disclosure. The computing device 1300 may be used to implement any component of the system 1200 that perform one or more functions disclosed in the present disclosure. For example, the processing device may be implemented on the computing device 1300, via its hardware, software program, firmware, or a combination thereof. Although only one such computer is shown, for convenience, the computer functions relating to the online to offline service as described herein may be implemented in a distributed fashion on a number of similar platforms, to distribute the processing load.

[0157] The computing device 1300, for example, may include COM ports 1350 connected to and from a network connected thereto to facilitate data communications. The COM port 1350 may be any network port or information exchange port to facilitate data communications. The computing device 1300 may also include a processor (e.g., the processor 1320), in the form of one or more processors (e.g., logic circuits), for executing program instructions. For example, the processor may include interface circuits and processing circuits therein. The interface circuits may be configured to receive electronic signals from a bus 1310, wherein the electronic signals encode structured data and/or instructions for the processing circuits to process. The processing circuits may conduct logic calculations, and then determine a conclusion, a result, and/or an instruction

encoded as electronic signals. The processing circuits may also generate electronic signals including the conclusion or the result (e.g., the traveling route) and a triggering code. In some embodiments, the trigger code may be in a format recognizable by an operation system (or an application installed therein) of an electronic device (e.g., the user terminal 1220) in the system 1200. For example, the trigger code may be an instruction, a code, a mark, a symbol, or the like, or any combination thereof, that can activate certain functions and/or operations of a mobile phone or let the mobile phone execute a predetermined program(s). In some embodiments, the trigger code may be configured to rend the operation system (or the application) of the electronic device to generate a presentation of the conclusion or the result (e.g., the literal destination) on an interface of the electronic device. Then the interface circuits may send out the electronic signals from the processing circuits via the bus 1310.

[0158] The exemplary computing device may include the internal communication bus 1310, program storage and data storage of different forms including, for example, a disk 1370, and a read only memory (ROM) 1330, or a random access memory (RAM) 1340, for various data files to be processed and/or transmitted by the computing device. The exemplary computing device may also include program instructions stored in the ROM 1330, RAM 1340, and/or other type of non-transitory storage medium to be executed by the processor 1320. The methods and/or processes of the present disclosure may be implemented as the program instructions. The exemplary computing device may also include operation systems stored in the ROM 1330, RAM 1340, and/or other type of non-transitory storage medium to be executed by the processor 1320. The program instructions may be compatible with the operation systems for providing the online to offline service. The computing device 1300 also includes an I/O component 1360, supporting input/output between the computer and other components. The computing device 1300 may also receive programming and data via network communications.

[0159] Merely for illustration, only one processor is illustrated in FIG. 13. Multiple processors are also contemplated; thus, operations and/or method steps performed

by one processor as described in the present disclosure may also be jointly or separately performed by the multiple processors. For example, if in the present disclosure the processor of the computing device 1300 executes both step A and step B, it should be understood that step A and step B may also be performed by two different processors jointly or separately in the computing device 1300 (e.g., the first processor executes step A and the second processor executes step B, or the first and second processors jointly execute steps A and B).

[0160] FIG. 14 is a schematic diagram illustrating exemplary hardware and/or software components of an exemplary mobile device 1400 on which the user terminal 1220 may be implemented according to some embodiments of the present disclosure.

[0161] As illustrated in FIG. 14, the mobile device 1400 may include a communication platform 1410, a display 1420, a graphic processing unit (GPU) 1430, a central processing unit (CPU) 1440, an I/O 1450, a memory 1460, and a storage 1490. The CPU may include interface circuits and processing circuits similar to the processor 1320. In some embodiments, any other suitable component, including but not limited to a system bus or a controller (not shown), may also be included in the mobile device 1400. In some embodiments, a mobile operating system 1470 (e.g., iOS™, Android™, Windows Phone™, etc.) and one or more applications 1480 may be loaded into the memory 1460 from the storage 1490 in order to be executed by the CPU 1440. The applications 1480 may include a browser or any other suitable mobile apps for receiving and rendering information relating to a voice request for a service. User interactions with the information stream may be achieved via the I/O devices 1450 and provided to the processing device and/or other components of the system 1200 via the network.

[0162] In some embodiments, when the user terminal 1220 communicate with the server 1210, the at least one processor of the server 1210 may detect an application executing on the user terminal 1220. The application may automatically communicate with a network service of the server over a network. The at least one processor of the server 1210 may communicate with the application executing on the

user terminal 1220 of the user with respect to a route planning request by: providing first data to the application executing on the user terminal 1220 to generate a presentation on a display of the user terminal 1220 of the user. The presentation may provide a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one processor, a determination process to determine at least one traveling route in response to the route planning request. The at least one processor of the server 1210 may then receive, from the user terminal 1220 of the user, the route planning request once the user interacts with the user interface feature. The route planning request may include a start location and a destination. In response to receiving the route planning request, the at least one processor of the server 1210 may initiate the determination process by programmatically determining second data including at least one traveling route according to the route planning request. The at least one processor of the server 1210 may then encrypt the second data to be provided to the application executing on the user terminal 1220 and provide the encrypted second data to the application executing on the user terminal 1220 to cause the presentation to depict the one or more traveling routes on the display of the user terminal 1220.

[0163] To implement various modules, units, and their functionalities described in the present disclosure, computer hardware platforms may be used as the hardware platform(s) for one or more of the elements described herein (e.g., the system 1200, and/or other components of the system 1200 described with respect to FIGs. 12A-12B). The hardware elements, operating systems and programming languages of such computers are conventional in nature, and it is presumed that those skilled in the art are adequately familiar therewith to adapt those technologies to provide a service in response to a voice request as described herein. A computer with user interface elements may be used to implement a personal computer (PC) or other type of work station or terminal device, although a computer may also act as a server if appropriately programmed. It is believed that those skilled in the art are familiar with the structure, programming and general operation of such computer equipment and as a result the drawings should be self-explanatory.

[0164] FIG. 15 is an exemplary user interface of a user terminal for presenting at least one traveling route according to some embodiments of the present disclosure. In some embodiments, the method for route planning may further include: after a route planning request is sent to a server, recommending to the user at least one traveling route including at least one station-free path segment which is sent back by the server. During each station-free path segment, the user may use a type of a station-free transportation tool.

[0165] In some embodiments, at least one traveling route including at least one station-free path segment may be recommended, which primarily combines traveling modes of the station-free transportation tools with other transportation tools or services, thus improving the traveling efficiency of the user.

[0166] In some embodiments, the method may further include: ranking the at least one traveling route based on the estimated traveling time and/or the estimated total walking distance of the at least one traveling route according to an ascending order and displaying the ranked at least one traveling route with the estimated total traveling time and the estimated total walking distance of each path segment thereof. Therefore, the user can balance the traveling time and the walking distance to determine a suitable traveling route. A reference cost may also be provided to the user, which may also help the user to balance the traveling time, the walking distance, and the traveling cost so as to determine a final traveling route.

[0167] As shown in FIG. 15, after the routes are optimized based on the method for route planning of the present disclosure, the information displayed on the user terminal may include: a route planning request from a user; Origin: No. X, North Road, Forestry University; Destination: Bird's Nest; Start time: 21: 00; and planning results. The planning results includes:

[0168] A first displayed traveling route: 25 minutes, Station-free Path Segment 9-Public Bus Path Segment 2-Station-free Path Segment 10, an estimated total walking distance is less than 100 meters, and the estimated cost is RMB 3 yuan.

[0169] A second displayed traveling route: 28 minutes, Station-free Path Segment 6-Subway Path Segment 2-Station-free Path Segment, an estimated total walking

distance is less than 100 meters, and the estimated cost is RMB 5 yuan.

[0170] A third displayed traveling route: 28 minutes, Station-free Path Segment 1-Subway Path Segment 1-Station-free Path Segment 3, an estimated total walking distance is 0.3 km, and the estimated cost is RMB 6 yuan.

[0171] With respect to FIG. 15, the estimated total walking distance and the estimated total traveling time in the first displayed traveling route are the shortest, and the estimated total cost is the lowest. The corresponding traveling route may be displayed on the user terminal for the user.

[0172] Further, additional information may be provided: Calling a taxi, estimated cost is RMB 10 yuan and the estimated total traveling time is 8 minutes. The interface may be directed to an interface for calling a taxi according to the user's touch operation on the additional information.

[0173] FIG. 16 is a flowchart illustrating an exemplary process for route planning according to some embodiments of the present disclosure.

[0174] As shown in FIG. 16, the method for route planning may include: In 1602, the at least one processor may determine whether a user opens a route planning function of usage of station-free transportation tools. If yes, proceeding to 1604, and if not, proceeding to 1620. In 1604, the at least one processor may determine whether a traveling distance is less than 5 kilometers, if yes, proceeding to 1606, and if not, proceeding to 1620. In 1606, the at least one processor may determine whether the user desires to classify different path segments in traveling routes. If yes, proceeding to 1608. In 1608, the at least one processor may designate a path segment intersecting a fixed station of a public transportation service as a second type of path segment. In 1610, the at least one processor may designate a path segment from an origin to a first station of a public transportation service or from a last station of public transportation service to a destination as a first type of path segment. In 1612, the at least one processor may determine whether the first type of path segment is within 1.5 to 3 kilometers, if yes, proceeding to 1614, if not, proceeding to 1620. In 1614, the at least one processor may designate the first type of path segment as a walking path segment. In 1616, the at least one

processor may designate a path segment intersecting a fixed station of a public transportation service that is out of service time or in peak hours as a walking path segment. In 1618, the at least one processor may determine whether a distribution of station-free transportation tools at a start area of the first or second type of path segment meets a demand. If yes, proceeding to 1622, and if not, proceeding to 1620. In 1620, the at least one processor may recommend a walking path segment or a path segment intersecting a fixed station of a public transportation service to the user. In 1622, the at least one processor may recommend a station-free path segment instead of a walking path segments to the user. In 1624, the at least one processor may rank all traveling routes according to a predetermined strategy and sending to the user terminal for display (as shown in FIG. 15).

[0175] It should be noted that if the distribution of the station-free transportation tools does not meet the demand for generating the station-free path segment, a recommendation to designate the path segment as a waling path segment may be provided to the user.

[0176] Having thus described the basic concepts, it may be rather apparent to those skilled in the art after reading this detailed disclosure that the foregoing detailed disclosure is intended to be presented by way of example only and is not limiting. Various alterations, improvements, and modifications may occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested by this disclosure, and are within the spirit and scope of the exemplary embodiments of this disclosure.

[0177] Moreover, certain terminology has been used to describe embodiments of the present disclosure. For example, the terms “one embodiment,” “an embodiment,” and/or “some embodiments” mean that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Therefore, it is emphasized and should be appreciated that two or more references to “an embodiment,” “one embodiment,” or “an alternative embodiment” in various portions of this specification are not necessarily all referring to the same embodiment. Furthermore, the particular

features, structures or characteristics may be combined as suitable in one or more embodiments of the present disclosure.

[0178] Further, it will be appreciated by one skilled in the art, aspects of the present disclosure may be illustrated and described herein in any of a number of patentable classes or context including any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof. Accordingly, aspects of the present disclosure may be implemented entirely hardware, entirely software (including firmware, resident software, micro-code, etc.) or combining software and hardware implementation that may all generally be referred to herein as a "block," "module," "engine," "unit," "component," or "system." Furthermore, aspects of the present disclosure may take the form of a computer program product embodied in one or more computer readable media having computer readable program code embodied thereon.

[0179] A computer readable signal medium may include a propagated data signal with computer readable program code embodied therein, for example, in baseband or as part of a carrier wave. Such a propagated signal may take any of a variety of forms, including electro-magnetic, optical, or the like, or any suitable combination thereof. A computer readable signal medium may be any computer readable medium that is not a computer readable storage medium and that may communicate, propagate, or transport a program for use by or in connection with an instruction execution system, apparatus, or device. Program code embodied on a computer readable signal medium may be transmitted using any appropriate medium, including wireless, wireline, optical fiber cable, RF, or the like, or any suitable combination of the foregoing.

[0180] Computer program code for carrying out operations for aspects of the present disclosure may be written in any combination of one or more programming languages, including an object oriented programming language such as Java, Scala, Smalltalk, Eiffel, JADE, Emerald, C++, C#, VB. NET, Python or the like, conventional procedural programming languages, such as the "C" programming language, Visual Basic, Fortran 1703, Perl, COBOL 1702, PHP, ABAP, dynamic programming

languages such as Python, Ruby and Groovy, or other programming languages. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider) or in a cloud computing environment or offered as a service such as a software as a service (SaaS).

[0181] Furthermore, the recited order of processing elements or sequences, or the use of numbers, letters, or other designations, therefore, is not intended to limit the claimed processes and methods to any order except as may be specified in the claims. Although the above disclosure discusses through various examples what is currently considered to be a variety of useful embodiments of the disclosure, it is to be understood that such detail is solely for that purpose, and that the appended claims are not limited to the disclosed embodiments, but, on the contrary, are intended to cover modifications and equivalent arrangements that are within the spirit and scope of the disclosed embodiments. For example, although the implementation of various components described above may be embodied in a hardware device, it may also be implemented as a software-only solution—e.g., an installation on an existing server or mobile device.

[0182] Similarly, it should be appreciated that in the foregoing description of embodiments of the present disclosure, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure aiding in the understanding of one or more of the various embodiments. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed subject matter requires more features than are expressly recited in each claim. Rather, claimed subject matter may lie in less than all features of a single foregoing disclosed embodiment.

[0183] In some embodiments, the numbers expressing quantities or properties used to describe and claim certain embodiments of the application are to be understood as being modified in some instances by the term “about,” “approximate,” or “substantially.” For example, “about,” “approximate,” or “substantially” may indicate $\pm 20\%$ variation of the value it describes, unless otherwise stated. Accordingly, in some embodiments, the numerical parameters set forth in the written description and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by a particular embodiment. In some embodiments, the numerical parameters should be construed in light of the number of reported significant digits and by applying ordinary rounding techniques.

Notwithstanding that the numerical ranges and parameters setting forth the broad scope of some embodiments of the application are approximations, the numerical values set forth in the specific examples are reported as precisely as practicable.

[0184] Each of the patents, patent applications, publications of patent applications, and other material, such as articles, books, specifications, publications, documents, things, and/or the like, referenced herein is hereby incorporated herein by this reference in its entirety for all purposes, excepting any prosecution file history associated with same, any of same that is inconsistent with or in conflict with the present document, or any of same that may have a limiting affect as to the broadest scope of the claims now or later associated with the present document. By way of example, should there be any inconsistency or conflict between the descriptions, definition, and/or the use of a term associated with any of the incorporated material and that associated with the present document, the description, definition, and/or the use of the term in the present document shall prevail.

[0185] In closing, it is to be understood that the embodiments of the application disclosed herein are illustrative of the principles of the embodiments of the application. Other modifications that may be employed may be within the scope of the application. Thus, by way of example, but not of limitation, alternative configurations of the embodiments of the application may be utilized in accordance

with the teachings herein. Accordingly, embodiments of the present application are not limited to that precisely as shown and describe.

WE CLAIM:

1. A system of one or more electronic devices for route planning, comprising:

at least one network interface to communicate with a user terminal of a user;

at least one processor operably coupled to the at least one network interface,

the at least one processor being directed to:

detect an application executing on a user terminal, the application automatically communicating with a network service of the system over a network;

communicate with the application executing on the user terminal of the user with respect to a route planning request;

wherein the at least one processor communicates with the application by:

providing first data to the application executing on the user terminal to generate a presentation, on a display of the user terminal of the user, the presentation providing a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one processor, a determination process to determine at least one traveling route in response to the route planning request;

receiving, from the user terminal of the user, the route planning request once the user interacts with the user interface feature, the route planning request including a start location and a destination;

in response to receiving the route planning request, initiate the determination process by programmatically determining second data including at least one traveling route according to the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool;

encrypt the second data to be provided to the application executing on the user terminal; and

provide the encrypted second data to the application executing on the user terminal to cause the presentation to depict the one or more traveling routes on the display of the user terminal.

2. The system of claim 1, wherein the traffic condition includes at least one of a congestion index or a service time of a public transportation service with fixed stations.

3. The system of claim 2, wherein the route planning request is a request for using public transportation, and to determine the second data including the at least one traveling route, the at least one processor is further directed to:

determine at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition;

for each of the at least one candidate route, identify at least one path segment intersecting a fixed station of a public transportation service in the candidate route; and

for each of the at least one path segment intersecting a fixed station of a public transportation service,

determine an estimated congestion index of the path segment;

identify a service time of the corresponding public transportation service;

assess whether the estimated congestion index exceeds a congestion threshold or that the corresponding public transportation service is out of the service time; and

determine, based on the assessment, whether to designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment.

4. The system of claim 3, wherein the at least one processor is further directed to: obtain the at least one traveling route based on the at least one candidate

route;

for each of the at least one traveling route,

identify at least one path segment type in the traveling route, each of the at least one path segment type including at least one of: a transfer path segment, a path segment intersecting a fixed station of a public transportation service, or a station-free path segment, and the transfer path segment connecting two public transportation services; and

determine an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type; and

rank the at least one traveling route based on at least one of the at least one estimated total traveling time or the at least one estimated total walking distance of the at least one traveling route.

5. The system of claim 4, wherein the at least one processor is further directed to:

determine a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route.

6. The system of claim 3, wherein to determine the second data including the at least one traveling route, the at least one processor is further directed to:

for each of the at least one station-free path segment,

identify a start area of a type of the station-free transportation tool corresponding to the station-free path segment;

obtain a distribution of station-free transportation tools of the corresponding type available at the start area; and

determine whether to generate the traveling route including the at least one station-free path segment based on the distribution.

7. The system of claim 6, wherein the at least one processor is further directed to:

identify a plurality of origins and destinations of the at least one station-free

path segment, wherein each of the at least one station-free path segment includes an origin and a destination;

identify two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments;

merge the identified two station-free path segments;

obtain a first count of station-free transportation tools of the corresponding type available at the start area of the merged station-free path segment at the time of receipt of the route planning request; and

obtain a historical usage record of each of the transportation tools of the corresponding type available at the start area, wherein

the distribution includes the first count and the historical usage record of each of the transportation tools of the corresponding type available at the start area.

8. The system of claim 7, wherein to determine whether to generate the at least one traveling route, the at least one processor is further directed to:

estimate a second count of station-free transportation tools of the corresponding type at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record;

determine that the second count exceeds a count threshold; and

in response to a determination that the second count exceeds the count threshold, generate the at least one traveling route including the merged station-free path segment.

9. The system of claim 8, wherein the at least one processor is further directed to:

generate and push a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a transportation tool of a type different from the corresponding type.

10. The system of any one of claims 1-9, wherein a distance of each station-free path segment of the at least one station-free path segment is not greater than five kilometers.

11. The system of any one of claims 1-10, wherein the type of the station-free transportation tool includes at least one of: a shared bike, a shared electric bicycle, a shared motorcycle, a shared scooter, or a shared car.

12. The system of claim 6, wherein the distribution is a real-time distribution of the station-free transportation tools of the corresponding type available at the start area when a user of the user terminal arrives at the start area.

13. The system of claim 12, wherein the real-time distribution is obtained based on GPS data of the station-free transportation tools of the corresponding type associated with the start area.

14. A computer-implemented method for operating one or more servers for route planning, the method comprising:

- detecting an application executing on a user terminal, the application automatically communicating with a network service of a system over a network;

- communicating with the application executing on the user terminal of the user with respect to a route planning request;

- wherein communicating with the application includes:

- providing first data to the application executing on the user terminal to generate a presentation, on a display of the user terminal of the user, the presentation providing a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one servers, a determination process to determine at least one traveling route in response to the route planning request;

- receiving, from the user terminal of the user, the route planning request

once the user interacts with the user interface feature, the route planning request including a start location and a destination;

in response to receiving the route planning request, initiating the determination process by programmatically determining second data including at least one traveling route according to the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool;

encrypting the second data to be provided to the application executing on the user terminal; and

providing the encrypted second data to the application executing on the user terminal to cause the presentation to depict the one or more traveling routes on the display of the user terminal.

15. The method of claim 14, wherein the traffic condition includes at least one of a congestion index or a service time of a public transportation service with fixed stations.

16. The method of claim 15, wherein the route planning request is a request for using public transportation, and the determining the second data including the at least one traveling route includes:

determining at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition;

for each of the at least one candidate route, identifying at least one path segment intersecting a fixed station of a public transportation service in the candidate route; and

for each of the at least one path segment intersecting a fixed station of a public transportation service,

determining an estimated congestion index of the path segment;

identifying a service time of the corresponding public transportation

service;

assessing whether the estimated congestion index exceeds a congestion threshold or that the corresponding public transportation service is out of the service time; and

determining, based on the assessment, whether to designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment.

17. The method of claim 16 further comprising:

obtaining the at least one traveling route based on the at least one candidate route;

for each of the at least one traveling route,

identifying at least one path segment type in the traveling route, each of the at least one path segment type including at least one of: a transfer path segment, a path segment intersecting a fixed station of a public transportation service, or a station-free path segment, and the transfer path segment connecting two public transportation services; and

determining an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type; and

ranking the at least one traveling route based on at least one of the at least one estimated total traveling time or the at least one estimated total walking distance of the at least one traveling route.

18. The method of claim 17, further comprising:

determining a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route.

19. The method of claim 16, wherein the determining of the at least one traveling route includes:

for each of the at least one station-free path segment,
 identifying a start area of a type of the station-free transportation tool
corresponding to the station-free path segment;
 obtaining a distribution of station-free transportation tools of the
corresponding type available at the start area; and
 determining whether to generate the traveling route including the at
least one station-free path segment based on the distribution.

20. The method of claim 19, further comprising:

 identifying a plurality of origins and destinations of the at least one station-free
path segment, wherein each of the at least one station-free path segment includes
an origin and a destination;

 identifying two station-free path segments in which an origin of one of the two
station-free path segments is the same as the destination of the other of the two
station-free path segments;

 merging the identified two station-free path segments;

 obtaining a first count of station-free transportation tools of the corresponding
type available at the start area of the merged station-free path segment at the time of
receipt of the route planning request; and

 obtaining a historical usage record of each of the transportation tools of the
corresponding type available at the start area, wherein

 the distribution includes the first count and the historical usage record
of each of the transportation tools of the corresponding type available at the
start area.

21. The method of claim 20, wherein the determining whether to generate the at
least one traveling route includes:

 estimating a second count of station-free transportation tools of the
corresponding type at the start area when a user of the user terminal arrives at the
start area based on the first count and the historical usage record;

determining that the second count exceeds a count threshold; and
in response to a determination that the second count exceeds the count threshold, generating the at least one traveling route including the merged station-free path segment.

22. The method of claim 21, further comprising:

generating and pushing a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a transportation tool of a type different from the corresponding type.

23. The method of any one of claims 14-22, wherein a distance of each station-free path segment of the at least one station-free path segment is not greater than five kilometers.

24. The method of any one of claims 14-23, wherein the type of the station-free transportation tool includes at least one of: a shared bike, a shared electric bicycle, a shared motorcycle, a shared scooter, or a shared car.

25. The method of claim 19, wherein the distribution is a real-time distribution of the station-free transportation tools of the corresponding type available at the start area when a user of the user terminal arrives at the start area.

26. The system of claim 25, wherein the real-time distribution is obtained based on GPS data of the station-free transportation tools of the corresponding type associated with the start area.

27. A non-transitory computer readable medium, comprising at least one set of instructions for route planning, wherein when executed by at least one processor of one or more electronic device, the at least one set of instructions directs the at least one processor to:

detect an application executing on a user terminal, the application automatically communicating with a network service of a system over a network;

communicate with the application executing on the user terminal of the user with respect to a route planning request;

wherein communicating with the application includes:

- providing first data to the application executing on the user terminal to generate a presentation, on a display of the user terminal of the user, the presentation providing a user interface feature from which the user can trigger transmission of the route planning request to initiate, by the at least one servers, a determination process to determine at least one traveling route in response to the route planning request;
- receiving, from the user terminal of the user, the route planning request once the user interacts with the user interface feature, the route planning request including a start location and a destination;
- in response to receiving the route planning request, initiate the determination process by programmatically determining second data including at least one traveling route according to the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool;
- encrypt the second data to be provided to the application executing on the user terminal; and
- provide the encrypted second data to the application executing on the user terminal to cause the presentation to depict the one or more traveling routes on the display of the user terminal.

28. A system of one or more electronic devices for route planning, comprising:

- at least one storage device including an operation system and a set of instructions compatible with the operation system for route planning; and
- at least one processor in communication with the storage device, wherein

when executing the set of instructions, the at least one processor is directed to:

- obtain a route planning request from a user terminal;
- determine at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool;
- in response to determining the at least one traveling route, generate electronic signals including information of the at least one traveling route; and
- send the electronic signals to the user terminal to direct the user terminal to display the at least one traveling route.

29. The system of claim 28, wherein the traffic condition includes at least one of a congestion index or a service time of a public transportation service with fixed stations.

30. The system of claim 29, wherein the route planning request is a request for using public transportation, and to determine the at least one traveling route, the at least one processor is further directed to:

- determine at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition;
- for each of the at least one candidate route, identify at least one path segment intersecting a fixed station of a public transportation service in the candidate route; and
- for each of the at least one path segment intersecting a fixed station of a public transportation service,
 - determine an estimated congestion index of the path segment;
 - identify a service time of the corresponding public transportation service;
 - assess whether the estimated congestion index exceeds a congestion

threshold or that the corresponding public transportation service is out of the service time; and

determine, based on the assessment, whether to designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment.

31. The system of claim 30, wherein the at least one processor is further directed to:

obtain the at least one traveling route based on the at least one candidate route;

for each of the at least one traveling route,

identify at least one path segment type in the traveling route, each of the at least one path segment type including at least one of: a transfer path segment, a path segment intersecting a fixed station of a public transportation service, or a station-free path segment, and the transfer path segment connecting two public transportation services; and

determine an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type; and

rank the at least one traveling route based on at least one of the at least one estimated total traveling time or the at least one estimated total walking distance of the at least one traveling route.

32. The system of claim 31, wherein the at least one processor is further directed to:

determine a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route.

33. The system of claim 30, wherein to determine the at least one traveling route, the at least one processor is further directed to:

for each of the at least one station-free path segment,

identify a start area of a type of the station-free transportation tool

corresponding to the station-free path segment;

obtain a distribution of station-free transportation tools of the corresponding type available at the start area; and

determine whether to generate the traveling route including the at least one station-free path segment based on the distribution.

34. The system of claim 33, wherein the at least one processor is further directed to:

identify a plurality of origins and destinations of the at least one station-free path segment, wherein each of the at least one station-free path segment includes an origin and a destination;

identify two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments;

merge the identified two station-free path segments;

obtain a first count of station-free transportation tools of the corresponding type available at the start area of the merged station-free path segment at the time of receipt of the route planning request; and

obtain a historical usage record of each of the transportation tools of the corresponding type available at the start area, wherein

the distribution includes the first count and the historical usage record of each of the transportation tools of the corresponding type available at the start area.

35. The system of claim 34, wherein to determine whether to generate the at least one traveling route, the at least one processor is further directed to:

estimate a second count of station-free transportation tools of the corresponding type at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record;

determine that the second count exceeds a count threshold; and

in response to a determination that the second count exceeds the count

threshold, generate the at least one traveling route including the merged station-free path segment.

36. The system of claim 35, wherein the at least one processor is further directed to:
generate and push a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a transportation tool of a type different from the corresponding type.

37. The system of any one of claims 28-36, wherein a distance of each station-free path segment of the at least one station-free path segment is not greater than five kilometers.

38. The system of any one of claims 28-37, wherein the type of the station-free transportation tool includes at least one of: a shared bike, a shared electric bicycle, a shared motorcycle, a shared scooter, or a shared car.

39. The system of claim 28, wherein at least one of the at least one traveling route does not include any station-free path segment.

40. A method for route planning, implemented on one or more electronic devices, comprising:

obtaining a route planning request from a user terminal;

determining at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool;

in response to determining the at least one traveling route, generating electronic signals including information of the at least one traveling route; and

sending the electronic signals to the user terminal to direct the user terminal

to display the at least one traveling route.

41. The method of claim 40, wherein the traffic condition includes at least one of a congestion index or a service time of a public transportation service with fixed stations.

42. The method of claim 41, wherein the route planning request is a request for using public transportation, and the determining the at least one traveling route includes:

- determining at least one candidate route including at least one public transportation service based on the route planning request and the traffic condition;

- for each of the at least one candidate route, identifying at least one path segment intersecting a fixed station of a public transportation service in the candidate route; and

- for each of the at least one path segment intersecting a fixed station of a public transportation service,

- determining an estimated congestion index of the path segment;

- identifying a service time of the corresponding public transportation service;

- assessing whether the estimated congestion index exceeds a congestion threshold or that the corresponding public transportation service is out of the service time; and

determining, based on the assessment, whether to designate the path segment intersecting the fixed station of the corresponding public transportation service as a station-free path segment.

43. The method of claim 42 further comprising:

- obtaining the at least one traveling route based on the at least one candidate route;

- for each of the at least one traveling route,

identifying at least one path segment type in the traveling route, each of the at least one path segment type including at least one of: a transfer path segment, a path segment intersecting a fixed station of a public transportation service, or a station-free path segment, and the transfer path segment connecting two public transportation services; and

determining an estimated total traveling time or an estimated total walking distance of the traveling route based on the at least one path segment type; and

ranking the at least one traveling route based on at least one of the at least one estimated total traveling time or the at least one estimated total walking distance of the at least one traveling route.

44. The method of claim 43, further comprising:

determining a display sequence of the at least one traveling route based on the ranking result of the at least one traveling route.

45. The method of claim 42, wherein the determining of the at least one traveling route includes:

for each of the at least one station-free path segment,

identifying a start area of a type of the station-free transportation tool corresponding to the station-free path segment;

obtaining a distribution of station-free transportation tools of the corresponding type available at the start area; and

determining whether to generate the traveling route including the at least one station-free path segment based on the distribution.

46. The method of claim 45, further comprising:

identifying a plurality of origins and destinations of the at least one station-free path segment, wherein each of the at least one station-free path segment includes an origin and a destination;

identifying two station-free path segments in which an origin of one of the two station-free path segments is the same as the destination of the other of the two station-free path segments;

merging the identified two station-free path segments;

obtaining a first count of station-free transportation tools of the corresponding type available at the start area of the merged station-free path segment at the time of receipt of the route planning request; and

obtaining a historical usage record of each of the transportation tools of the corresponding type available at the start area, wherein

the distribution includes the first count and the historical usage record of each of the transportation tools of the corresponding type available at the start area.

47. The method of claim 46, wherein the determining whether to generate the at least one traveling route includes:

estimating a second count of station-free transportation tools of the corresponding type at the start area when a user of the user terminal arrives at the start area based on the first count and the historical usage record;

determining that the second count exceeds a count threshold; and

in response to a determination that the second count exceeds the count threshold, generating the at least one traveling route including the merged station-free path segment.

48. The method of claim 47, further comprising:

generating and pushing a prompt message to the user terminal to advise the user to reserve a transportation tool of the corresponding type at the start area or to reserve a transportation tool of a type different from the corresponding type.

49. The method of any one of claims 40-48, wherein a distance of each station-free path segment of the at least one station-free path segment is not greater than five

kilometers.

50. The method of any one of claims 40-49, wherein the type of the station-free transportation tool includes at least one of: a shared bike, a shared electric bicycle, a shared motorcycle, a shared scooter, or a shared car.

51. The method of claim 40, wherein at least one of the at least one traveling route does not include any station-free path segment.

52. A non-transitory computer readable medium, comprising at least one set of instructions for route planning, wherein when executed by at least one processor of one or more electronic device, the at least one set of instructions directs the at least one processor to:

- obtain a route planning request from a user terminal;

- determine at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment, and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool;

- in response to determining the at least one traveling route, generate electronic signals including information of the at least one traveling route; and

- send the electronic signals to the user terminal to direct the user terminal to display the at least one traveling route.

53. A system for route planning, comprising:

- an obtaining module configured to obtain a route planning request from a user terminal; and

- a determining module configured to determine at least one traveling route based on a traffic condition associated with the route planning request, at least one of the at least one traveling route including at least one station-free path segment,

and during each station-free path segment the travel route specifying usage of a type of a station-free transportation tool.

100

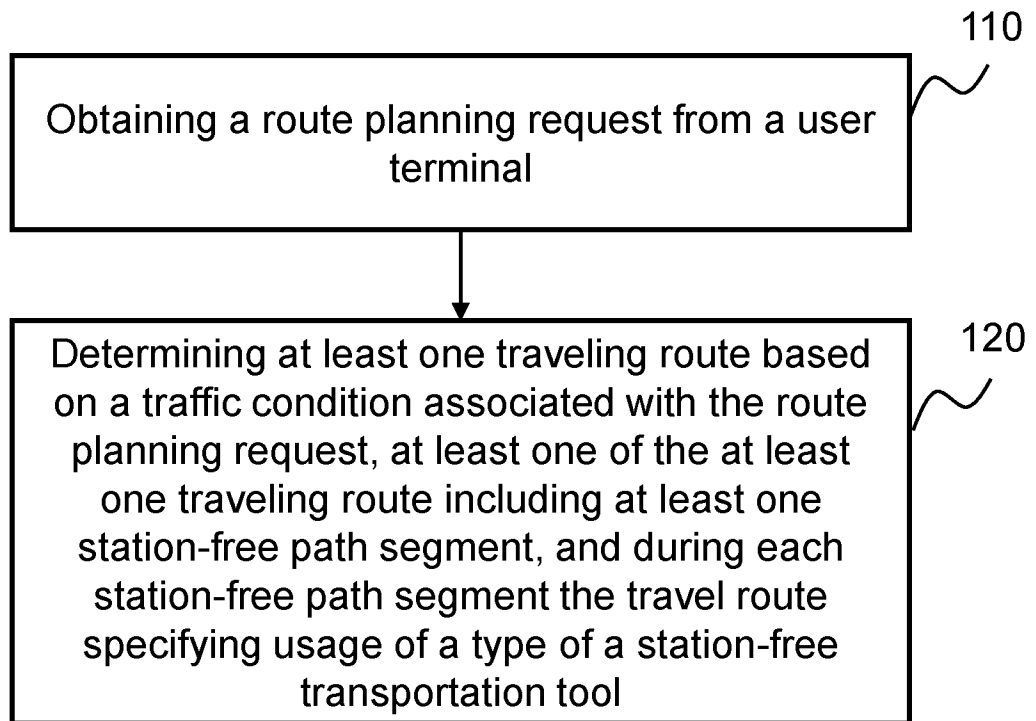


FIG. 1

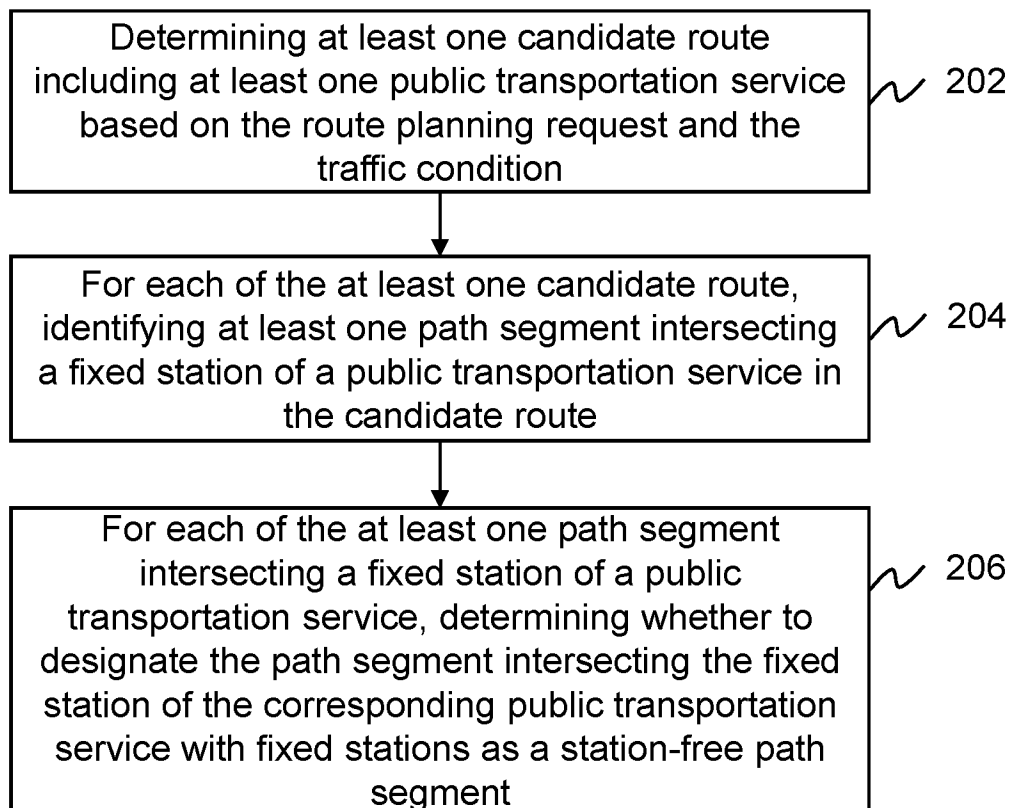
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FIG. 2

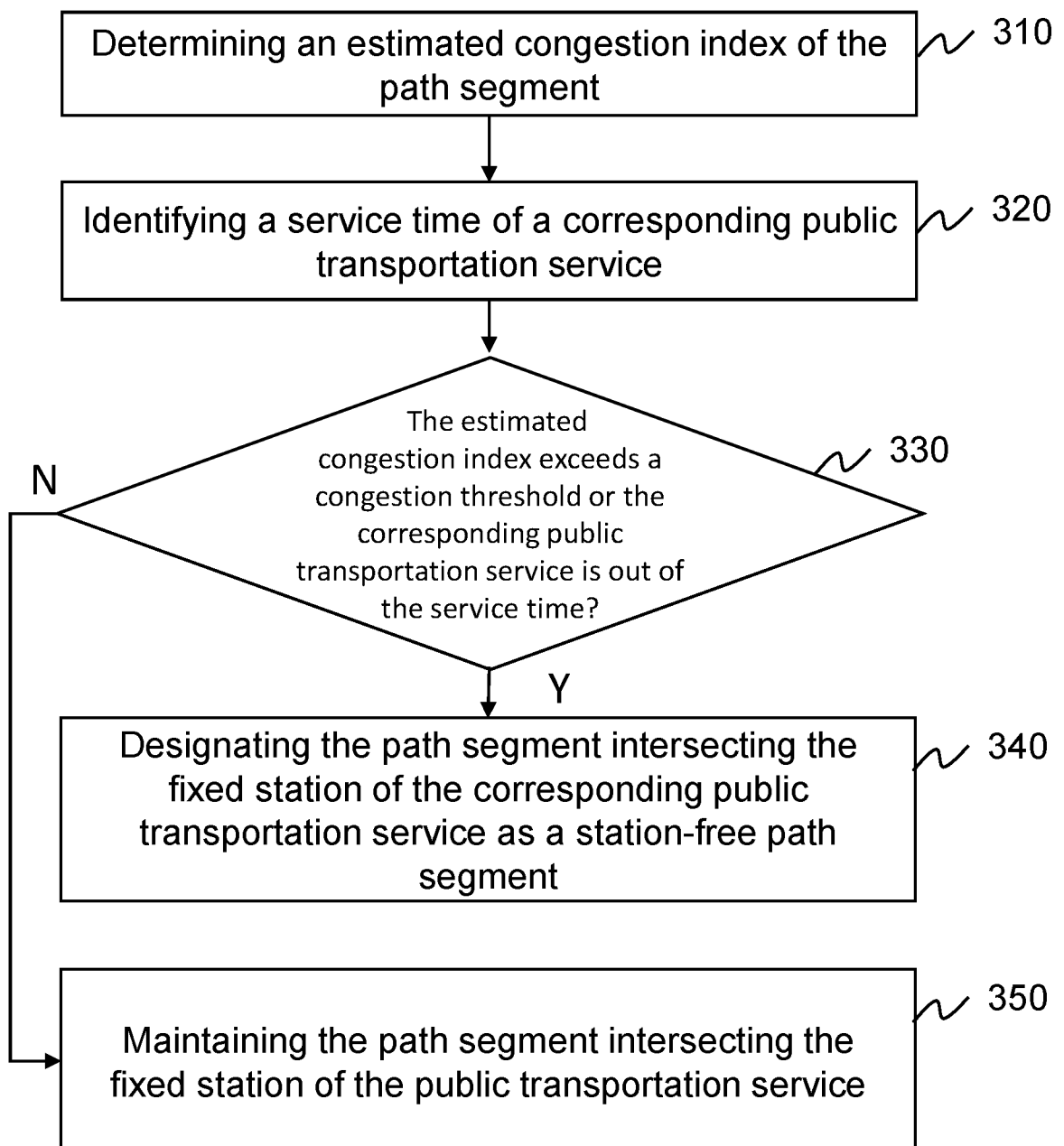
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FIG. 3

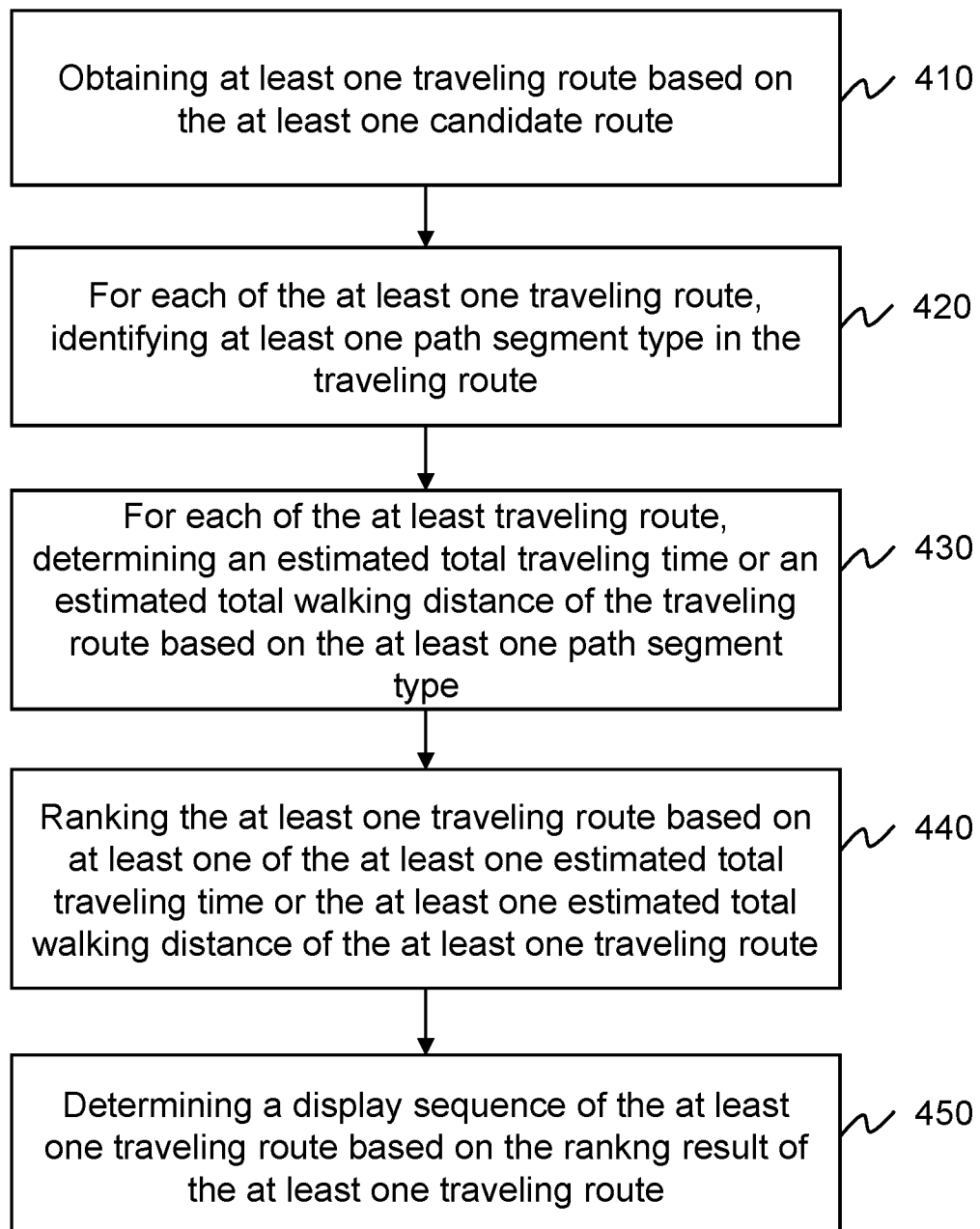
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FIG. 4

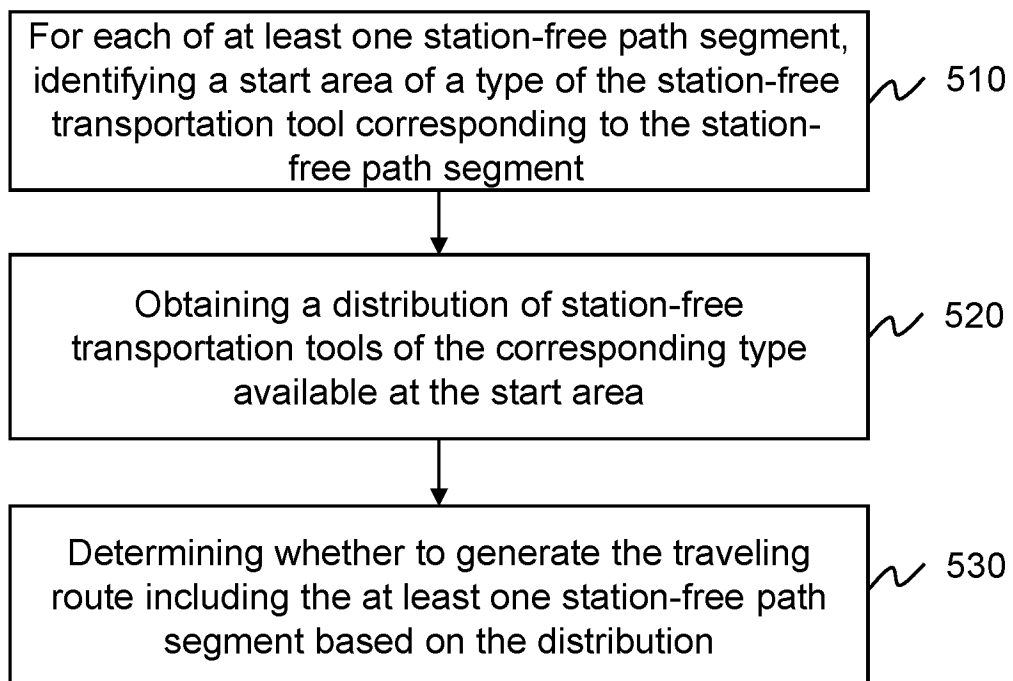
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FIG. 5

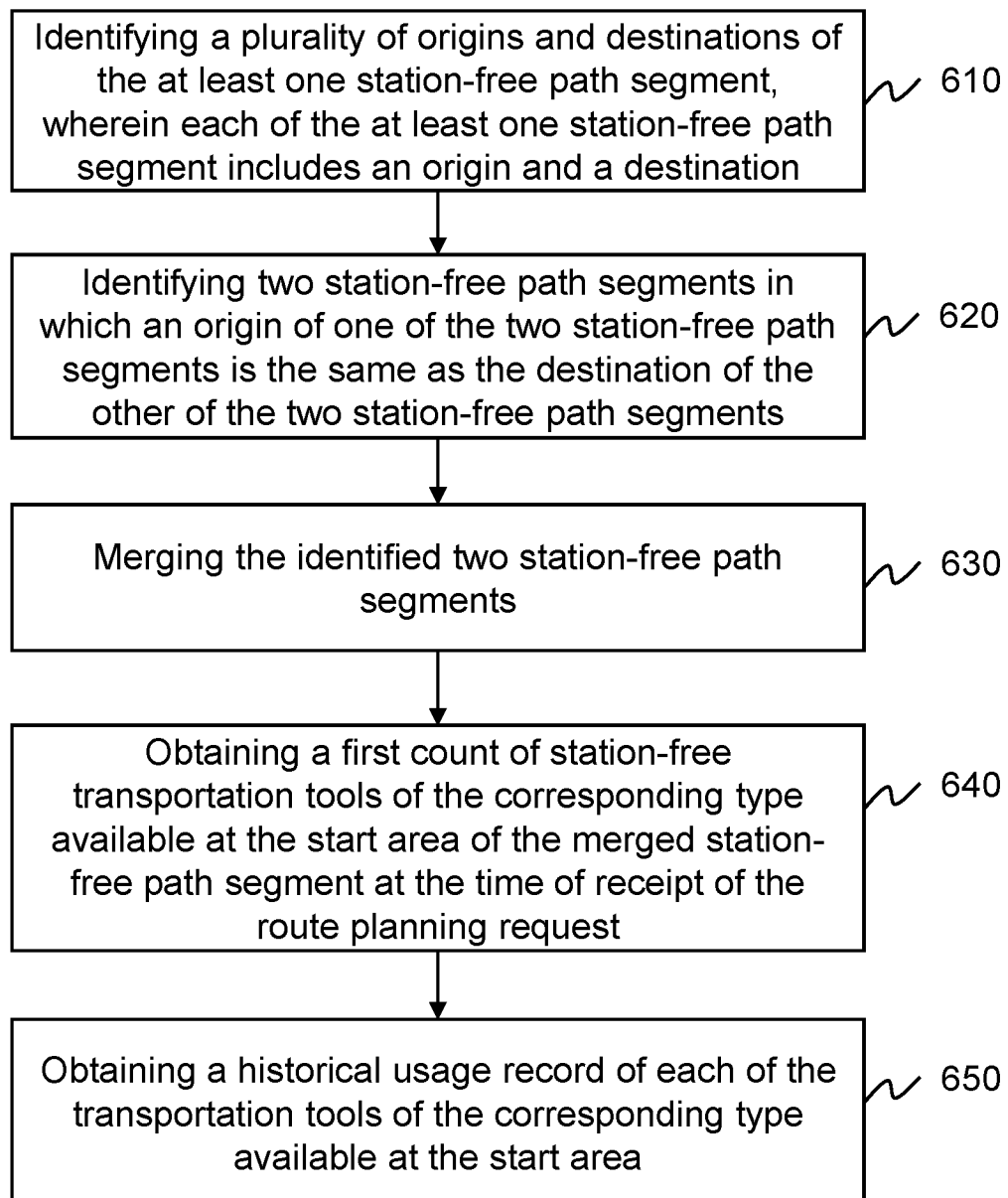
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FIG. 6

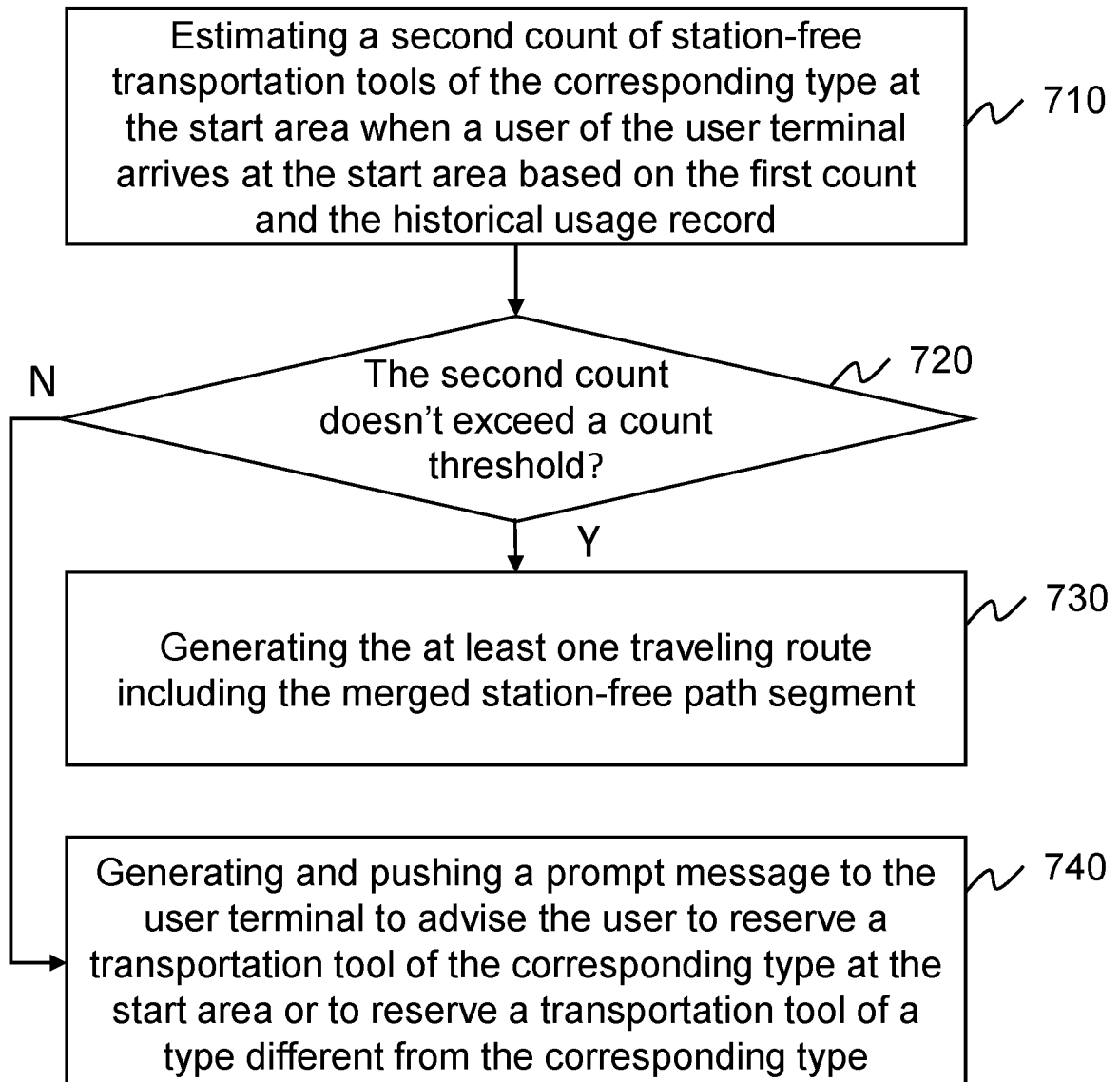
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FIG. 7

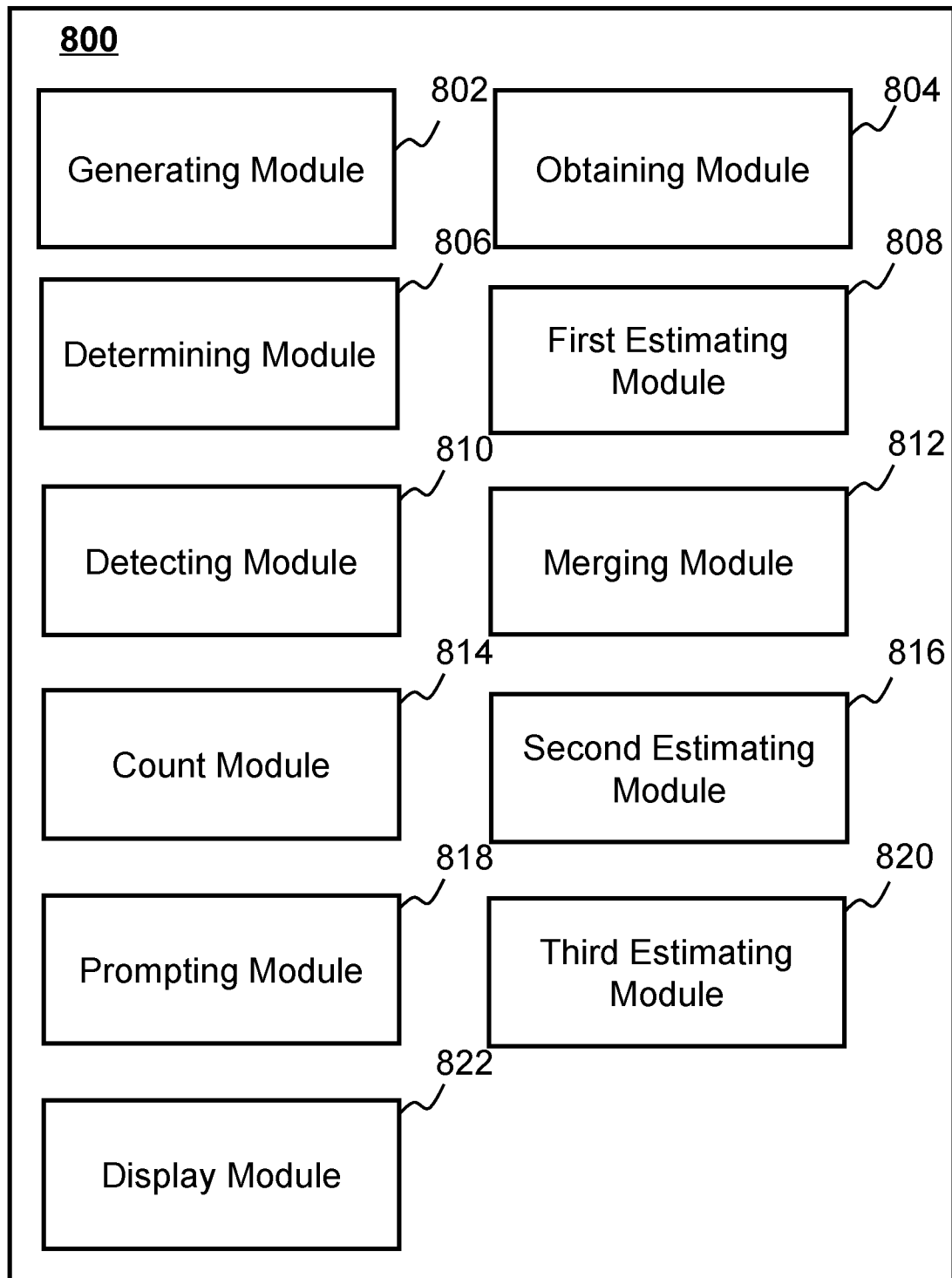


FIG. 8

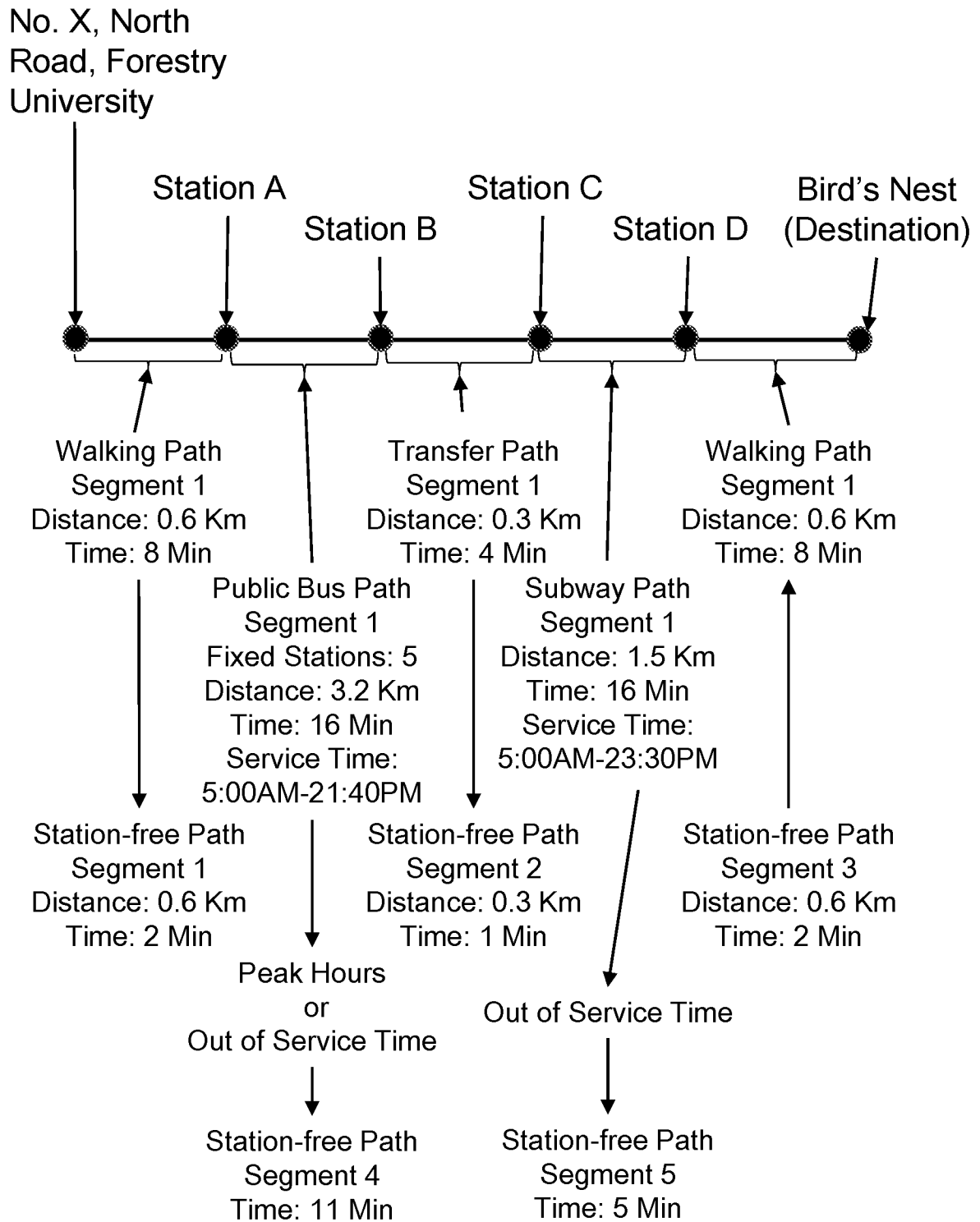


FIG. 9

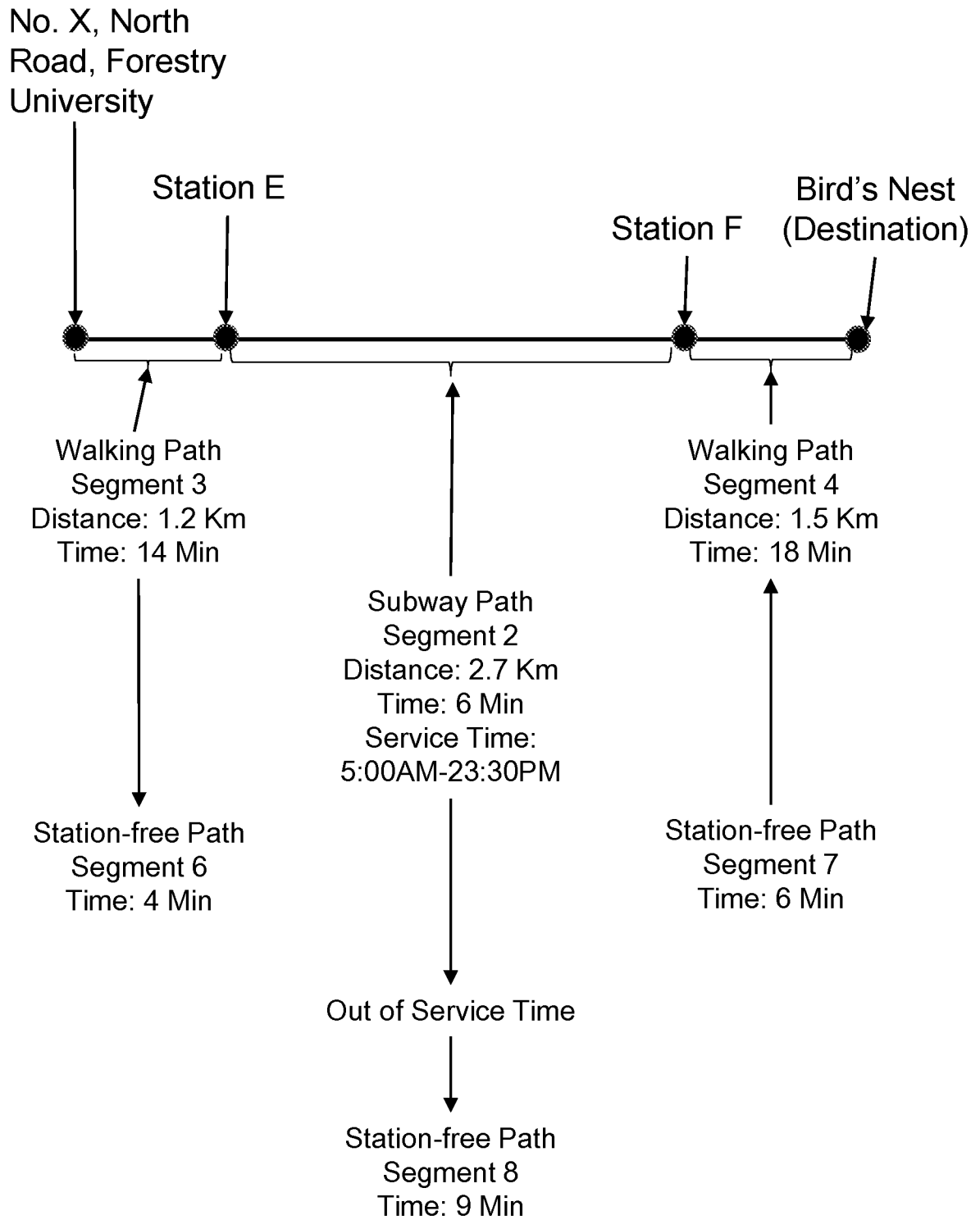


FIG. 10

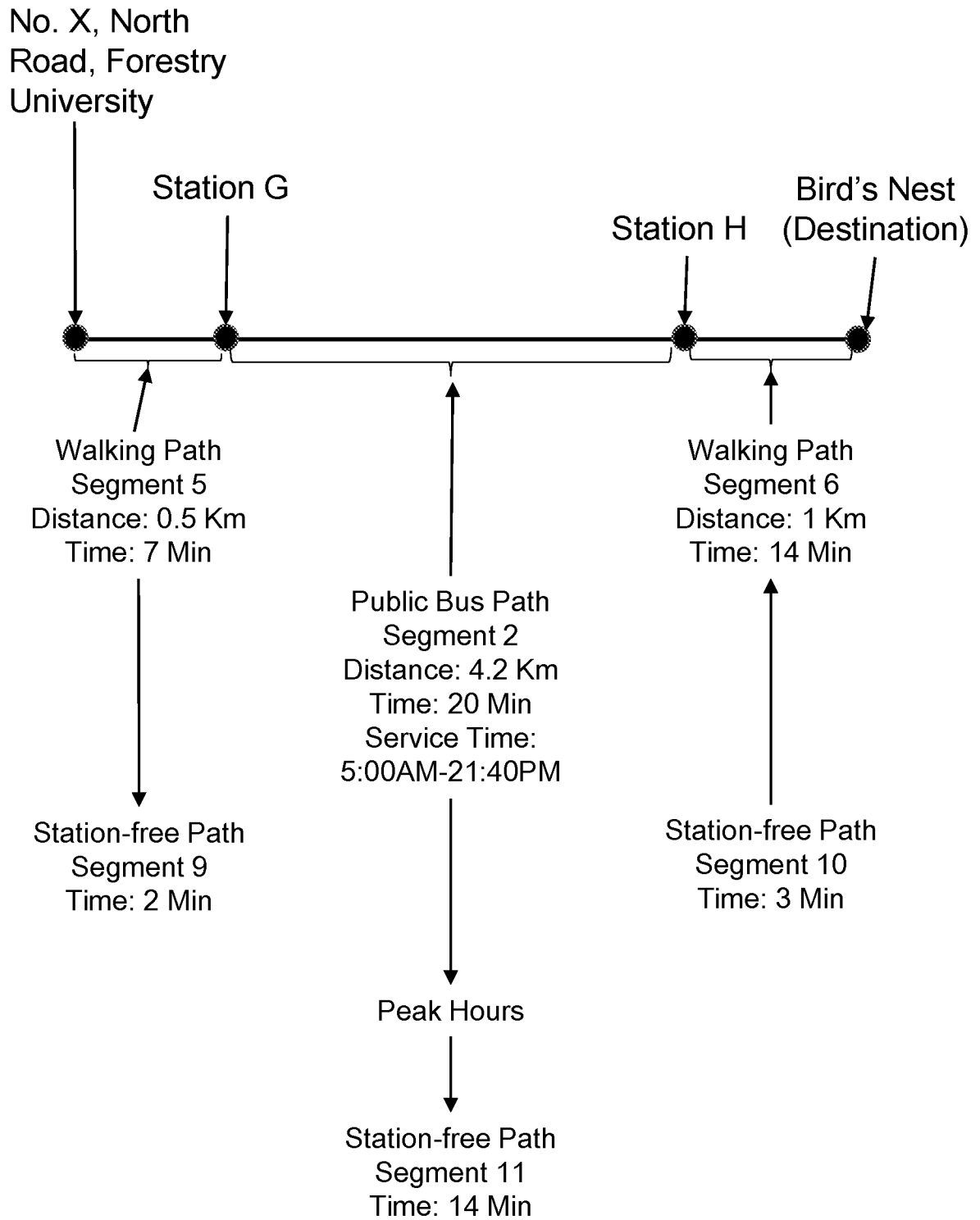


FIG. 11

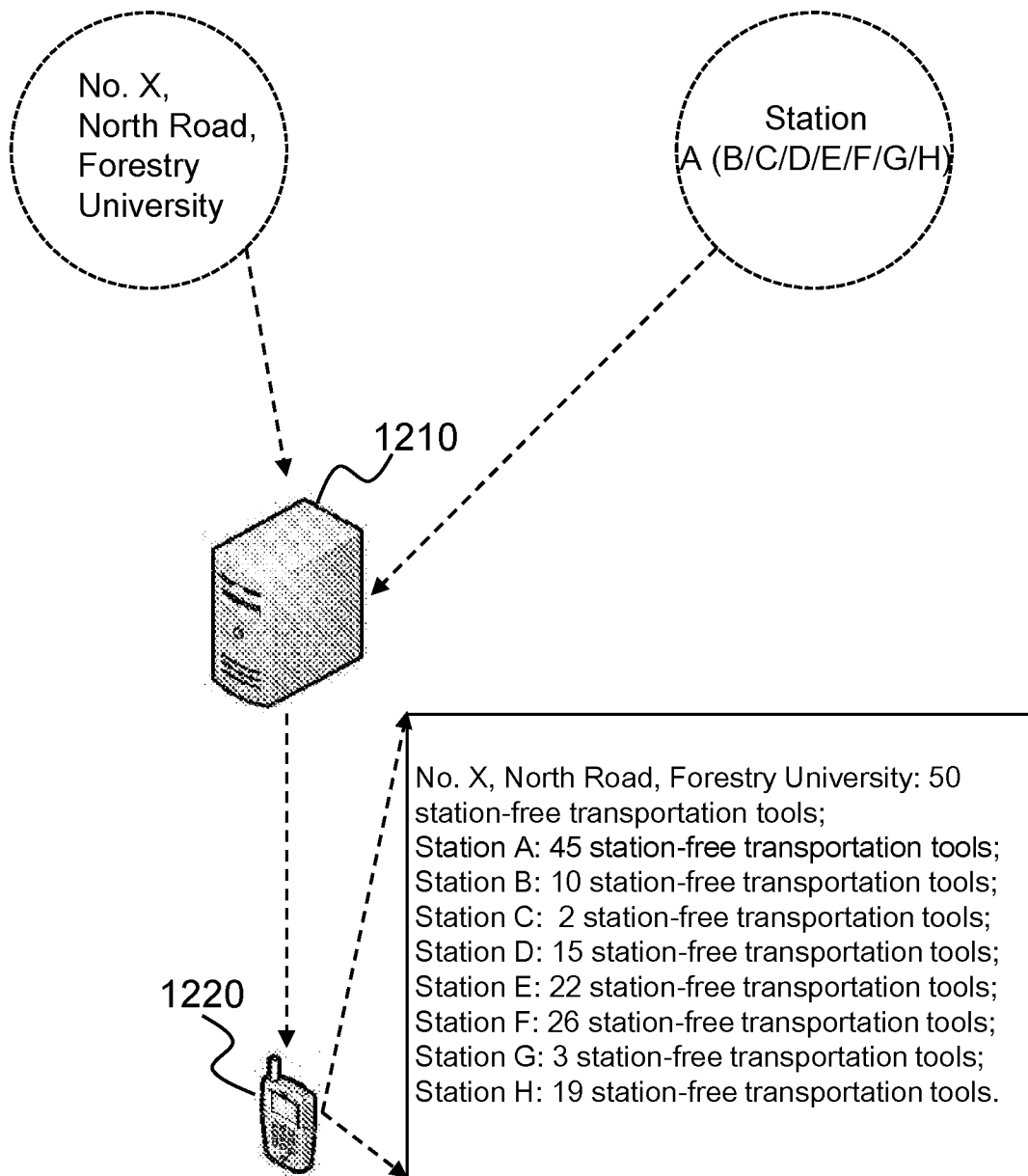
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FIG. 12A

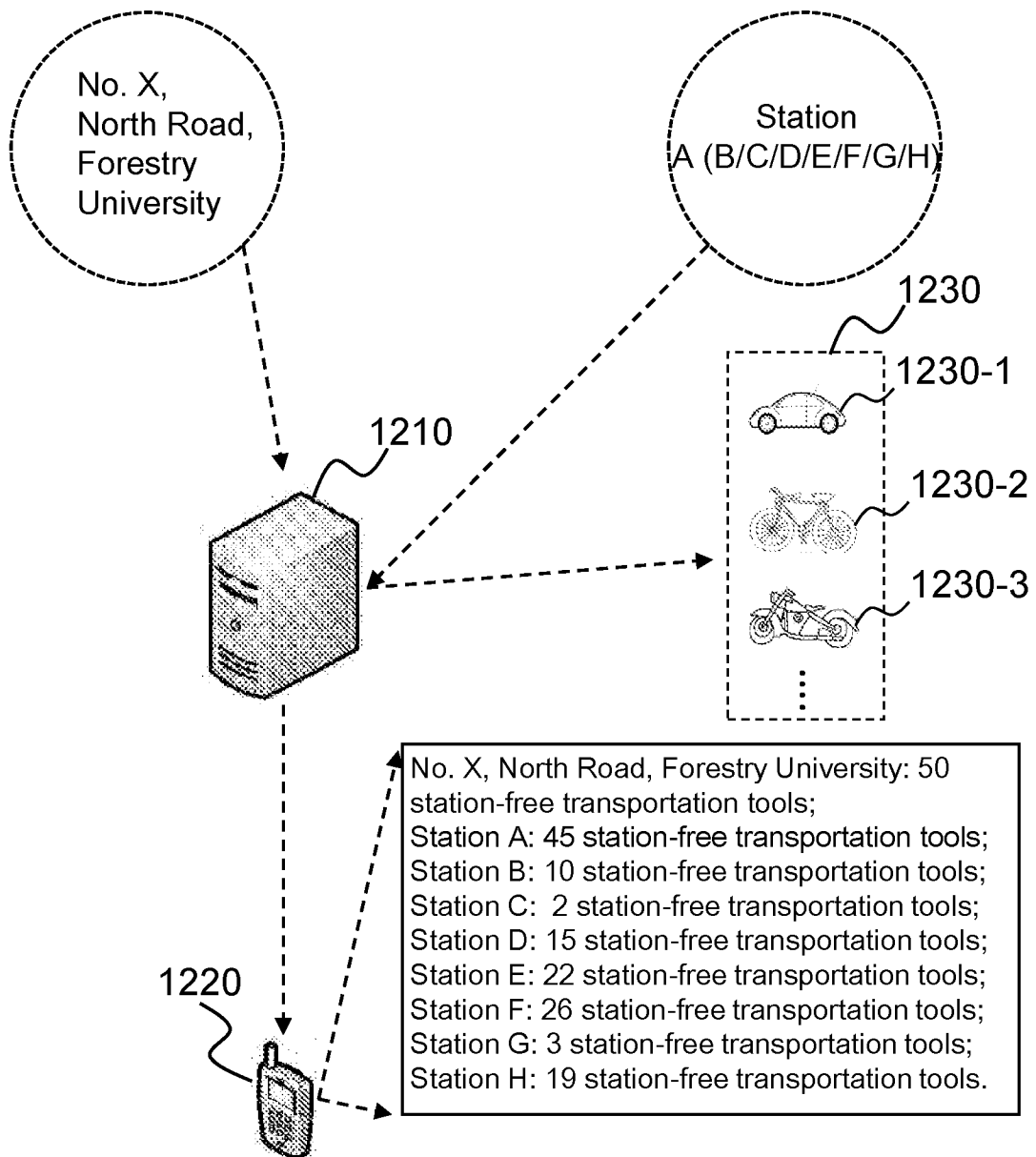
1200

FIG. 12B

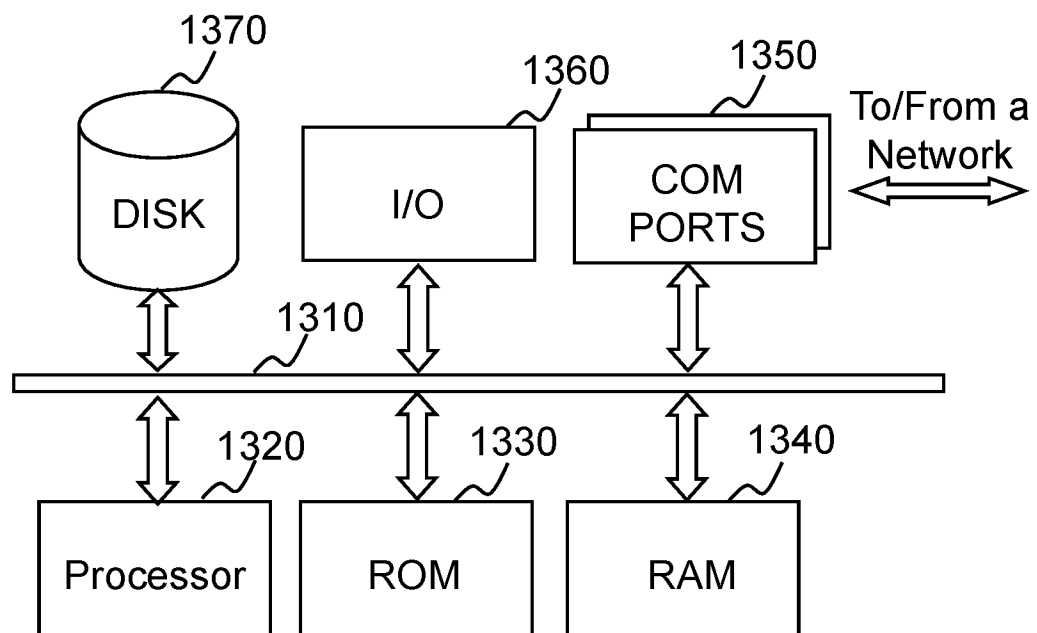
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FIG. 13

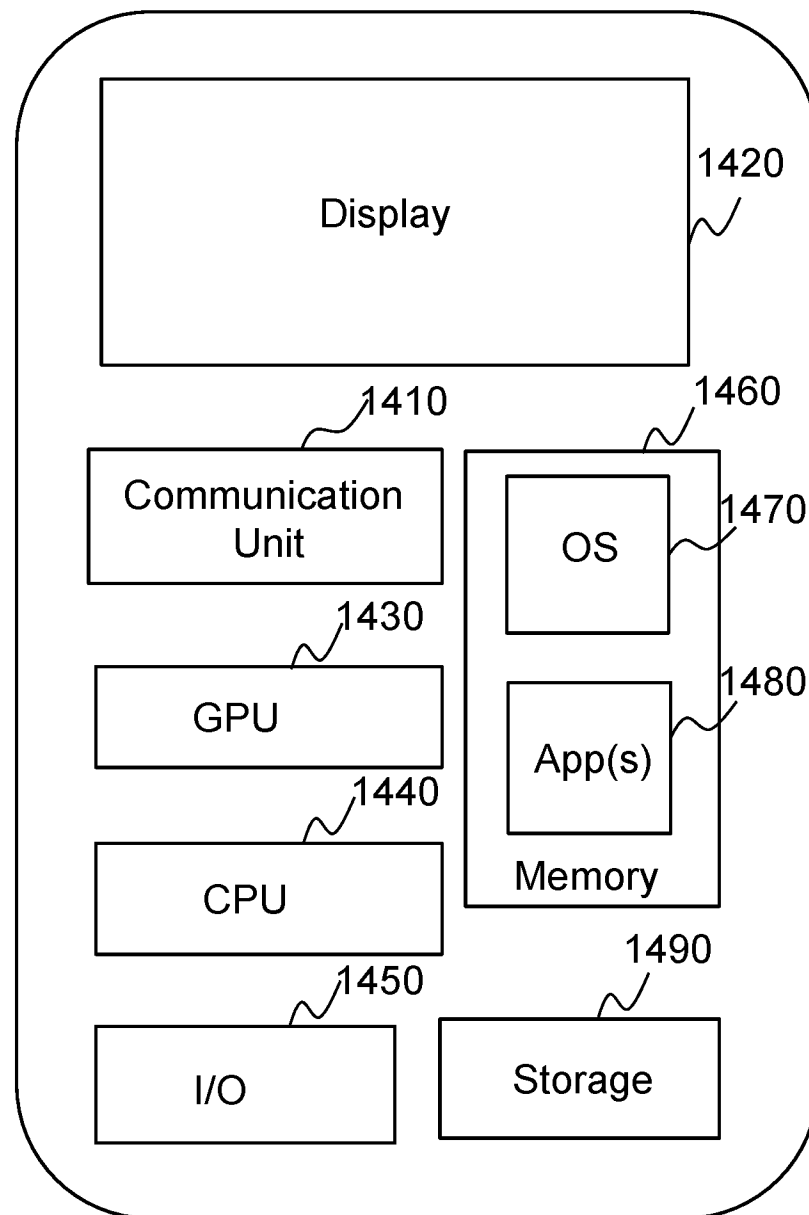
1400

FIG. 14

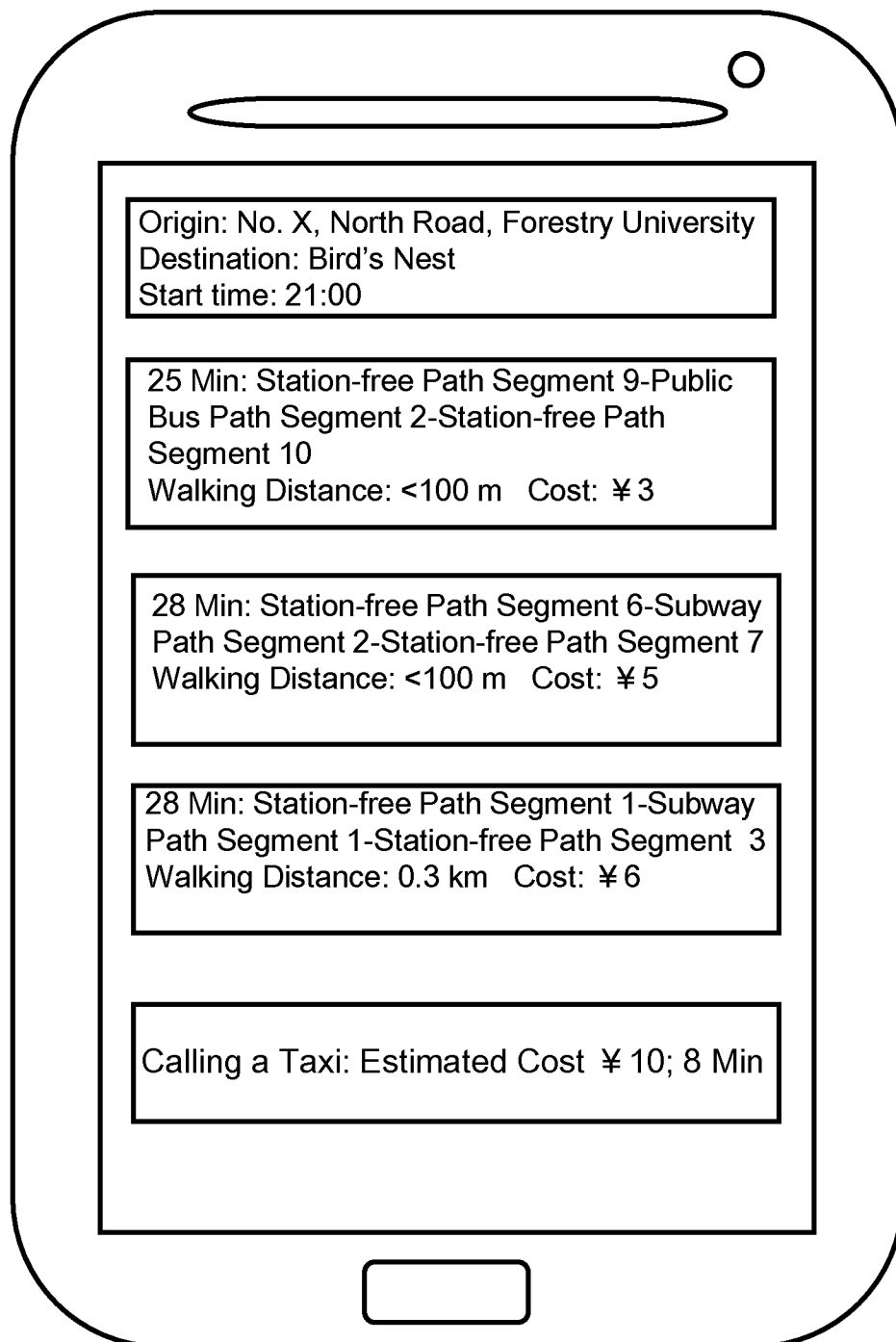


FIG. 15

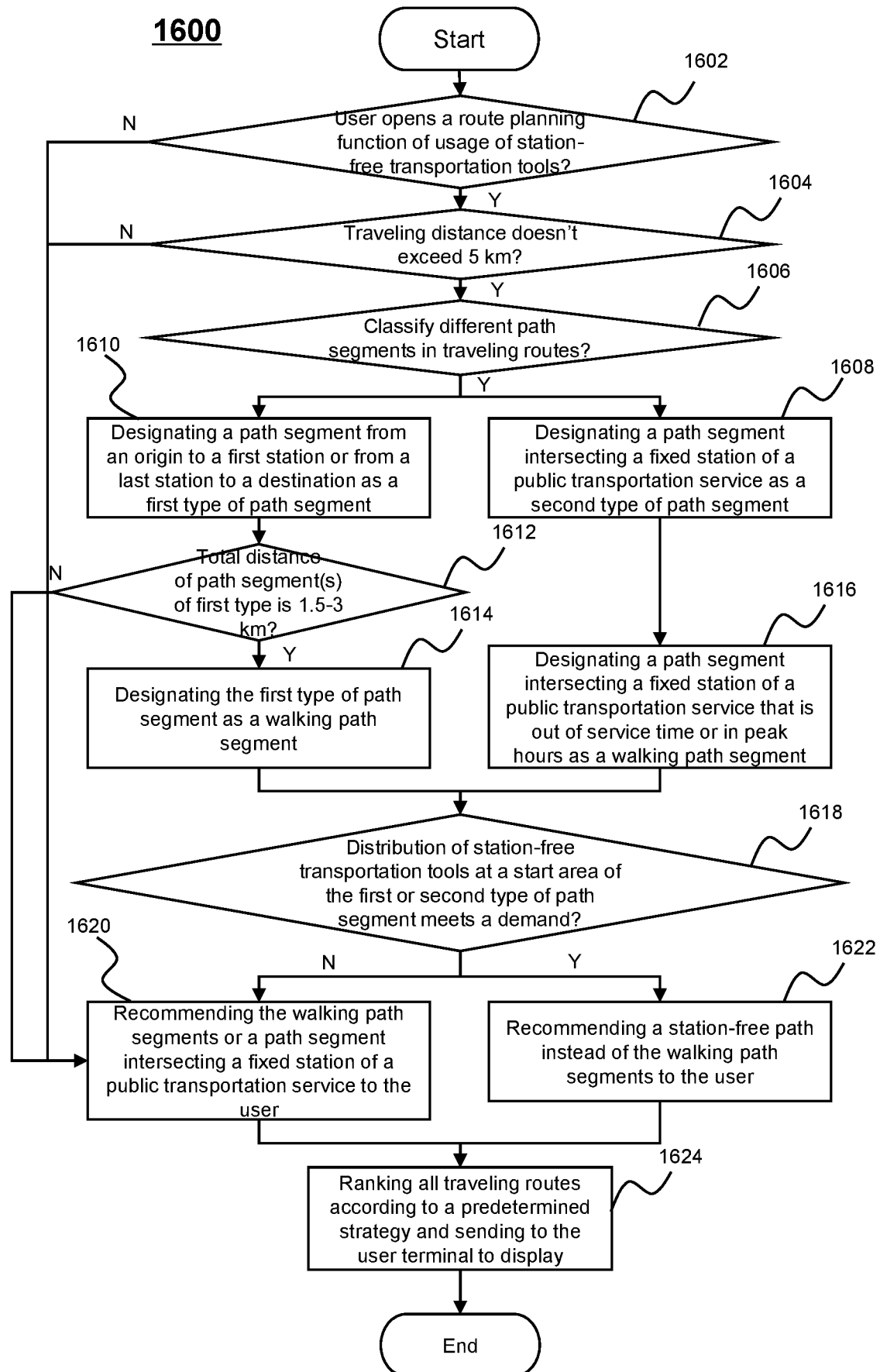


FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/089440

A. CLASSIFICATION OF SUBJECT MATTER

G01C 21/34(2006.01)i; G01C 21/36(2006.01)i; G06Q 10/04(2012.01)i; G06Q 50/30(2012.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01C; G06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT,CNKI,WPI,EPODOC,IEEE: navigate, route, plan, path, segment,traffic, congestion, condition, service time, vehicle, bus, bike, bicycle, taxi, subway, location, start, destination, station, transport

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 107289958 A (BEIJING DIDI INFINITY TECHNOLOGY AND DEVELOPMENT CO., LTD.) 24 October 2017 (2017-10-24) description paragraphs [0103]-[0246]	1-53
PX	CN 107036617 A (NORTHEASTERN UNIVERSITY) 11 August 2017 (2017-08-11) description paragraphs [0005]-[0051]	1-53
X	CN 106643771 A (SHANGHAI BOTAI YUEZHEN NETWORK TECHNOLOGY SERVICE CO., LTD.) 10 May 2017 (2017-05-10) description paragraphs [0032]-[0059]	1-53
A	CN 103020734 A (BEIJING CENNAVI TECHNOLOGIES CO., LTD.) 03 April 2013 (2013-04-03) the whole document	1-53
A	CN 104200650 A (ZHEJIANG UNIVERSITY OF TECHNOLOGY) 10 December 2014 (2014-12-10) the whole document	1-53
A	US 2016202079 A1 (TOMTOM NAVIGATION B.V. ET AL.) 14 July 2016 (2016-07-14) the whole document	1-53



Further documents are listed in the continuation of Box C.



See patent family annex.

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“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

10 August 2018

Date of mailing of the international search report

29 August 2018

Name and mailing address of the ISA/CN

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Telephone No. 86-(10)-53961565

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2018/089440

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	107289958	A	24 October 2017	None			
CN	107036617	A	11 August 2017	None			
CN	106643771	A	10 May 2017	None			
CN	103020734	A	03 April 2013	None			
CN	104200650	A	10 December 2014	None			
US	2016202079	A1	14 July 2016	GB	201314824	D0	02 October 2013
				EP	3036507	A1	29 June 2016
				CN	105683712	A	15 June 2016
				KR	20160044026	A	22 April 2016
				JP	2016528508	A	15 September 2016
				WO	2015024807	A1	26 February 2015