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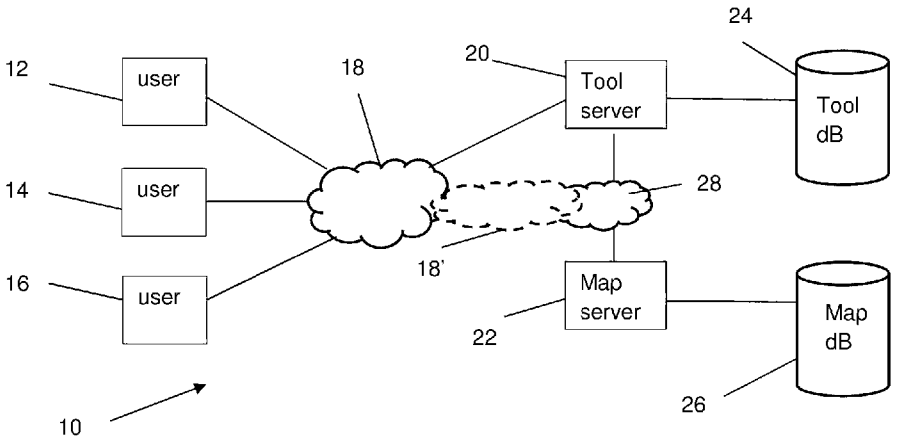

FIG. 1

(57) Abstract: A road event planning tool comprises a map fetcher for fetching a map, satellite or aerial view of an area in which a road event is to occur; an event object definer for defining one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view; a labeller for labelling each or groups of polygons or circles with a descriptor; and a scaler for scaling the size of the polygons or circles to be proportional to the scaling that occurs when the map is zoomed in or out. The tool may receive a notification from the field that the plan has been implemented and may publish implementation of the plan to a map/navigation service.

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Road Event Planning Tool

Field of the Invention

[0001] The present invention relates to a tool for planning of events occurring in or around roadways, pathways or other trafficable areas. Such events include but are not limited to road works, entertainment events or emergency events.

Background

[0002] Whenever road works are to be conducted, considerable planning is required, not only of the work itself, but also to manage traffic whilst the works are taking place. Such planning often requires collaboration between people drawing up these plans and also to authorities that consider and approve such plans. The same is also the case for entertainment events, such as those that occur in trafficked areas.

[0003] In all western countries, there are regulations governing the way a road closure is designed and implemented. Each time an entity such as a road agency, city council, utility or private company wants to occupy part or all of a road, the entity may need to apply to the road owner for a licence to occupy the road. The road owner will provide permission with a number of conditions. One condition that is usually compulsory for all road closures is the provision of a traffic control plan.

[0004] A Traffic Control Plan is provided by a licenced traffic controller and must show how the road will be closed or occupied. The plan will typically show the road layout including the number of lanes, the name of the roads, the infrastructure to be used, such as cones and barrier boards. The equipment used and rules followed to develop the plan will be based on that jurisdictions traffic control guidelines. Often one event or maintenance activity will require a number of traffic control plans. For example, during New Year's Eve in Sydney, there is a large fireworks event. More than 170 individual traffic control plans are required to close roads in the CBD to accommodate crowds for this event.

[0005] The traditional process is to draw up these plans on paper. There may be one plan for the works or event and another plan for the traffic management. With computer aided design what was once done on paper can now be done on the computer screen. However, this generally only involves computerising the paper based process. Such a process is fixed in its scale, meaning that work is conducted on a document that is static, such as a drawing

of the road. Also static maps are used. The details of the plan are added manually at the same scale as the drawing is prepared. All of the elements of plan must be manually drawn including street names, the number of lanes and then infrastructure such as cones, barriers and signage is added over the top of the road layer. Once complete the document can be printed out or copies of a PDF of the plan can be emailed. The plan will be provided to the road workers who then implement the road closure using the paper copy.

[0006] Alternatively, off-the-shelf images can be pre-prepared and overlaid on a background drawing. However the images are at a scale that is not necessarily the scale of the drawing and thus need to be manually scaled, again before the document can be converted into an image so that the whole can be enlarged or shrunk by zooming in or out.

[0007] Nowadays maps and satellite/aerial images can be readily accessed through platforms such as Google ™ Maps, and other GIS systems. It is possible to overlay an image on these systems, but the images do not scale, or when they do they are not linear and proportional.

[0008] Existing software for road work planning can import a map and place objects on the map, but it does not deal with the scaling problem, with the result being objects that are not to scale with a given scale of the underlying map or image.

[0009] The present invention seeks to remedy this deficiency.

[0010] Any references to documents that are made in this specification are not intended to be an admission that the information contained in those documents form part of the common general knowledge known to a person skilled in the field of the invention, unless explicitly stated as such.

Summary of the Invention

[0011] According to an aspect of the present invention there is provided a road event planning tool comprising:

a map fetcher for fetching a map, satellite or aerial view of an area in which a road event is to occur;

an event object definer for defining one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
a labeller for labelling each or groups of polygons or circles with a descriptor;
a scaler for scaling the size of the polygons or circles to be proportional to the scaling that occurs when the map is zoomed in or out.

[0012] In an embodiment the tool further comprises an object selector for selection of the object to be overlaid on the map, satellite or aerial view.

[0013] In an embodiment the tool further comprises an object placer for placement of the selected object on the map, satellite or aerial view. In an embodiment the object placer links a centre point of the polygon or circle to a point on the map, satellite or aerial view.

[0014] In an embodiment the scaler is configured to adjust the dimensions of the polygon or circle displayed in overlay on the map, satellite, aerial or street view according to the scale of the map, satellite, aerial or street view displayed.

[0015] In an embodiment the scaler selects one of a number of pre-scaled objects according to the scale of the map, satellite, aerial or street view displayed.

[0016] In an embodiment the scaler scales the polygons or circles with a rendering of a scaled image of the object they represent. In an embodiment the rendering is scaled according to the scaling applied to the polygon or circle.

[0017] According to another aspect of the present invention there is provided a method of preparing a road event plan comprising:
fetching a map, satellite or aerial view of an area in which a road event is to occur;
defining one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
labelling each or groups of polygons or circles with a descriptor;
storing unscaled information in relation to the true size of the object;
scaling the stored true size of the polygons or circles to be proportional in represented size according to scaling that occurs when the map is zoomed in or out.

[0018] In an embodiment the defining step comprises selecting an object type to be overlaid on the map, satellite or aerial view.

[0019] In an embodiment the selected object type determines the shape of the polygon or circle and its rendering.

[0020] In an embodiment the type of selected object determines information that needed to resource and implement the plan. In an embodiment a rule for the placement of the selected object is accessed to determine how it should be placed on the map. In an embodiment the rule is determined based on the location on the map, satellite or aerial view. In an embodiment a helper display shows the correct placement of the selected object. In an embodiment the helper display is a circle showing the distance an object should be placed from another object.

[0021] Typically each polygon or circle is placed on the map, satellite or aerial view by providing co-ordinates of its centre on the map, satellite or aerial view.

[0022] In an embodiment the polygons or circles are rendered with a scaled image of the object they represent. In an embodiment the rendering is scaled according to the scaling applied to the polygon or circle.

[0023] In an embodiment one of more of the polygons or circles are merged on the map, satellite or aerial view into a single polygon when they are not individually discernible.

[0024] In an embodiment when the map is changed to a street view, the polygons and circles are replaced by three dimensional polyhedrons and scaled according to the scale of the street view.

[0025] In an embodiment the plan is displayed on a portable device in the field along with the location of the portable device on the map, satellite or aerial view for showing the location of where to place the object in the plan in the field. In an embodiment when the location of the portable device is at or near the location of an object to be placed in the field instructions are displayed explaining how the object should be correctly placed in the field according to rule for placement of the object and/or according to information in the plan.

[0026] In an embodiment the portable device send a signal to indicate that the plan has been implemented.

[0027] In an embodiment when a plan has been implemented for road closures the implementation of the plan is published to a map service or navigation system.

[0028] In an embodiment the road event is a road work, or a road closure, or traffic diversion, or traffic management, or an entertainment event, or an emergency event.

[0029] In an embodiment the polygons or circles represent line works, cones, markers, barriers, signs, excavation, resurfacing, road base, side walk, drains, curb or paving.

[0030] According to another aspect of the present invention there is provided a computer program in the form of instructions stored in a non-volatile manner for controlling a processor to:
fetch a map, satellite or aerial view of an area in which a road event is to occur;
define one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
label each or groups of polygons or circles with a descriptor;
store unscaled information in relation to the true size of the object;
scale the stored true size of the polygons or circles to be proportional in represented size according to scaling that occurs when the map is zoomed in or out.

[0031] According to an aspect of the present invention there is provided a portable device configured to display road event plan, the portable device comprising:
a map fetcher for fetching a map, satellite or aerial view for display on the portable device;
a processor for fetching objects in the displayed area of the fetched map, satellite or aerial view, wherein the objects are one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view, wherein the objects are scaled to a size to be proportional to the scale of the map as it is zoomed in or out.

[0032] According to an aspect of the present invention there is provided a method for display of a road event plan on a portable device comprising:
fetching a map, satellite or aerial view for display on the portable device;
fetching objects in the displayed area of the fetched map, satellite or aerial view, wherein the objects are one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view,

wherein the objects are scaled to a size to be proportional to the scale of the map as it is zoomed in or out.

[0033] According to another aspect of the present invention there is provided a computer program in the form of instructions stored in a non-volatile manner for controlling a processor of a portable device to:
fetch a map, satellite or aerial view for display on the portable device;
fetch objects in the displayed area of the fetched map, satellite or aerial view, wherein the objects are one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view,
wherein the objects are scaled to a size to be proportional to the scale of the map as it is zoomed in or out;
display the fetched map overlaid with the fetched scaled objects.

[0034] According to another aspect of the present invention there is provided a method of notification of a road closure to a map or navigation service, comprising:
defining a plan for closure of the road;
saving the plan to a field accessible storage;
viewing the plan for closure of the road in the vicinity of the road to be closed on a portable device, where the plan is retrieved by the portable device from the field accessible storage;
implementing the plan, comprising closing the road;
receiving an indication in vicinity of the road that the road is now closed according to the plan;
transmitting the indication of the road closure and information about the road closure in the plan to the map or navigation service.

[0035] In an embodiment the transmission of the indication of the road closure is transmitted from the portable device to a server, and the server causes the information about the road closure to be transmitted to the map or navigation service. In an alternative the transmission of the indication of the road closure and information about the road closure is transmitted from the portable device to the map or navigation service.

[0036] In an embodiment when opening of the road is implemented the method further comprises receiving an indication in vicinity of the road that the road is now re-opened;
transmitting the indication of the road reopening to the map or navigation service.

[0037] According to another aspect of the present invention there is provided a system for notification of a road closure to a map or navigation service, comprising:
a storage for storing of a plan for closure of the road;
a transmitter of the plan for viewing the plan in the vicinity of the road to be closed on a portable device;
a receiver for receiving an indication from the portable device that the road is now closed according to the plan;
a transmitter for transmitting information about the road closure according to the plan to the map or navigation service.

[0038] Throughout the specification and claims, unless the context requires otherwise, the word “comprise” or variations such as “comprises” or “comprising”, will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Description of Drawings

[0039] In order to provide a better understanding of the present invention, embodiments will now be described by way of example only, with reference to the accompanying drawings, in which:
Figure 1 is a block diagram of a system for road event planning according to an embodiment of the present invention;
Figure 2 is a block diagram of a tool server of Figure 1;
Figure 3 is a flow chart for planning an event according to an embodiment of the present invention;
Figure 4 is a flow chart for scaling an object according to an embodiment of the present invention;
Figure 5 is a screen shot of a file management page of a website according to an embodiment of the present invention;
Figure 6 is a screen shot of a plan sets page of a website according to an embodiment of the present invention;
Figure 7 is a screen shot of a plan editor page a website according to an embodiment of the present invention;
Figure 8 is a screen shot of a plan tool for merging polygons of a website according to an embodiment of the present invention;

Figure 9 is a screen shot of a plan tool for selecting signage of a website according to an embodiment of the present invention;
Figure 10 is a screen shot of a plan tool for selecting infrastructure of a website according to an embodiment of the present invention;
Figure 11 is a screen shot of a plan tool for measurement, text and feedback of a website according to an embodiment of the present invention; and
Figure 12 is a screen shot of a plan tool for feedback of a website according to an embodiment of the present invention.

Detailed Description of Preferred Embodiments

[0040] Referring to Figure 1 there is a system for planning a road event 10, comprising user interfaces 12, 14, and 16. In an embodiment the user interfaces 12, 14, and 16 are computers with webpage browsing capability. The interfaces 12, 14, and 16 are connected to a computer network 18, such as the Internet. The interfaces 12, 14, and 16 access a tool server 20 across the network 18. The tool server 20 comprises a webpage server which provides content to the interfaces to provide to their users and to receive interaction with their users.

[0041] The tool server 20 accesses maps, satellites or aerial views from a map server 22. It will be understood that the user can switch between viewing a map, or satellite or aerial view. Accordingly the remainder of the invention describes maps, although it is to be understood that satellites, aerial or street views are also implicitly available. The map server 22 accesses a map database 26. The map server 22 may be Google ™ Maps, or similar offerings from Apple ™, Bing ™ or another provider.

[0042] The tool server 20 has access to and can store information in a tool database 24. The tool server 20 accesses the map server 22 via a computer network 28, which may be part of the Internet as indicated by 18'.

[0043] The tool sever 20 comprises a memory, comprising volatile memory such as random access memory (RAM) and non-volatile memory, such as read only memory (ROM). The tool server 20 comprises a computer program storage medium reader for reading the computer program instructions from computer program storage media. The storage media may be optical media such as DVD-ROM disks, magnetic media such as floppy disks and tape cassettes, hard disk drive, or flash media such as USB memory sticks.

[0044] The tool server 20 may be configured to comprise a plurality of functional modules shown in Figure 2 and described further below. The modules may be configured as electronic circuits or may be implemented by the processor being configured by instructions of a computer program.

[0045] The tool server 20 comprises:
a map fetcher module 40 for fetching a map, satellite or aerial view of an area in which a road event is to occur from the map database 26;
an event object definer module 42 for defining one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
a labeller module 44 for labelling each, or groups, of polygons or circles with a descriptor;
a scaler module 46 for scaling the size of the polygons or circles to be proportional to the scaling that occurs when the map is zoomed in or out;
a store module 50 for storing the defined objects, labels and in some embodiments size or scale information in the tool database 24; and
a servlet module 48 for preparing and serving website pages to the user interfaces 12, 14 and 16.

[0046] The servlet module 48 may be any suitably configured technology to dynamically serve webpages to the client interfaces 12, 14 and 16. The servlet module 48 uses information stored in the tool database for dynamically creating the webpages.

[0047] In an embodiment the event object definer module 42 comprises an object selector for selection of the object type to be overlaid on the map.

[0048] Referring to Figure 3 the tool server 20 is used to prepare a road event plan according to a method 60, which comprises:
receiving 62 an input from a user via one of the user interfaces 12, 14, 16 to define an area in which the road event plan is to occur;
fetching 64 a map of the input area;
defining 66 one or more polygons, or circles, each representing an object overlaid on the map, and where its centre is placed on the map;
labelling 68 each or groups of polygons or circles with a descriptor;
storing 70 unscaled information in relation to the true size of the object;

scaling 72 the stored true size of the polygons or circles to be proportional in represented size according to scaling that occurs when the map is zoomed in or out; and
serving 74 the scaled polygons or circles overlaid on the map to the user.

[0049] In an embodiment the defining step 66 comprises selecting an object type to be overlaid on the map. The selected object type determines the shape of the polygon or circle and its rendering.

[0050] The selected object is “smart” in that the object represented on the map is rendered according to the selected type of object and it scales according to the scale of the map on which it is placed. These smart objects include road layers, lane lines and infrastructure such as cones. The smart objects calculate critical information that are needed to resource and implement the plan. For example, a plan drawn in Sydney, Australia will calculate the correct distance an operator should place between each cone as well as the number of cones, based on the requirement in that state.

[0051] The scaling process 72 is described in more detail in relation to Figure 4.

[0052] The process starts with the map, which is scaled 82. The scale of the map is ascertained 84. Typically this will be contained in meta data in the map served from the map server 22. Alternatively, this could be obtained by starting with a map of known size and then zooming in to a selected area of known size. The scale would thus be able to be determined. For example in a 10km by 10km area the shown area is 100m by 100m, therefore the scale will be 1:100.

[0053] At a given scale some objects that have been placed on the map will be visible, others will be off the displayed area of the map. Those objects which are in the display area are identified 86. Typically each object is “pinned” to the map by its centre thus the location of each object on the maps is known 88, typically by providing its co-ordinates on the map.

[0054] The polygon or circle of the object is then scaled 90 according to the ascertained scaling. It is again noted that in existing technical implementations of this process existing objects pinned to maps are not scaled. The map is zoomed in or out and the object stays the same size. Alternatively where the object is scaled, it is not linear and tends to do so discontinuously. The scaled polygon or circle is then placed on the map 92, with its centre in the pinned positon.

[0055] In an embodiment the polygons or circles are rendered with a scaled image of the object they represent.

[0056] In an embodiment, when the object is placed on to the map it is defined as an icon in scalable vector graphics (SVG) format. The reference coordinate system of an SVG canvas is relative to the extent of the element. The coordinate system of the extent of an element is with a Geographic Coordinate system (eg Latitude/Longitude). By transforming the extent of the element using the Transformation attributes of the SVG standard the location, scale and rotation of all the sub-elements can be determined without affecting other elements. (See "www.w3.org/TR/SVG/coords.html" for more information, the contents of which are incorporated herein by reference). The details of each element including the real world coordinates of the extent are stored within a database and logically grouped together into Traffic Control Plans.

[0057] In this embodiment the SVG elements are grouped together in a Google ™ Maps Overlay layer and use the Google ™ Maps Drawing libraries to determine when a user is interacting with and modifying the extent of an element, which in turn affects the location, scale and rotation of icons and images.

[0058] Many of the icons/images of the objects may be templates. When they are added to a traffic control plan, these templates are made specific. For example, a generic speed sign may not have a specific speed until it is added to a Traffic Control Plan. Because that SVG is based on XML, placeholder text or properties (such as colours) can be found and replaced with specific values using CSS Selectors. (See "http://www.w3schools.com/cssref/css_selectors.asp" for more information, the contents of which are incorporated herein by reference). Metadata about placeholders and properties can be stored within each SVG in a replaceable manner. This metadata is also used to present a custom user interface for the user to enter the text or properties to be replaced.

[0059] This process is repeated as the map is zoomed in or out.

[0060] The foregoing process is used to plan a road event, where accurate scaling is important. In an embodiment the road event is a road work, or a road closure, or traffic diversion, or traffic management, or an entertainment event, or an emergency event.

[0061] The plan is then saved to the tool database 24.

[0062] Referring to Figure 5, a file management page of the served website is shown. The user may have privileges to undertake different types of operation, depending on their access right. For example an administrator user may be able to create, edit or delete plans, other users may only be able to view plans, and other users may only be able to review plans, where they can comment on, but not edit the plan.

[0063] In some embodiments, a plan for road event comprises a set of plans, such as management of infrastructure, a plan for signage and a plan for traffic management, all at the same site.

[0064] The user may be assigned to an agency, which allows the user access to plans of that agency, but not others. An add plan set button is provided to set up a new plan set. An existing plan set can be selected. The selected plan set can be shared with other users from the agency, or with another agency, such as an authority agency that must review in order for it to be approved for implementation. The selected plan set can be edited. A review of the plan set is shown on the right hand window. A list of people with authorisation in relation to the plan set is shown in the bottom right box. An overview of the plans set is shown in the main map window.

[0065] In an embodiment at this scale a single icon representing the plan is shown, this icon does not scale as described above. When the scale is sufficiently zoomed in for the relative positions of the objects to be discerned then this icon is replaced with the rendered object(s) as described above.

[0066] When the user selects a plan set to edit they are taken to the screen shown in Figure 6. This is similar to Figure 5, but relates to one of the plans in the selected plan set. An add plan button is provided to set up a new plan. An existing plan can be selected. The selected plan set can be edited or deleted. A preview of the plan is shown on the right hand window. A list of people with authorisation in relation to the plan is shown in the bottom right box. An overview of the plan is shown in the main map window.

[0067] When the user selects a plan to edit they are taken to the screen shown in Figure 7. The plan has a descriptive title. A selection bar is provided to group objects of similar type

together. In Figure 7 road drawing objects have been selected and various different types of road objects are available for selection. When one of the objects is selected it can be dragged and dropped on to the map in the main part of the Figure. The objects are placed on the map by default at their actual size by scaling them according to the scale of the map as described above. The location of the centre of the dropped object on the map is stored along with its object type. During some parts of the planning process it may be desirable to have the object at a fixed size, no matter the scale of the map, or at a scale to the map, but one which is not the actual size of the object. These options can be selected by the user.

[0068] It may be desirable to merge one of more of the polygons on a map into a single polygon. This is shown in Figure 8. Also the polygons have properties that can be changed, such as opacity or colour.

[0069] Figure 9 shows the signage group of polygons available for selection. The signs may be grouped into categories so that the required sign can be selected and placed on the map. Signs with a SMART tag can be updated or changed to display chosen text. The select tool icon can be selected to perform other operations on the polygon, such as to manually define its orientation (by rotation) or to resize it.

[0070] Figure 10 shows the infrastructure group of polygons available for selection. These may include traffic cones, bollards to be selected and placed on the map. They may also include barriers for traffic control or location markers. The properties can be manually defined, such as spacing or size.

[0071] A measurement, text and feedback screen is shown in Figure 11. The plan with its placed object can be considered by an approval authority. The user can use a measurement tool by selecting points on the map, and a real distance between the selected points is shown. The user can place comments in a text box, so as to for example provide feedback or to outline required changes to be made to the plan in order to obtain approval.

[0072] Figure 12 shows feedback in more detail. Feedback can be changes on status level, which is logged and provided for review at a later stage. The items of feedback can be listed. A feedback icon is added to the map on the location the feedback is provided. The colour of the feedback item can be changed according to its status.

[0073] In an embodiment the polygons or circles represent line works, cones, markers, barriers, signs, excavation, resurfacing, road base, side walk, drains, curb or paving. Objects available for selection can be filtered according to the locality of the map area being viewed. For example, one type of sign may be used in one locality (eg.; a state) and another type of sign may be used for the same purpose in another locality (eg.; a different state). The representation of the object may also vary from one locality to another.

[0074] When a street view is selected, the polygons can be replaced by three dimensional polyhedral and scaled according to the scale of the street view.

[0075] During placement of objects, rules can be provided so that the objects are placed according to the rules and regulations of the locality of the map. For example; one Council may specify bollards are to be 2m apart, whereas another Council may specify that the bollards are to be 1.5m apart, for example. The rules will suggest a radius of the appropriate distance so that the bollards are correctly placed. Another example may be that a "Road Work Ahead" sign is to be 200m from the road work in one state, whereas a different state might require a slightly different sign be 150m before the road work. The rules may be implemented by a rules engine that suggests compliance with the rules of the relevant locality.

[0076] The placement of objects on the map may be recorded in latitude and longitude. The recorded plan can be stored for reuse on more than one occasion. Also a stored plan can be updated or adapted for use on the same or another location.

[0077] A client can amend or comment on a plan and the changes can be quickly accepted or updated. Once a plan or set of plans has been approved, the entity can manage the implementation of the plan in real time. Through the use of an app on a mobile device, such as a smart phone or tablet, field personnel will have live access to the plan. From a control centre an operations manager can direct staff in real time and monitor and manage real time implementation. Field staff can use the plan on a tablet or phone, using GPS to show them the exact location of where to place infrastructure. They can also use the app to inform the control centre when the closure is in place. The app can also be used to ensure any essential changes made to the plan during implementation are recorded.

[0078] The plan may be viewed on a portable device so that a worker can know the location of each object of an approved plan. An extension module on the mobile device

implementation may provide instructions on placement of the various objects in their allocated latitude and longitude by GPS tracking to the location and instruction on which object is to be placed at the tracked position.

[0079] An example of use of the present invention is now described, where a lane of a dual carriage way road is to be repaired. The plan requires closure of the affected lane, the use of bollards, installation of appropriate warning and speed restriction signs, end of road work signs and designation of the area of repair work to be conducted. The user opens their browser to the website and logs in. They select creation of a new plan and then start on a map. A person may have areas of responsibility and that may localize the displayed map to their area of responsibility. Otherwise the suburb or name of the road can be searched and the map will identify the search location, just as a search for a locality will be done on, for example, Google ™ Maps. The planning tool is then used to plan the layout of the objects used in the road work. In placing the objects on the map it is usually necessary to zoom in on the map to more precisely identify the location of the placement of each object. When the use zooms in or out of the map, objects already placed will zoom in and out to scale with the zooming of the map. This is a significant difference from existing systems and an advantage. Each of the objects are selected and placed and an inventory of placed objects is automatically kept so that the required objects can be installed on site when the work occurs. Once completed, the plan can be shared with a supervisor or other authority for approval. The authority can also zoom in or out on the placed objects to see in greater detail their placement, configuration etc. Comments or feedback can be added, such as this particular sign needs to be moved here (with an indicator) for the plan to be approved.

[0080] Referring back to Figure 4, an optional or standalone process 100 of implementation of the plan is described. On-site workers can bring up the plan on their portable device and can implement the plan 102. In particular the workers can zoom in the see the exact location the sign, bollard, barrier etc. needs to be installed along with their location. The worker can zoom out and scroll the view with the display of objects scaling proportionally so that the worker finds it easier to implement the plan.

[0081] Real time data can be extracted during the implementation and afterwards, to ensure continuous improvement. For example, an entity will estimate that a closure may take 20 minutes to implement but this estimate can be checked after each event and times adjusted.

[0082] Once a plan for road closures has been implemented the on-site worker can indicates that the plan has been implemented 104 on their portable device. The device transmits a signal back to the tool server 20. With this “real time notification”, traffic companies, road agencies can publish implementation of road closures live from the field using a smart phone or tablet. The publication can be made to the map server 22 of a map service, such as Google ™ Maps, Apple™ Maps, etc., or a navigation service. In this manner these mapping services can be display to users of these services that a road closure is in place. Likewise, when the road closure is over, this can also be published to these map services. This publication can have a particular advantage for driverless cars.

[0083] Currently there is no way for a driverless car to automatically know if a road is temporarily closed. To avoid driverless vehicles arriving at closed roads, the publication of the road closure can be accessed by a navigation system, via an API. This allows for the digital updates of mapping and navigation systems in real time, to communicate directly with vehicles about current road closures. Thus a navigation system of a driverless car can automatically route its path around the road closure.

[0084] Likewise when the road closure is completed (the plan is de-implemented) 106, the on-site worker can indicates that the plan has been de-implemented on their portable device. The device transmits a signal back to the tool server 20, which in-turn can be published to the map server 22 to indicate re-opening of the road. Furthermore, if the roadwork involves modification of the road, the changes to the road can also be published to the map service in real-time.

[0085] The present invention can also be used as a teaching aid. It allows users to create traffic plans over a Google ™ map in a training portal to assist in traffic management training. A training organisation can give students real time traffic management experience both in and out of the classroom. Trainers can demonstrate the planning process in the classroom and also create assignments for students. Students can use design a plan as the assignment and can submit it for assessment to the trainer within the program without emailing documents or printing hard copies. Training can also be implemented in the field (or training field) using portable device to see the plan in the field, provide live modifications to the plan from the field and see the live implementation of the plan in the field.

[0086] Modifications may be made to the present invention within the context of that described and shown in the drawings. Such modifications are intended to form part of the invention described in this specification.

CLAIMS

1. A road event planning tool comprising:
a map fetcher for fetching a map, satellite or aerial view of an area in which a road event is to occur;
an event object definer for defining one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
a labeller for labelling each or groups of polygons or circles with a descriptor;
a scaler for scaling the size of the polygons or circles to be proportional to the scaling that occurs when the map is zoomed in or out.

2. A road event planning tool according to claim 1, wherein the tool further comprises an object selector for selection of the object to be overlaid on the map, satellite or aerial view.

3. A road event planning tool according to claim 1 or 2, wherein the tool further comprises an object placer for placement of the selected object on the map, satellite or aerial view.

4. A road event planning tool according to claim 3, wherein the object placer links a centre point of the polygon or circle to a point on the map, satellite or aerial view.

5. A road event planning tool according to any one of claims 1 to 4, wherein the scaler is configured to adjust the dimensions of the polygon or circle displayed in overlay on the map, satellite, aerial or street view according to the scale of the map, satellite, aerial or street view displayed.

6. A road event planning tool according to any one of claims 1 to 5, wherein the scaler selects one of a number of pre-scaled objects according to the scale of the map, satellite, aerial or street view displayed.

7. A road event planning tool according to any one of claims 1 to 6, wherein the scaler scales to polygons or circles with a rendering of a scaled image of the object they represent.

8. A method of preparing a road event plan comprising:

fetching a map, satellite or aerial view of an area in which a road event is to occur;
defining one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
labelling each or groups of polygons or circles with a descriptor;
storing unscaled information in relation to the true size of the object;
scaling the stored true size of the polygons or circles to be proportional in represented size according to scaling that occurs when the map is zoomed in or out.

9. A method according to claim 8, wherein the defining step comprises selecting an object type to be overlaid on the map, satellite or aerial view.

10. A method according to claim 8 or 9, wherein the selected object type determines the shape of the polygon or circle and its rendering.

11. A method according to any one of claims 8 to 10, wherein the type of selected object determines information that needed to resource and implement the plan.

12. A method according to any one of claims 8 to 11, wherein a rule for the placement of the selected object is accessed to determine how it should be placed on the map.

13. A method according to claim 12, wherein the rule is determined based on the location on the map, satellite or aerial view.

14. A method according to any one of claims 8 to 13, wherein the correct placement of the selected object is displayed.

15. A method according to claim 14, wherein the display of the correct placemen is in the form of a circle showing the distance an object should be placed from another object.

16. A method according to any one of claims 8 to 15, wherein each polygon or circle is placed on the map, satellite or aerial view by providing co-ordinates of its centre on the map, satellite or aerial view.

17. A method according to any one of claims 8 to 16, wherein the polygons or circles are rendered with a scaled image of the object they represent.

18. A method according to any one of claims 8 to 17, wherein one of more of the polygons or circles are merged on the map, satellite or aerial view into a single polygon when they are not individually discernible.

19. A method according to any one of claims 8 to 18, wherein when the map is changed to a street view, the polygons and circles are replaced by three dimensional polyhedrons and scaled according to the scale of the street view.

20. A method according to any one of claims 8 to 19, wherein the plan is displayed on a portable device in the field along with the location of the portable device on the map, satellite or aerial view for showing the location of where to place the object in the plan in the field.

21. A method according to claim 20, wherein when the location of the portable device is at or near the location of an object to be placed in the field instructions are displayed explaining how the object should be correctly placed in the field according to rule for placement of the object and/or according to information in the plan.

22. A method according to claim 21, wherein the portable device sends a signal to indicate that the plan has been implemented.

23. A method according to any one of claims 8 to 22, wherein when a plan has been implemented for road closures the implementation of the plan is published to a map service or navigation system.

24. A computer program in the form of instructions stored in a non-volatile manner for controlling a processor to:
fetch a map, satellite or aerial view of an area in which a road event is to occur;
define one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view;
label each or groups of polygons or circles with a descriptor;
store unscaled information in relation to the true size of the object;
scale the stored true size of the polygons or circles to be proportional in represented size according to scaling that occurs when the map is zoomed in or out.

25. A portable device configured to display road event plan, the portable device comprising:
a map fetcher for fetching a map, satellite or aerial view for display on the portable device;

a processor for fetching objects in the displayed area of the fetched map, satellite or aerial view, wherein the objects are one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view, wherein the objects are scaled to a size to be proportional to the scale of the map as it is zoomed in or out.

26. A method for display of a road event plan on a portable device comprising:
fetching a map, satellite or aerial view for display on the portable device;
fetching objects in the displayed area of the fetched map, satellite or aerial view, wherein the objects are one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view,
wherein the objects are scaled to a size to be proportional to the scale of the map as it is zoomed in or out.

27. A computer program in the form of instructions stored in a non-volatile manner for controlling a processor of a portable device to:
fetch a map, satellite or aerial view for display on the portable device;
fetch objects in the displayed area of the fetched map, satellite or aerial view, wherein the objects are one or more polygons, or circles, each representing an object overlaid on the map, satellite or aerial view,
wherein the objects are scaled to a size to be proportional to the scale of the map as it is zoomed in or out;
display the fetched map overlaid with the fetched scaled objects.

28. A method of notification of a road closure to a map or navigation service, comprising:
defining a plan for closure of the road;
saving the plan to a field accessible storage;
viewing the plan for closure of the road in the vicinity of the road to be closed on a portable device, where the plan is retrieved by the portable device from the field accessible storage;
implementing the plan, comprising closing the road;
receiving an indication in vicinity of the road that the road is now closed according to the plan;
transmitting the indication of the road closure and information about the road closure in the plan to the map or navigation service.

29. A method according to claim 28, wherein transmission of the indication of the road closure is transmitted from the portable device to a server, and the server causes the information about the road closure to be transmitted to the map or navigation service.

30. A method according to claim 28, wherein transmission of the indication of the road closure and information about the road closure is transmitted from the portable device to the map or navigation service.

31. A method according to claim 28, wherein when opening of the road is implemented the method further comprises receiving an indication in vicinity of the road that the road is now re-opened; and
transmitting the indication of the road reopening to the map or navigation service.

32. A system for notification of a road closure to a map or navigation service, comprising:
a storage for storing of a plan for closure of the road;
a transmitter of the plan for viewing the plan in the vicinity of the road to be closed on a portable device;
a receiver for receiving an indication from the portable device that the road is now closed according to the plan;
a transmitter for transmitting information about the road closure according to the plan to the map or navigation service.

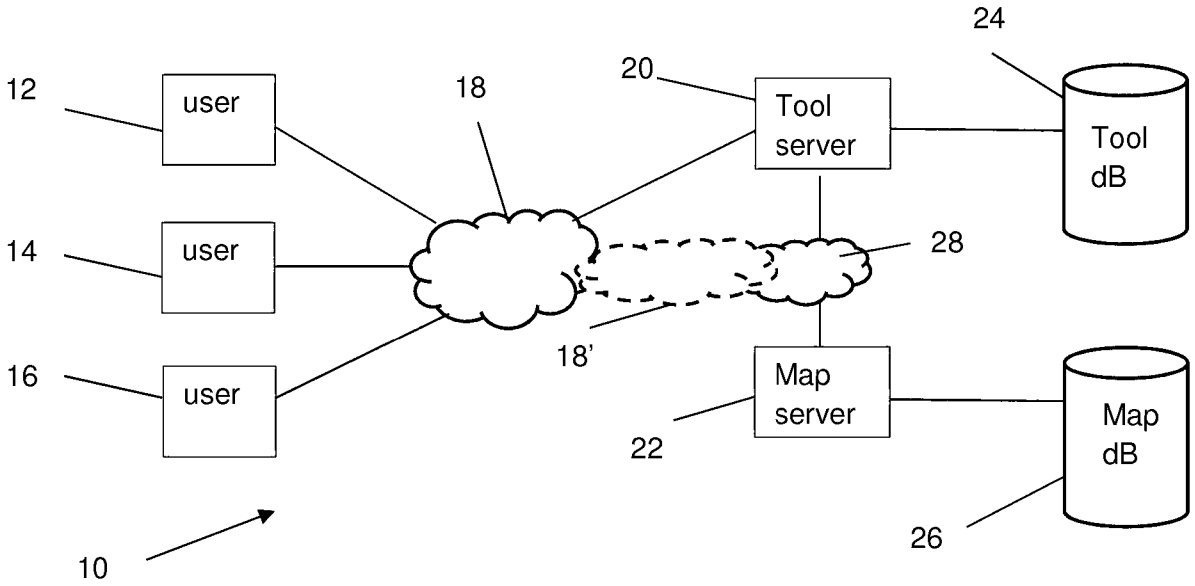


FIG. 1

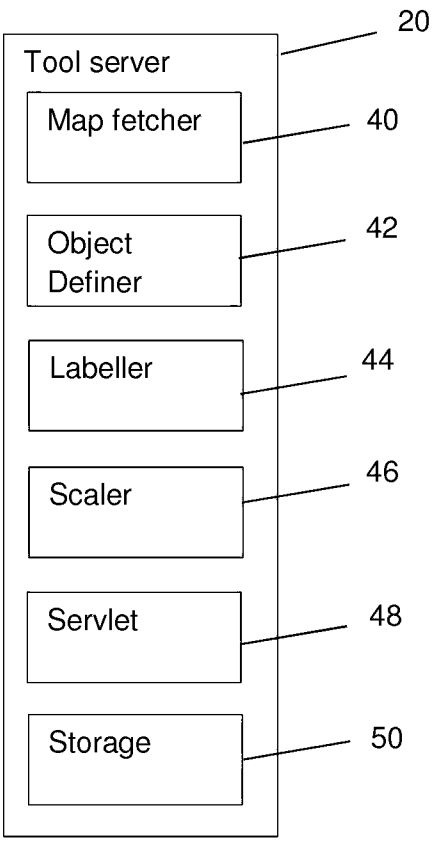


FIG. 2

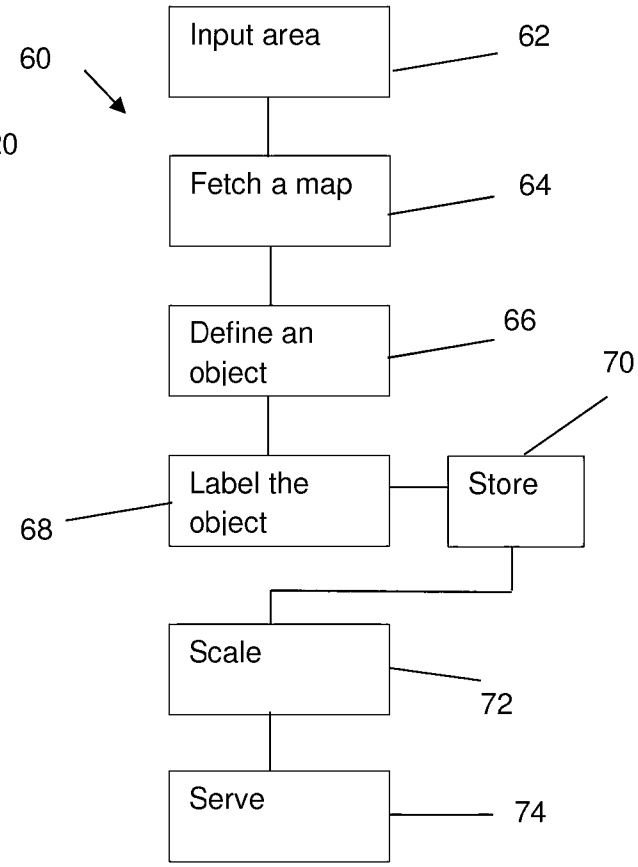


FIG. 3

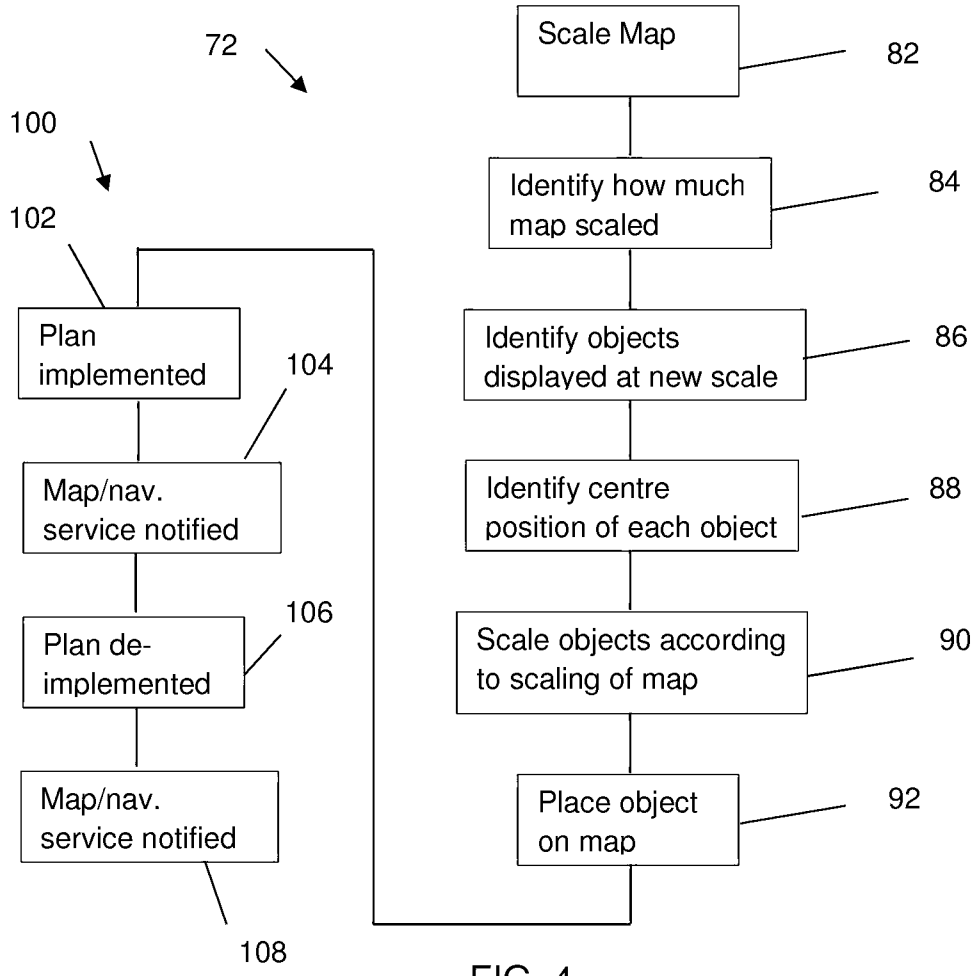

72
100
102
Plan implemented
104
Map/nav. service notified
106
Plan de-implemented
Map/nav. service notified
108
Scale Map
82
Identify how much map scaled
84
Identify objects displayed at new scale
86
Identify centre position of each object
88
Scale objects according to scaling of map
90
Place object on map
92

FIG. 4

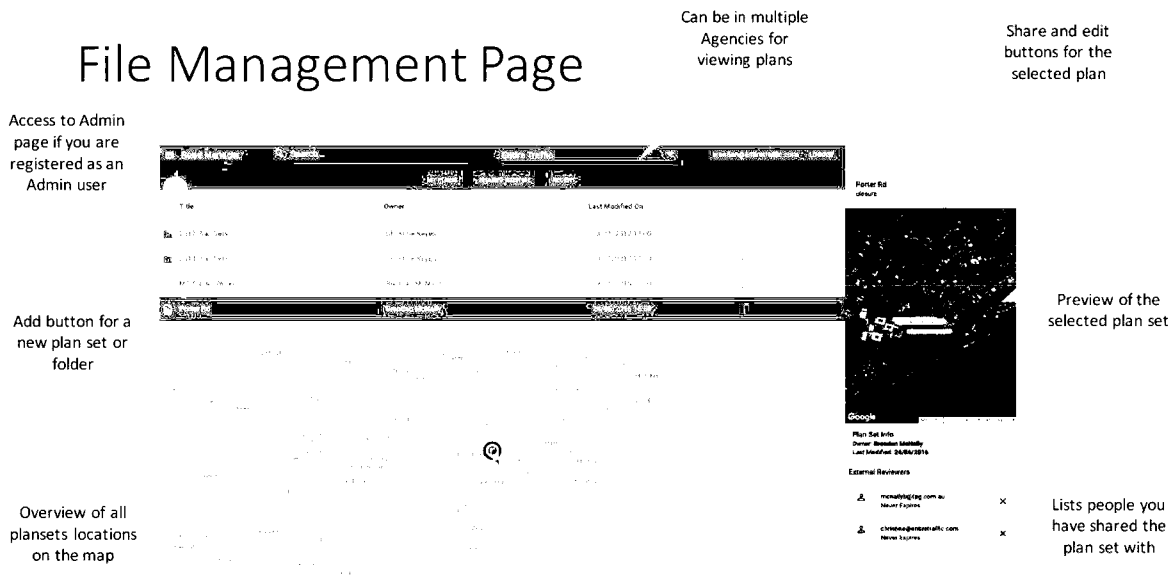
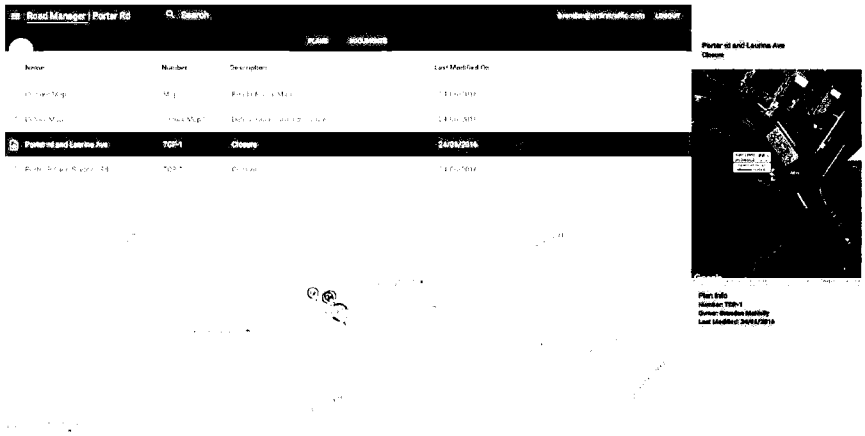

File Management Page
Can be in multiple Agencies for viewing plans
Share and edit buttons for the selected plan
Access to Admin page if you are registered as an Admin user
Add button for a new plan set or folder
Overview of all plansets locations on the map
Preview of the selected plan set
Lists people you have shared the plan set with

FIG. 5

Plan sets page

Edit-Delete plans as required



Add button for a new plan or document upload

Preview of the selected plan

Overview of all plan locations on the map

Lists people you have shared the plan set with

FIG. 6

Plan editor page

Plan title

Share/feedback/print/ manifest for resources used

Selection bar for tools to draw/use over map

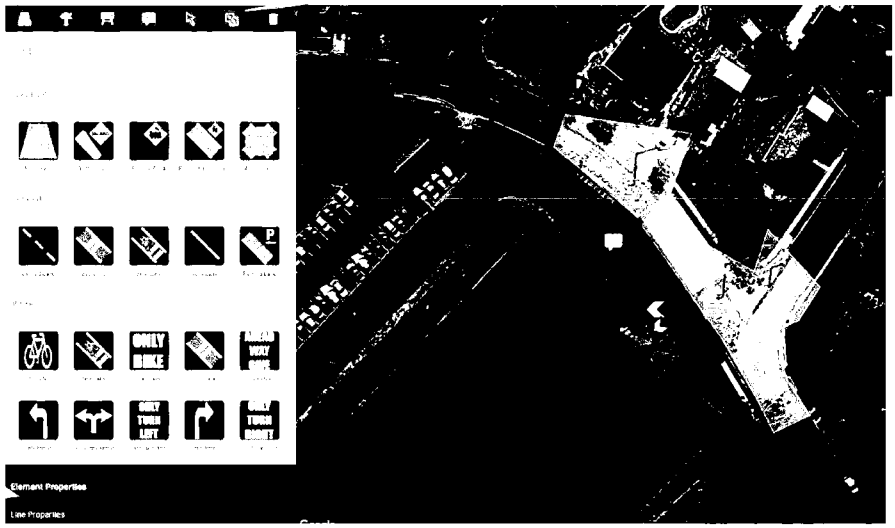
Plan drawing map

Road drawing tools to use over map. Defaults set at 'actual' size

FIG. 7

Plan tools - Merging polygons

Select multiple polygons on the map and select merge button to merge into one polygon

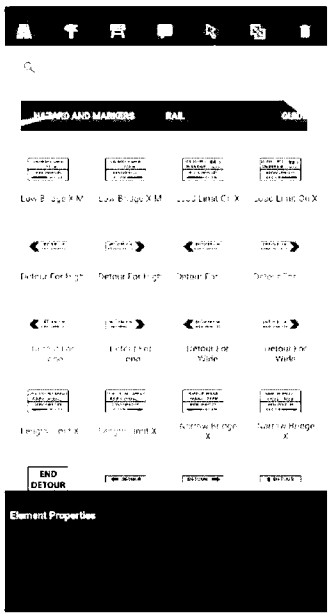


Polygons can be changed in the properties panel for colour, opacity

FIG. 8

Plan tools - Signage

Select sign category. Click on the required sign and click on the location on the map.

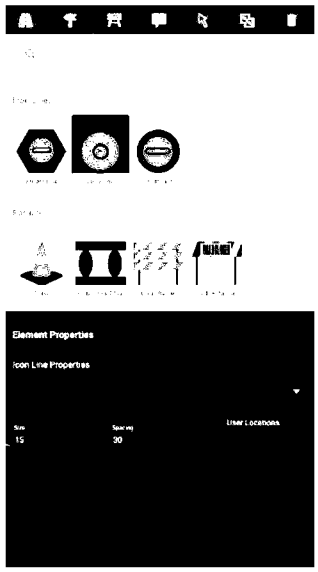


Use the select tool, to click on the sign while on the map, to manually rotate and resize the sign

FIG. 9

Plan tools – Infrastructure

Icon line tools are used to set traffic cones, bollards, etc on the map at set distances set in the properties panel

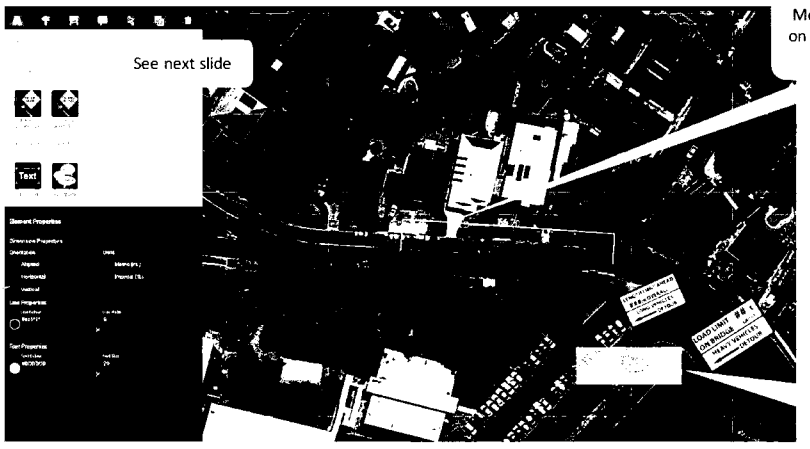


Barriers are single images placed on the map for traffic control or location markers

Properties are set as default or adjusted by the user. Spacing/size are all in metres

FIG. 10

Plan tools – Measurement/text/feedback



Measures actual distance on the map and displays in metric or imperial

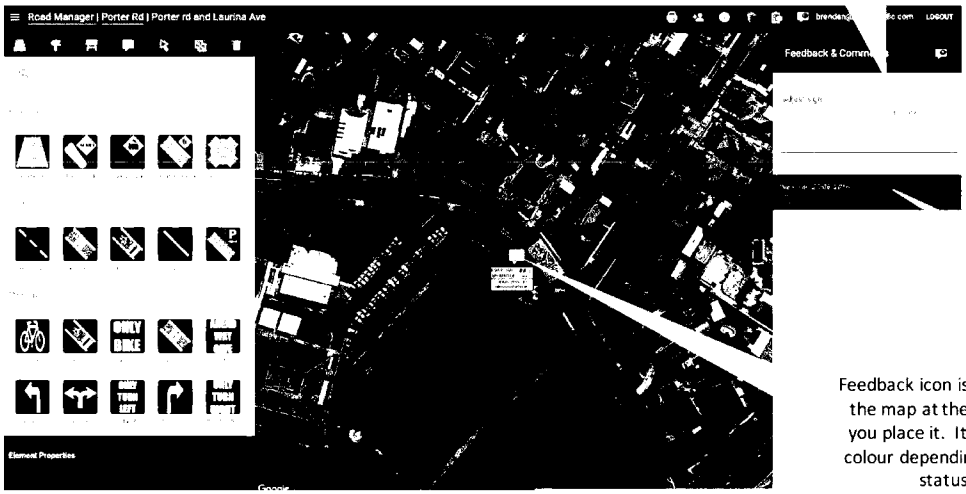
Text box properties

Text can be rotated and resized as required

FIG. 11

Plan tools - Feedback

Feedback can be changed on status level. All feedback is logged for review at a later stage.



List of feedback

Feedback icon is added to the map at the location you place it. It changes colour depending on the status

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2017/051309

A. CLASSIFICATION OF SUBJECT MATTER

G09B 29/00 (2006.01) G06Q 50/00 (2012.01) G09G 5/373 (2006.01) G06Q 10/06 (2012.01)

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)

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)

Databases: WPIAP & EPODOC, also $PATEN (all English language full-text databases): IPC/CPC's: G09B29/00; Keywords include: app, aerial, barrier, circle, closure, cone, curb, detour, diversion, drain, event, excavate, gps, implement, insert, instruction, manage, manifest, map, navigation, object, order, overlay, plan, polygon, proportion, reopen, resurface, road, satellite, scale, schedule, select, service, status, traffic, transmit, vicinity, work, zoom, & like terms.

Espacenet, Google, Google Patents, Google Scholar, The Lens: Keywords include: closure, completed, contractor, crew, detour, dispatch, instructions, job, map, mobile, navigation, notes, plan, pothole, reopen, road, roadwork, server, status, system, traffic, work, and like terms, and applicant/inventor names. Also internal IP Australia databases & AusPat for applicant/inventor names.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"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	Date of mailing of the international search report
28 February 2018	28 February 2018
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Robert Foster AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61262223617

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2017/051309**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ZHANG, M. et al., "Integrated construction zone traffic management", University of California Davis, Task Order 5300, published June 2008, [retrieved from internet on 4 October 2017] <URL: http://www.its.berkeley.edu/sites/default/files/publications/UCB/2008/PRR/UCB-ITS-PRR-2008-9.pdf> Entire document, especially: FIG.'s 3.23, 5.5-5.8, 6.1, 6.3, pages 28, 49-50, 55-56, 60-62, 67-68, 55-56, and Tables 5.1 & 5.8	1-14, 17, 24
X	US 2011/0131597 A1 (CERA et al.) 02 June 2011 Entire document, especially: FIG.'s 7-9, 17A-17B , 19, 22, 37-38 & 40, and para's [0009]-[0015], [0050], [0064]-[0065], [0089], [0103], [0128], [0139]-[0140] & [0158]	1-10, 12-14, 16-19, 23-24
Y	WO 2016/114325 A1 (FUJITSU LIMITED) 21 July 2016, English abstract and description translation obtained from Google Patents & US 2017/0308625 Entire document, especially: FIG.'s 5, 7 & 8, and WO para's 10, 29 & 49 (US para's [0019], [0038] & [0058])	1-17, 19-20, 24-27
Y	APPLE, "Annotating Maps", Location and Maps Programming Guide, published 21 August 2016, [retrieved from internet on 3 October 2017] <URL: https://developer.apple.com/library/content/documentation/UserExperience/Conceptual/LocationAwarenessPG/AnnotatingMaps/AnnotatingMaps.html> Entire document, especially: Figure 6-2, Listings 6-6, 6-9 & 6-10, and topics 'Steps for Adding an Annotation to the Map', 'Displaying Overlays on a Map', 'Annotation Maps' & 'Displaying Multiple Overlay Objects'	1-17, 19-27
Y	US 2013/0007501 A1 (AREAL et al.) 03 January 2013 Entire document, especially: Abstract, FIG.'s 1-4, para's [0021], [0031], [0040]-[0041], [0044], [0047]-[0048], [0050]-[0051], [0058], [0062]-[0064] & [0099] and claim 1	1-17, 19-27
X	US 2012/0200411 A1 (BEST) 09 August 2012 Entire document, especially FIG.'s 1, 2, 5 & 6, para's [0020], [0051]-[0052], [0058] & [0067]-[0068]	28-32
Y	MCDONALD, P., "Christchurch Earthquakes Transport Response", published 30 August 2012, [retrieved from internet on 26 February 2018], <URL: http://www.ramm.com/manuals/binayaSharma.pdf> Entire document, especially pages 2 & 6-8	28-32
Y	RAMM SOFTWARE LIMITED, "RAMM Contractor", Release Version 4.2, published 10 August 2016, [retrieved from internet on 26 February 2018], <URL: http://www.ramm.com/manuals/PDFs/RAMM Contractor.pdf> Entire document, especially pages 18, 34, 119, 123, 126, 235, 335, 342, 379 & 443	28-32
A	US 2016/0275404 A1 (INTERNATIONAL BUSINESS MACHINES CORPORATION) 22 September 2016 Entire document.	
A	US 2016/0334241 A1 (TOMTOM TRAFFIC B.V.) 17 November 2016 Entire document.	
A	US 2005/0267651 A1 (ARANGO et al.) 01 December 2005 Entire document.	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2017/051309

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

Supplemental Box

Continuation of: **Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1-27 are directed to a road event planning tool. The feature of a scaler for scaling the size of polygons or circles to be proportional to the scaling that occurs when a map is zoomed in or out, is specific to this group.

- Claims 28-32 are directed to notification of a road closure to a map or navigation service. The features of receiving an indication in the vicinity of the road that the road is now closed according to the plan, and transmitting the indication of the road closure and information about the road closure in the plan to the map or navigation service, are specific to this group.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The features common to all of the claimed inventions and which provides a technical relationship among them, for instance a map fetcher for fetching a map, satellite or aerial view of an area in which a road event is to occur, do not make a contribution over the prior art because it is disclosed in:

D1: ZHANG, M. et al., "Integrated construction zone traffic management", University of California Davis, Task Order 5300, published June 2008 (see page 50 Table 5.1 where 'Set up the network' can be 'Imported', resulting in fetched maps such as disclosed at pages 55-56 under topic '5.3.2 Step 2: Set up the network' Figures 5.5-5.6)

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a posteriori*.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2017/051309**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

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