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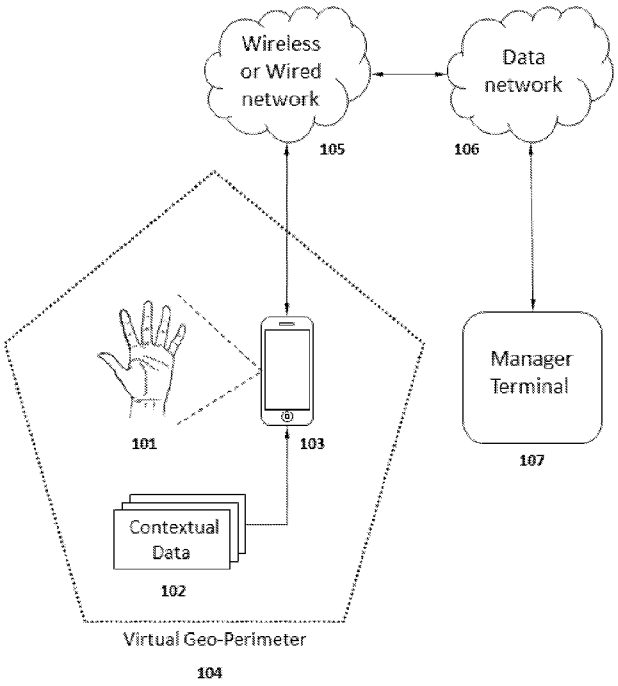

FIG. 1A

(57) Abstract: System and method for single-action time and attendance record generation and processing via computing devices. The record is generated via a computing device ("Client System") and received by a server system or other computing device ("Server System"). The user utilizes the Client System to execute a simultaneous or near-simultaneous process of authenticating his or her identity, recording time data and location data, and then sending this data to the server system.

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ATTENDANCE AUTHENTICATION AND MANAGEMENT IN CONNECTION WITH MOBILE DEVICES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the U.S. Provisional Patent Application No. 62/007,337, filed June 3, 2014, the entire disclosure of which is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The ability to remotely authenticate identity, time, and location has become increasingly important due to the growth of mobile workforces in an increasingly inter-connected global economy, the prevalence of mobile and stationary computing devices around the world, the ability to measure a diversity of data via the sensors of modern computing devices, and the ability to transmit this data wirelessly and communicate across devices.

[0003] The time and attendance management for a person (e.g., a worker, a waiter, a guest, an accountant, a lawyer, a facilities maintenance professional, an attendant, a driver, etc.) across a variety of premises (e.g., an office, a store, a factory, a warehouse, an automobile, a building, a government agency, a mine, etc.) which themselves may change over time is an important task for both an enterprise and the personnel themselves. In one aspect, a time and attendance record may only can be generated and submitted by an authenticated person. In another aspect, the amount of time that an authenticated person works at a designated location has to be recorded and controlled. The management can be for various purposes, such as payroll, security, activity measurement, working hour control, etc. However, without a reliable system or tools for precise time and attendance management, errors frequently occur and both financial and operational costs are incurred. When an error takes place in a payroll system, an employee incurs an inaccurate pay. When an error occurs in a high security environment, the security control may be compromised, creating both financial and human risks. Moreover, empowering end users with a more elegant solution to this important activity can greatly increase the productivity of mobile workforces and lead to greater personal happiness in everyday workflow.

SUMMARY OF THE INVENTION

[0004] The subject matter disclosed herein is a system and method for time and attendance management that automatically combines modern mobile computing hardware and software to provide a one-click solution to a difficult problem. The present technology utilizes secure authentication, and specifically comprises the measurement, processing and transmittal of identity, time, and location data via computing devices and a communications network.

[0005] The ability to remotely authenticate identity, time, and location has become increasingly important due to the growth of mobile workforces in an increasingly inter-connected global

economy, the prevalence of mobile and stationary computing devices around the world, the ability to measure a diversity of data via the sensors of modern computing devices, and the ability to transmit this data wirelessly and communicate across devices.

[0006] A key aspect of the system and method described is the ability to provide a single-action time and attendance system to reduce the number of actions needed to record time and attendance, providing a critical productivity advancement for on-the-go mobile workforces who often find it difficult to enter and manage multi-action instructions on computing devices, as can especially be the case with touchscreen smartphones.

[0007] In one aspect, disclosed herein is a computing system of authenticating and processing time and attendance used by a mobile end user, the system comprising: (a) a mobile processor, a memory module and a mobile operating system configured to perform executable instructions; (b) a sensor configured to measure and record a first set of time and attendance data from the mobile end user, the time and attendance data comprising: (1) an identity of the mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention; and (c) a communication module configured to send the first set of the time and attendance data to a database in a server. In some embodiments, the ancillary information comprises a note or a tag. In some embodiments, the server is configured to verify the time and attendance data based on a clock of the server. In some embodiments, the system completes time and attendance authentication of the mobile end user without requesting the mobile end user to actively execute an identifying step, the identifying step comprising one or more of: (a) submitting a name, (b) entering a passcode, (c) swiping a keycard, (d) providing one or more biometric signatures, and (e) submitting a form of identity. In some embodiments, the system further comprises a display configured to display the time and attendance data to the mobile end user. In some embodiments, the system further comprises a camera configured to record biometric information of the mobile end user by taking one or more biometric photographs. In some embodiments, the display is further configured to indicate an action, the action comprising one or more of the following: (a) recording the biometric information of the mobile end user in a simultaneous or near-simultaneous or asynchronous recording and transmittal of a second set of the time and attendance data, (b) pressing a button or touching the display, and (c) speaking one or more sounds. In some embodiments, the executable instructions comprise a determination of the mobile end user being correctly within premises for a time and attendance purpose, the determination comprising: (a) capturing geo-location data comprising free-form geographic coordinates representing a location in the world, and (b) comparing the geo-location data to permitted geo-location data, either locally on the system, or remotely via transmission of the geo-location data to the server. In

some embodiments, the permitted geo-location data is provisioned by an additional party in a process comprising: (a) entering of the permitted geo-location data into the database; (b) syncing of the permitted geo-location data with the system. In some embodiments, entering of the permitted geo-location data comprises entering of one or more geographic coordinate points on a digital map on a computer terminal to form a shape encompassing a target area for the permitted geo-location data. In some embodiments, the permitted geo-location data is updated with a new set of permitted geo-location data and synced real-time with the system, providing a configurable and changing permitted premises for time and attendance authentication. In some embodiments, the determination of the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted user, via geo-location data of two users' mobile devices, or via short-range wireless communication between the two users' mobile devices, enabling a sufficient determination of a permitted proximity. In some embodiments, the determination of the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted sensory device, via geo-location data of the system and the permitted sensory device, or via short-range wireless communication between the mobile end user and the permitted sensory device, enabling a sufficient determination of permitted proximity. In some embodiments, the geo-location data: (a) is created via a clock of the mobile end-use for the time and attendance purpose automatically, and (b) creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting outside geographic coordinates defined by the geo-fence perimeter, without having to actively enter his or her clock out instructions. In some embodiments, the geo-location data creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting specific geo-location based conditions without having to actively enter his or her clock out instructions, including but not limited to: (a) exiting outside geographic coordinates defined by a geo-fence perimeter; (b) exiting outside the wireless signal range of a sensory device; (c) exiting beyond a predefined distance from another mobile device as measured by a signal between the devices. In some embodiments, the geo-location is checked at a regular interval or at a random interval, the checking of the location executed as part of an anti-spoofing process to ensure the mobile user remains compliant with a premises requirement based on one or more of the following: a time-denominated rule, and a location-denominated rule. In some embodiments, the server comprises a smartphone, a tablet or a notebook, a stationary computing device, or a desktop. In some embodiments, the time and attendance data is synchronized with a database in a third computing device. In some embodiments, the third computing device comprises a manager of a workforce,

the manager allowing a user of the third computing device to perform one or more of the following: (a) viewing the time and attendance data; (b) communicating directly with the mobile end user; and (c) triggering a time and attendance authentication directly to the mobile end user. In some embodiments, the time and attendance data is real-time updated or regularly-updated.

[0008] In another aspect, disclosed herein includes a method of authenticating and processing time and attendance implemented by a mobile computing system and used by a mobile end user, the method comprising: (a) measuring and recording, by a sensor, a first set of time and attendance data from the mobile end user, the time and attendance data comprising: (1) an identity of the mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention; and (b) sending, by a communication module, the first set of the time and attendance data to a database in a server. In some embodiments, the ancillary information comprises a note or a tag. In some embodiments, the server is configured to verify the time and attendance data based on a clock of the server. In some embodiments, the method further comprises completing time and attendance authentication of the mobile end user without requesting the mobile end user to actively execute an identifying step, the identifying step comprising one or more of: (a) submitting a name, (b) entering a passcode, (c) swiping a keycard, (d) providing one or more biometric signatures, and (e) submitting a form of identity. In some embodiments, the method further comprises displaying, by a display, the time and attendance data to the mobile end user. In some embodiments, the method further comprises recording, by a camera, biometric information of the mobile end user by taking one or more biometric photographs. In some embodiments, the display is further configured to indicate an action, the action comprising one or more of the following: (a) recording the biometric information of the mobile end user in a simultaneous or near-simultaneous or asynchronous recording and transmittal of a second set of the time and attendance data, (b) pressing a button or touching the display, and (c) speaking one or more sounds. In some embodiments, the method further comprises determining the mobile end user being correctly within premises for a time and attendance purpose, the determination comprising: (a) capturing geo-location data comprising free-form geographic coordinates representing a location in the world, and (b) comparing the geo-location data to permitted geo-location data, either locally on the system, or remotely via transmission of the geo-location data to the server. In some embodiments, the permitted geo-location data is provisioned by an additional party in a process comprising: (a) entering of the permitted geo-location data into the database; (b) syncing of the permitted geo-location data with the system. In some embodiments, entering of the permitted geo-location data comprises entering of one or more geographic coordinate points on a digital map on a computer terminal to form a shape encompassing a target

area for the permitted geo-location data. In some embodiments, the permitted geo-location data is updated with a new set of permitted geo-location data and synced real-time with the system, providing a configurable and changing permitted premises for time and attendance authentication. In some embodiments, determining the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted user, via geo-location data of two users' mobile devices, or via short-range wireless communication between the two users' mobile devices, enabling a sufficient determination of a permitted proximity. In some embodiments, the determining the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted sensory device, via geo-location data of the system and the permitted sensory device, or via short-range wireless communication between the mobile end user and the permitted sensory device, enabling a sufficient determination of permitted proximity. In some embodiments, the geo-location data: (a) is created via a clock of the mobile end-use for the time and attendance purpose automatically, and (b) creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting outside geographic coordinates defined by the geo-fence perimeter, without having to actively enter his or her clock out instructions. In some embodiments, geo-location data creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting specific geo-location based conditions without having to actively enter his or her clock out instructions, including but not limited to: (a) exiting outside geographic coordinates defined by a geo-fence perimeter; (b) exiting outside the wireless signal range of a sensory device; (c) exiting beyond a predefined distance from another mobile device as measured by a signal between the devices. In some embodiments, the geo-location is checked at a regular interval or at a random interval, the checking of the location executed as part of an anti-spoofing process to ensure the mobile user remains compliant with a premises requirement based on one or more of the following: a time-denominated rule, and a location-denominated rule. In some embodiments, the server comprises a smartphone, a tablet or a notebook, a stationary computing device, or a desktop. In some embodiments, the time and attendance data is synchronized with a database in a third computing device. In some embodiments, the third computing device comprises a manager of a workforce, the manager allowing a user of the third computing device to perform one or more of the following: (a) viewing the time and attendance data; (b) communicating directly with the mobile end user; and (c) triggering a time and attendance authentication directly to the mobile end user. In some embodiments, the time and attendance data is real-time updated or regularly-updated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The novel features of the invention are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present invention will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the invention are utilized, and the accompanying drawings of which:

[0010] **Figure 1A** shows a non-limiting example system of time and attendance authentication, illustrating an embodiment thereof.

[0011] **Figure 1B** shows a non-limiting example of a block diagram, illustrating an embodiment thereof.

[0012] **Figure 2** shows a non-limiting example of a flow chart illustrating key steps in verifying a user's identity for time and attendance record generation.

[0013] **Figure 3** shows a flow chart illustrating key steps in identifying a user for time and attendance record generation

DETAILED DESCRIPTION OF THE INVENTION

[0014] Reference will now be made in detail to various exemplary embodiments of the invention. It is to be understood that the following discussion of exemplary embodiments is not intended as a limitation on the invention, as broadly disclosed herein. Rather, the following discussion is provided to give the reader a more detailed understanding of certain aspects and features of the invention.

[0015] Before the embodiments of the present invention are described in detail, it is to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting. Unless defined otherwise, all technical terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the term belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice of the present invention, the preferred methods and materials are now described. All publications mentioned herein are incorporated herein by reference to disclose and describe the methods and/or materials in connection with which the publications are cited. The present disclosure is controlling to the extent it conflicts with any incorporated publication.

[0016] As used herein and in the appended claims, the singular forms “a”, “an”, and “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to “a palm” includes a single palm or both palms of an individual and reference to “an image” includes reference to one or more images. Furthermore, the use of terms that can be described using equivalent terms includes the use of those equivalent terms. Thus, for example,

the use of the term "camera" is to be understood to include any device capable of obtaining an image of an object. As another example, the term "smartphone" includes all mobile devices with a digital signal processor.

[0017] In various embodiments, the technology described herein includes a computing system of authenticating and processing time and attendance used by a mobile end user, the system comprising: (a) a mobile processor, a memory module and a mobile operating system configured to perform executable instructions; (b) a sensor configured to measure and record a first set of time and attendance data from the mobile end user, the time and attendance data comprising: (1) an identity of the mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention; and (c) a communication module configured to send the first set of the time and attendance data to a database in a server. In some embodiments, the ancillary information comprises a note or a tag. In some embodiments, the server is configured to verify the time and attendance data based on a clock of the server. In some embodiments, the system completes time and attendance authentication of the mobile end user without requesting the mobile end user to actively execute an identifying step, the identifying step comprising one or more of: (a) submitting a name, (b) entering a passcode, (c) swiping a keycard, (d) providing one or more biometric signatures, and (e) submitting a form of identity. In some embodiments, the system further comprises a display configured to display the time and attendance data to the mobile end user. In some embodiments, the system further comprises a camera configured to record biometric information of the mobile end user by taking one or more biometric photographs. In some embodiments, the display is further configured to indicate an action, the action comprising one or more of the following: (a) recording the biometric information of the mobile end user in a simultaneous or near-simultaneous or asynchronous recording and transmittal of a second set of the time and attendance data, (b) pressing a button or touching the display, and (c) speaking one or more sounds. In some embodiments, the executable instructions comprise a determination of the mobile end user being correctly within premises for a time and attendance purpose, the determination comprising: (a) capturing geo-location data comprising free-form geographic coordinates representing a location in the world, and (b) comparing the geo-location data to permitted geo-location data, either locally on the system, or remotely via transmission of the geo-location data to the server. In some embodiments, the permitted geo-location data is provisioned by an additional party in a process comprising: (a) entering of the permitted geo-location data into the database; (b) syncing of the permitted geo-location data with the system. In some embodiments, entering of the permitted geo-location data comprises entering of one or more geographic coordinate points on a digital map on a computer terminal to form a shape

encompassing a target area for the permitted geo-location data. In some embodiments, the permitted geo-location data is updated with a new set of permitted geo-location data and synced real-time with the system, providing a configurable and changing permitted premises for time and attendance authentication. In some embodiments, the determination of the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted user, via geo-location data of two users' mobile devices, or via short-range wireless communication between the two users' mobile devices, enabling a sufficient determination of a permitted proximity. In some embodiments, the determination of the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted sensory device, via geo-location data of the system and the permitted sensory device, or via short-range wireless communication between the mobile end user and the permitted sensory device, enabling a sufficient determination of permitted proximity. In some embodiments, the geo-location data: (a) is created via a clock of the mobile end-use for the time and attendance purpose automatically, and (b) creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting outside geographic coordinates defined by the geo-fence perimeter, without having to actively enter his or her clock out instructions. In some embodiments, geo-location data creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting specific geo-location based conditions without having to actively enter his or her clock out instructions, including but not limited to: (a) exiting outside geographic coordinates defined by a geo-fence perimeter; (b) exiting outside the wireless signal range of a sensory device; (c) exiting beyond a predefined distance from another mobile device as measured by a signal between the devices. In some embodiments, the geo-location is checked at a regular interval or at a random interval, the checking of the location executed as part of an anti-spoofing process to ensure the mobile user remains compliant with a premises requirement based on one or more of the following: a time-denominated rule, and a location-denominated rule. In some embodiments, the server comprises a smartphone, a tablet or a notebook, a stationary computing device, or a desktop. In some embodiments, the time and attendance data is synchronized with a database in a third computing device. In some embodiments, the third computing device comprises a manager of a workforce, the manager allowing a user of the third computing device to perform one or more of the following: (a) viewing the time and attendance data; (b) communicating directly with the mobile end user; and (c) triggering a time and attendance authentication directly to the mobile end user. In some embodiments, the time and attendance data is real-time updated or regularly-updated.

[0018] In various embodiments, the technology described herein includes a method of authenticating and processing time and attendance implemented by a mobile computing system and used by a mobile end user, the method comprising: (a) measuring and recording, by a sensor, a first set of time and attendance data from the mobile end user, the time and attendance data comprising: (1) an identity of the mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention; and (b) sending, by a communication module, the first set of the time and attendance data to a database in a server. In some embodiments, the ancillary information comprises a note or a tag. In some embodiments, the server is configured to verify the time and attendance data based on a clock of the server. In some embodiments, the method further comprises completing time and attendance authentication of the mobile end user without requesting the mobile end user to actively execute an identifying step, the identifying step comprising one or more of: (a) submitting a name, (b) entering a passcode, (c) swiping a keycard, (d) providing one or more biometric signatures, and (e) submitting a form of identity. In some embodiments, the method further comprises displaying, by a display, the time and attendance data to the mobile end user. In some embodiments, the method further comprises recording, by a camera, biometric information of the mobile end user by taking one or more biometric photographs. In some embodiments, the display is further configured to indicate an action, the action comprising one or more of the following: (a) recording the biometric information of the mobile end user in a simultaneous or near-simultaneous or asynchronous recording and transmittal of a second set of the time and attendance data, (b) pressing a button or touching the display, and (c) speaking one or more sounds. In some embodiments, the method further comprises determining the mobile end user being correctly within premises for a time and attendance purpose, the determination comprising: (a) capturing geo-location data comprising free-form geographic coordinates representing a location in the world, and (b) comparing the geo-location data to permitted geo-location data, either locally on the system, or remotely via transmission of the geo-location data to the server. In some embodiments, the permitted geo-location data is provisioned by an additional party in a process comprising: (a) entering of the permitted geo-location data into the database; (b) syncing of the permitted geo-location data with the system. In some embodiments, entering of the permitted geo-location data comprises entering of one or more geographic coordinate points on a digital map on a computer terminal to form a shape encompassing a target area for the permitted geo-location data. In some embodiments, the permitted geo-location data is updated with a new set of permitted geo-location data and synced real-time with the system, providing a configurable and changing permitted premises for time and attendance authentication. In some embodiments, determining

the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted user, via geo-location data of two users' mobile devices, or via short-range wireless communication between the two users' mobile devices, enabling a sufficient determination of a permitted proximity. In some embodiments, the determining the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted sensory device, via geo-location data of the system and the permitted sensory device, or via short-range wireless communication between the mobile end user and the permitted sensory device, enabling a sufficient determination of permitted proximity. In some embodiments, the geo-location data: (a) is created via a clock of the mobile end-use for the time and attendance purpose automatically, and (b) creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting outside geographic coordinates defined by the geo-fence perimeter, without having to actively enter his or her clock out instructions. In some embodiments, geo-location data creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out simply by physically exiting specific geo-location based conditions without having to actively enter his or her clock out instructions, including but not limited to: (a) exiting outside geographic coordinates defined by a geo-fence perimeter; (b) exiting outside the wireless signal range of a sensory device; (c) exiting beyond a predefined distance from another mobile device as measured by a signal between the devices. In some embodiments, the geo-location is checked at a regular interval or at a random interval, the checking of the location executed as part of an anti-spoofing process to ensure the mobile user remains compliant with a premises requirement based on one or more of the following: a time-denominated rule, and a location-denominated rule. In some embodiments, the server comprises a smartphone, a tablet or a notebook, a stationary computing device, or a desktop. In some embodiments, the time and attendance data is synchronized with a database in a third computing device. In some embodiments, the third computing device comprises a manager of a workforce, the manager allowing a user of the third computing device to perform one or more of the following: (a) viewing the time and attendance data; (b) communicating directly with the mobile end user; and (c) triggering a time and attendance authentication directly to the mobile end user. In some embodiments, the time and attendance data is real-time updated or regularly-updated.

System design

[0019] Figure 1A is an example system of time and attendance authentication under the present invention. This embodiment supports single-action time and attendance over the Internet using a computing device. In a synchronous or near-synchronous process, user **101** authenticates his or

her biometric data via a mobile device **103**, the mobile device **103** captures contextual data **102**, which may include time data, geo-location data based on geographic coordinates, geo-location data based on a measurement of proximity to other devices via short-range signals exchanged between the devices, a note or tag to be associated with said time and attendance data for the purpose of attributing a specific hourly rate or other form of cost code to the data or for associating an informational note with the data for other archival or record retention purposes, and the time and attendance data is sent to manager terminal **107** via wireless or wired network **105** and data network **106**. In a preferred embodiment, the authentication of biometric data occurs via biometric matching of the palm modality of user **101**, with the unique features of the palm of user **101** captured via an image or set of images from the optical camera of mobile device **103**. Manager terminal **107** can provision a virtual geo-fence perimeter **104**, and associate virtual geo-fence perimeter **104** as the permitted premises for authenticating time and attendance by user **101**. As such, when user **101** attempts to authenticate his or her time and attendance data, a matching of geo-location data between user **101** and mobile device **103** with virtual geo-perimeter **104** can be made, with compliance allowing submission of the time and attendance data to manager terminal **107**, and non-compliance triggering the rejection of the submission of time and attendance data.

[0020] Figure 1B is a block diagram illustrating an embodiment of the present invention. The server system **120** includes a client ID/employee table **121**, a time and attendance record database **122**, and a server engine **123**. The client ID/Employee table contains a map of each employee to a unique ID number. The time and attendance record database **122** contains a list of previous records generated by each employee. The server engine **123** receives record generation requests and returns confirmation when a record has been generated. The client system **110** contains a display **111**, a client ID **112**, a biometric engine **113**, and a biometric model **114**.The display may show the employee the current status of the computing device. If a record was just generated, the display may show a confirmation. The client ID **112** stores the unique identifier for a given employee. The biometric system **113** transforms a given biometric reading into a client signature. This signature is then compared to the biometric model **114** to confirm or deny the identity of the individual attempting to generate a record. As will be apparent to one of skill in the art, the comparison and matching functions for user identity may be implemented either on the client system **110**, on the server system **120**, or alternately between client system **110** and server system **120**, with biometric engine **113**, biometric model **114**, client ID/employee table **121**, and time and attendance record database **122** operating on any one device, both devices, or some combination of devices. It should further be apparent to one of skill in the art that the functions performance by server system **120** could alternately be performed by any computing

device, including but not limited to smartphones, tablets, notebooks, desktops, or any variety of other mobile or stationary computing device.

Contextual data

[0021] Referring to **Figure 1A**, in some embodiments, the system transmits contextual data for time and attendance management. Contextual data comprises data or information associated with a condition where a user is using the system.

[0022] In various implementations, contextual data comprises geo-location data of an end user, e.g., a house number, a unit number, a building, a center, a bank, a fitness center, an enterprise, a firm, a company, a hotel, a clinic, a medical center, a hospital, a school, a university, a government agency, a library, a station, a road crossing, a landmark, an attraction, a hotel, a theater, a street, a county, a city, a geographic region, a country, a continent, an aerospace, etc.

[0023] In some applications, contextual data comprises device information, e.g., an IP address, browser, a user ID, a timestamp, an operating system, a device type, a device manufacturer, network connectivity, a network carrier, a network type, etc.

[0024] An example of contextual data includes vehicles a user is taking, e.g., a public transportation system, a personal automobile, a motorcycle, a taxi, a car, a bicycle, a bus, a train, a tram, a boat, a ship, an airplane, shuttle, etc.

[0025] Another example includes activities that a user is doing or participating, e.g., a breakfast, a lunch, a dinner, a wedding, a meeting, a conference, a travel, a ceremony, a celebration, a training, a class, an interview, a chat, a phone call, a document preparation, cooking, bathing, showering, sleeping, reading, singing, working, walking, driving, music playing, sports playing, taking a break, seeing, movie-watching, etc.

[0026] A person with skills in the art can easily recognize potential variations of contextual data.

Sensor

[0027] In various embodiments, the system, device, media, network, and method described herein include a sensor or use of the same. A sensor is able to measure one or more physical signals. In some embodiments, the signals are in a raw form; alternatively, raw signals are processed or cleaned or assembled by the sensor. Non-limiting examples include: one or more video cameras, one or more sound recorders, one or more global positioning systems (GPSs), one or more weather stations, one or more position sensors, one or more RF tags, one or more GPS tracking units, one or more wind speed sensors, wind direction sensors, one or more temperature sensors, one or more rain sensors, one or more snow sensors, one or more liquid sensors, one or more gas sensors, one or more carbon dioxide sensors, one or more carbon monoxide sensors, one or more oxygen sensors, one or more motion sensors, one or more speed sensors, one or more acceleration sensors, one or more pressure sensors, one or more torque

sensors, one or more force sensors, one or more load sensors, one or more electric current sensors, one or more electric voltage sensors, one or more stability sensor, and one or more balance sensors.

Time and attendance data

[0028] In some embodiments, the raw signals collected by one or more sensors are analyzed and processed to generate time and attendance data. In some cases, the data comprises temporal and/or spatial information. In various applications, the data comprises (1) an identity of a mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention.

[0029] In some embodiments, the time and attendance data comprises ancillary information, which can include a note, a tag, a mark, a document, a message. This ancillary data may be automatically associated with the other time and attendance data as a critical component. For example, in the case of job site costing, this ancillary data may provide key information for matching an hourly pay rate to the hours recorded, which hourly pay rate may change for different work shifts depending on various factors, including the identity of the job site itself, which end customer is being serviced by an hourly worker at a given job site, the nature of the work itself, as well as other factors.

[0030] In some embodiments, the geo-location of a mobile end user, as well as the end user's proximity to a location of permitted premises, is measured in one of several ways or any combination thereof, including: (a) measurement of the geographic coordinates of the end user; (b) measurement of the distance of the end user from a sensory device, such sensory devices including such devices known as ibeacons, NFC terminals, as well as a variety of other suitable devices, capable of sending and receiving a variety of wireless signals including Bluetooth, NFC signals, Wi-Fi, and other signals; (c) measurement of the distance of the end user from another user, as measured by short-range radio-frequency signals transmitted between the mobile devices of the users, for example short-range signals such as Bluetooth, NFC signals, Wi-Fi, as well as other signals, that may enable sufficient determination of permitted proximity.

Workforce manager

[0031] In some embodiments, the system and method described herein include a manager of a workforce. In some embodiments, the manager is implemented as one or more software modules, one or more hardware modules, or a combination of thereof. In certain embodiments, the manager allows a user of a third computing device to view the time and attendance data of the mobile user. In various embodiments, the manager allows a user of a third computing device to communicate directly with the mobile user. In some applications, the manager allows a user

of a third computing device to trigger a time and attendance authentication directly to the mobile user.

Applications of the system

[0032] Based on the above description of the system and methodologies of the present invention, it can be understood that various applications are possible. Examples include, without limitation, recording and managing working hours spent by an employee in a workplace or in a project; authenticating access to a workplace; managing access to a workplace; dismissing an employee from a workplace.

[0033] In some embodiments, the system is used to manage time spent to a physical resource, such as a house, an apartment, a hotel room, an office, a building, a facility, a storage unit, an automobile, a bicycle, a motorcycle, an airplane, a helicopter, a remotely operated robot such as a drone, or a maritime vessel.

Digital processing device

[0034] In some embodiments, the system, media, and method described herein include a digital processing device, or use of the same. In further embodiments, the digital processing device includes one or more hardware central processing units (CPU) that carry out the device's functions. In still further embodiments, the digital processing device further comprises an operating system configured to perform executable instructions. In some embodiments, the digital processing device is optionally connected to a computer network. In further embodiments, the digital processing device is optionally connected to the Internet such that it accesses the World Wide Web. In still further embodiments, the digital processing device is optionally connected to a cloud computing infrastructure. In other embodiments, the digital processing device is optionally connected to an intranet. In other embodiments, the digital processing device is optionally connected to a data storage device.

[0035] In accordance with the description herein, suitable digital processing devices include, by way of non-limiting examples, server computers, desktop computers, laptop computers, notebook computers, sub-notebook computers, netbook computers, netpad computers, set-top computers, handheld computers, Internet appliances, mobile smartphones, tablet computers, personal digital assistants, video game consoles, and vehicles. Those of skill in the art will recognize that many smartphones are suitable for use in the system described herein. Those of skill in the art will also recognize that select televisions, video players, and digital music players with optional computer network connectivity are suitable for use in the system described herein. Suitable tablet computers include those with booklet, slate, and convertible configurations, known to those of skill in the art.

[0036] In some embodiments, the digital processing device includes an operating system configured to perform executable instructions. The operating system is, for example, software, including programs and data, which manages the device's hardware and provides services for execution of applications. Those of skill in the art will recognize that suitable server operating systems include, by way of non-limiting examples, FreeBSD, OpenBSD, NetBSD®, Linux, Apple® Mac OS X Server®, Oracle® Solaris®, Windows Server®, and Novell® NetWare®. Those of skill in the art will recognize that suitable personal computer operating systems include, by way of non-limiting examples, Microsoft® Windows®, Apple® Mac OS X®, UNIX®, and UNIX-like operating systems such as GNU/Linux®. In some embodiments, the operating system is provided by cloud computing. Those of skill in the art will also recognize that suitable mobile smart phone operating systems include, by way of non-limiting examples, Nokia® Symbian® OS, Apple® iOS®, Research In Motion® BlackBerry OS®, Google® Android®, Microsoft® Windows Phone® OS, Microsoft® Windows Mobile® OS, Linux®, and Palm® WebOS®.

[0037] In some embodiments, the device includes a storage and/or memory module. The storage and/or memory module is one or more physical apparatuses used to store data or programs on a temporary or permanent basis. In some embodiments, the module is volatile memory and requires power to maintain stored information. In some embodiments, the module is non-volatile memory and retains stored information when the digital processing device is not powered. In further embodiments, the non-volatile memory comprises flash memory. In some embodiments, the non-volatile memory comprises dynamic random-access memory (DRAM). In some embodiments, the non-volatile memory comprises ferroelectric random access memory (FRAM). In some embodiments, the non-volatile memory comprises phase-change random access memory (PRAM). In other embodiments, the device is a storage device including, by way of non-limiting examples, CD-ROMs, DVDs, flash memory devices, magnetic disk drives, magnetic tapes drives, optical disk drives, and cloud computing based storage. In further embodiments, the storage and/or memory module is a combination of modules such as those disclosed herein.

[0038] In some embodiments, the digital processing device includes a display to send visual information to a user. In some embodiments, the display is a cathode ray tube (CRT). In some embodiments, the display is a liquid crystal display (LCD). In further embodiments, the display is a thin film transistor liquid crystal display (TFT-LCD). In some embodiments, the display is an organic light emitting diode (OLED) display. In various further embodiments, on OLED display is a passive-matrix OLED (PMOLED) or active-matrix OLED (AMOLED) display. In some embodiments, the display is a plasma display. In other embodiments, the display is a video

projector. In still further embodiments, the display is a combination of devices such as those disclosed herein.

[0039] In some embodiments, the digital processing device includes an input device to receive information from a user. In some embodiments, the input device is a keyboard. In some embodiments, the input device is a pointing device including, by way of non-limiting examples, a mouse, trackball, track pad, joystick, game controller, or stylus. In some embodiments, the input device is a touch screen or a multi-touch screen. In other embodiments, the input device is a microphone to capture voice or other sound input. In other embodiments, the input device is a video camera to capture motion or visual input. In still further embodiments, the input device is a combination of devices such as those disclosed herein.

Non-transitory computer readable storage medium

[0040] In some embodiments, the system, media, and method disclosed herein include one or more non-transitory computer readable storage media encoded with a program including instructions executable by the operating system of an optionally networked digital processing device. In further embodiments, a computer readable storage medium is a tangible component of a digital processing device. In still further embodiments, a computer readable storage medium is optionally removable from a digital processing device. In some embodiments, a computer readable storage medium includes, by way of non-limiting examples, CD-ROMs, DVDs, flash memory devices, solid state memory, magnetic disk drives, magnetic tape drives, optical disk drives, cloud computing systems and services, and the like. In some cases, the program and instructions are permanently, substantially permanently, semi-permanently, or non-transitorily encoded on the media.

Computer program

[0041] In some embodiments, the system, media, and method disclosed herein include at least one computer program, or use of the same. A computer program includes a sequence of instructions, executable in the digital processing device's CPU, written to perform a specified task. Computer readable instructions may be implemented as program modules, such as functions, objects, Application Programming Interfaces (APIs), data structures, and the like, that perform particular tasks or implement particular abstract data types. In light of the disclosure provided herein, those of skill in the art will recognize that a computer program may be written in various versions of various languages.

[0042] The functionality of the computer readable instructions may be combined or distributed as desired in various environments. In some embodiments, a computer program comprises one sequence of instructions. In some embodiments, a computer program comprises a plurality of sequences of instructions. In some embodiments, a computer program is provided from one

location. In other embodiments, a computer program is provided from a plurality of locations. In various embodiments, a computer program includes one or more software modules. In various embodiments, a computer program includes, in part or in whole, one or more web applications, one or more mobile applications, one or more standalone applications, one or more web browser plug-ins, extensions, add-ins, or add-ons, or combinations thereof.

Web application

[0043] In some embodiments, a computer program includes a web application. In light of the disclosure provided herein, those of skill in the art will recognize that a web application, in various embodiments, utilizes one or more software frameworks and one or more database systems. In some embodiments, a web application is created upon a software framework such as Microsoft® .NET or Ruby on Rails (RoR). In some embodiments, a web application utilizes one or more database systems including, by way of non-limiting examples, relational, non-relational, object oriented, associative, and XML database systems. In further embodiments, suitable relational database systems include, by way of non-limiting examples, Microsoft® SQL Server, mySQL™, and Oracle®. Those of skill in the art will also recognize that a web application, in various embodiments, is written in one or more versions of one or more languages. A web application may be written in one or more markup languages, presentation definition languages, client-side scripting languages, server-side coding languages, database query languages, or combinations thereof. In some embodiments, a web application is written to some extent in a markup language such as Hypertext Markup Language (HTML), Extensible Hypertext Markup Language (XHTML), or eXtensible Markup Language (XML). In some embodiments, a web application is written to some extent in a presentation definition language such as Cascading Style Sheets (CSS). In some embodiments, a web application is written to some extent in a client-side scripting language such as Asynchronous Javascript and XML (AJAX), Flash® Actionscript, Javascript, or Silverlight®. In some embodiments, a web application is written to some extent in a server-side coding language such as Active Server Pages (ASP), ColdFusion®, Perl, Java™, JavaServer Pages (JSP), Hypertext Preprocessor (PHP), Python™, Ruby, Tcl, Smalltalk, WebDNA®, or Groovy. In some embodiments, a web application is written to some extent in a database query language such as Structured Query Language (SQL). In some embodiments, a web application integrates enterprise server products such as IBM® Lotus Domino®. In some embodiments, a web application includes a media player element. In various further embodiments, a media player element utilizes one or more of many suitable multimedia technologies including, by way of non-limiting examples, Adobe® Flash®, HTML 5, Apple® QuickTime®, Microsoft® Silverlight®, Java™, and Unity®.

Mobile application

[0044] In some embodiments, a computer program includes a mobile application provided to a mobile digital processing device. In some embodiments, the mobile application is provided to a mobile digital processing device at the time it is manufactured. In other embodiments, the mobile application is provided to a mobile digital processing device via the computer network described herein.

[0045] In view of the disclosure provided herein, a mobile application is created by techniques known to those of skill in the art using hardware, languages, and development environments known to the art. Those of skill in the art will recognize that mobile applications are written in several languages. Suitable programming languages include, by way of non-limiting examples, C, C++, C#, Objective-C, Java™, Javascript, Pascal, Object Pascal, Python™, Ruby, VB.NET, WML, and XHTML/HTML with or without CSS, or combinations thereof.

[0046] Suitable mobile application development environments are available from several sources. Commercially available development environments include, by way of non-limiting examples, AirplaySDK, alcheMo, Appcelerator®, Celsius, Bedrock, Flash Lite, .NET Compact Framework, Rhomobile, and WorkLight Mobile Platform. Other development environments are available without cost including, by way of non-limiting examples, Lazarus, MobiFlex, MoSync, and Phonegap. Also, mobile device manufacturers distribute software developer kits including, by way of non-limiting examples, iPhone and iPad (iOS) SDK, Android™ SDK, BlackBerry® SDK, BREW SDK, Palm® OS SDK, Symbian SDK, webOS SDK, and Windows® Mobile SDK.

[0047] Those of skill in the art will recognize that several commercial forums are available for distribution of mobile applications including, by way of non-limiting examples, Apple® App Store, Android™ Market, BlackBerry® App World, App Store for Palm devices, App Catalog for webOS, Windows® Marketplace for Mobile, Ovi Store for Nokia® devices, Samsung® Apps, and Nintendo® DSi Shop.

Standalone application

[0048] In some embodiments, a computer program includes a standalone application, which is a program that is run as an independent computer process, not an add-on to an existing process, e.g., not a plug-in. Those of skill in the art will recognize that standalone applications are often compiled. A compiler is a computer program(s) that transforms source code written in a programming language into binary object code such as assembly language or machine code. Suitable compiled programming languages include, by way of non-limiting examples, C, C++, Objective-C, COBOL, Delphi, Eiffel, Java™, Lisp, Python™, Visual Basic, and VB .NET, or combinations thereof. Compilation is often performed, at least in part, to create an executable

program. In some embodiments, a computer program includes one or more executable complied applications.

Web browser plug-in

[0049] In some embodiments, the computer program includes a web browser plug-in. In computing, a plug-in is one or more software components that add specific functionality to a larger software application. Makers of software applications support plug-ins to enable third-party developers to create abilities which extend an application, to support easily adding new features, and to reduce the size of an application. When supported, plug-ins enable customizing the functionality of a software application. For example, plug-ins are commonly used in web browsers to play video, generate interactivity, scan for viruses, and display particular file types. Those of skill in the art will be familiar with several web browser plug-ins including, Adobe® Flash® Player, Microsoft® Silverlight®, and Apple® QuickTime®. In some embodiments, the toolbar comprises one or more web browser extensions, add-ins, or add-ons. In some embodiments, the toolbar comprises one or more explorer bars, tool bands, or desk bands.

[0050] In view of the disclosure provided herein, those of skill in the art will recognize that several plug-in frameworks are available that enable development of plug-ins in various programming languages, including, by way of non-limiting examples, C++, Delphi, Java™, PHP, Python™, and VB .NET, or combinations thereof.

[0051] Web browsers (also called Internet browsers) are software applications, designed for use with network-connected digital processing devices, for retrieving, presenting, and traversing information resources on the World Wide Web. Suitable web browsers include, by way of non-limiting examples, Microsoft® Internet Explorer®, Mozilla® Firefox®, Google® Chrome, Apple® Safari®, Opera Software® Opera®, and KDE Konqueror. In some embodiments, the web browser is a mobile web browser. Mobile web browsers (also called mircrobrowsers, mini-browsers, and wireless browsers) are designed for use on mobile digital processing devices including, by way of non-limiting examples, handheld computers, tablet computers, netbook computers, subnotebook computers, smartphones, music players, personal digital assistants (PDAs), and handheld video game systems. Suitable mobile web browsers include, by way of non-limiting examples, Google® Android® browser, RIM BlackBerry® Browser, Apple® Safari®, Palm® Blazer, Palm® WebOS® Browser, Mozilla® Firefox® for mobile, Microsoft® Internet Explorer® Mobile, Amazon® Kindle® Basic Web, Nokia® Browser, Opera Software® Opera® Mobile, and Sony® PSP™ browser.

Software modules

[0052] In some embodiments, the system, media, and method disclosed herein include software, server, and/or database modules, or use of the same. In view of the disclosure provided herein,

software modules are created by techniques known to those of skill in the art using machines, software, and languages known to the art. The software modules disclosed herein are implemented in a multitude of ways. In various embodiments, a software module comprises a file, a section of code, a programming object, a programming structure, or combinations thereof. In further various embodiments, a software module comprises a plurality of files, a plurality of sections of code, a plurality of programming objects, a plurality of programming structures, or combinations thereof. In various embodiments, the one or more software modules comprise, by way of non-limiting examples, a web application, a mobile application, and a standalone application. In some embodiments, software modules are in one computer program or application. In other embodiments, software modules are in more than one computer program or application. In some embodiments, software modules are hosted on one machine. In other embodiments, software modules are hosted on more than one machine. In further embodiments, software modules are hosted on cloud computing platforms. In some embodiments, software modules are hosted on one or more machines in one location. In other embodiments, software modules are hosted on one or more machines in more than one location.

Databases

[0053] In some embodiments, the system, media, and method disclosed herein include one or more databases, or use of the same. In view of the disclosure provided herein, those of skill in the art will recognize that many databases are suitable for storage and retrieval of biometric information. In various embodiments, suitable databases include, by way of non-limiting examples, relational databases, non-relational databases, object oriented databases, object databases, entity-relationship model databases, associative databases, and XML databases. In some embodiments, a database is internet-based. In further embodiments, a database is web-based. In still further embodiments, a database is cloud computing-based. In other embodiments, a database is based on one or more local computer storage devices.

EXAMPLES

[0054] The following illustrative examples are representative of embodiments of the software applications, systems, and methods described herein and are not meant to be limiting in any way.

Example 1— Time and Attendance Management

[0055] **Figure 2** and **Figure 3** are examples of how a user operates the system. In the case of verification (**Figure 2**), the user enters his or her name or ID in the mobile device. The single-action time and attendance process is triggered. The mobile device captures the biometric information. Once the biometric information is captured, a detector immediately determines a region of interest in the biometric scan. The device further extracts feature information unique to

the user. The system extracts a signature from this feature information and compares the signature and user ID or user name with a model stored in the database. If the match is found, the time and attendance data is sent to the server; otherwise, the time and attendance data is rejected. In the case of identification (**Figure 3**), the single-action time and attendance process is triggered and the user identity accepted or rejected without first requiring the user to enter a name or ID in the mobile device.

[0056] While preferred embodiments of the present invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. It should be understood that various alternatives to the embodiments of the invention described herein may be employed in practicing the invention.

CLAIMS

WHAT IS CLAIMED IS:

1. A computing system of authenticating and processing time and attendance used by a mobile end user, the system comprising:

(a) a mobile processor, a memory module and a mobile operating system configured to perform executable instructions;

(b) a sensor configured to measure and record a first set of time and attendance data from the mobile end user, the time and attendance data comprising: (1) an identity of the mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention; and

(c) a communication module configured to send the first set of the time and attendance data to a database in a server.

2. The system of claim 1, wherein the ancillary information comprises a note or a tag.

3. The system of claim 1, wherein the server is configured to verify the time and attendance data based on a clock of the server.

4. The system of claim 1, wherein the system completes time and attendance authentication of the mobile end user without requesting the mobile end user to actively execute an identifying step, the identifying step comprising one or more of: (a) submitting a name, (b) entering a passcode, (c) swiping a keycard, (d) providing one or more biometric signatures, and (e) submitting a form of identity.

5. The system of claim 1, further comprising a display configured to display the time and attendance data to the mobile end user.

6. The system of claim 5, further comprising a camera configured to record biometric information of the mobile end user by taking one or more biometric photographs.

7. The system of claim 6, wherein the display is further configured to indicate an action, the action comprising one or more of the following: (a) recording the biometric information of the mobile end user in a simultaneous or near-simultaneous or asynchronous recording and transmittal of a second set of the time and attendance data, (b) pressing a button or touching the display, and (c) speaking one or more sounds.

8. The system of claim 1, wherein the executable instructions comprise a determination of the mobile end user being correctly within premises for a time and attendance purpose, the determination comprising: (a) capturing geo-location data comprising free-form geographic

coordinates representing a location in the world, and (b) comparing the geo-location data to permitted geo-location data, either locally on the system, or remotely via transmission of the geo-location data to the server.

9. The system of claim 8, wherein the permitted geo-location data is provisioned by an additional party in a process comprising: (a) entering of the permitted geo-location data into the database; (b) syncing of the permitted geo-location data with the system.

10. The system of claim 9, wherein the entering of the permitted geo-location data comprises entering of one or more geographic coordinate points on a digital map on a computer terminal to form a shape encompassing a target area for the permitted geo-location data.

11. The system of claim 8, wherein the permitted geo-location data is updated with a new set of permitted geo-location data and synced real-time with the system, providing a configurable and changing permitted premises for time and attendance authentication.

12. The system of claim 8, wherein the determination of the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted user, via geo-location data of two users' mobile devices, or via short-range wireless communication between the two users' mobile devices, enabling a sufficient determination of a permitted proximity.

13. The system of claim 8, wherein the determination of the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted sensory device, via geo-location data of the system and the permitted sensory device, or via short-range wireless communication between the mobile end user and the permitted sensory device, enabling a sufficient determination of permitted proximity.

14. The system of claim 8, wherein the geo-location data:

(a) is created via an authentication of the mobile end user for the time and attendance purpose automatically, and

(b) creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out by physically exiting specific geo-location based conditions without having to actively enter clock out instructions, the mobile end user performing one or more of: (1) exiting outside geographic coordinates defined by a geo-fence perimeter; (2) exiting outside a wireless signal range of a sensory device; (3) exiting beyond a predefined distance from a second mobile

device as measured by a signal between the system and the second mobile devices.

15. The system of claim 1, wherein the geo-location is checked at a regular interval or at a random interval, the checking of the location executed as part of an anti-spoofing process to ensure the mobile user remains compliant with a premises requirement based on one or more of the following: a time-denominated rule, and a location-denominated rule.

16. The system of claim 1, wherein the server comprises a smartphone, a tablet or a notebook, a stationary computing device, or a desktop.

17. The system of claim 1, wherein the time and attendance data is synchronized with a database in a third computing device.

18. The system of claim 17, wherein the third computing device comprises a manager of a workforce, the manager allowing a user of the third computing device to perform one or more of the following:

(a) viewing the time and attendance data;

(b) communicating directly with the mobile end user; and

(c) triggering a time and attendance authentication directly to the mobile end user.

19. The system of claim 18, wherein the time and attendance data is real-time updated or regularly-updated.

20. A method of authenticating and processing time and attendance implemented by a mobile computing system and used by a mobile end user, the method comprising:

(a) measuring and recording, by a sensor, a first set of time and attendance data from the mobile end user, the time and attendance data comprising: (1) an identity of the mobile end user, (2) a time of authentication, (3) a geo-location, and (4) ancillary information associated with time and attendance for cost coding or record retention; and

(b) sending, by a communication module, the first set of the time and attendance data to a database in a server.

21. The method of claim 20, wherein the ancillary information comprises a note or a tag.

22. The method of claim 20, wherein the server is configured to verify the time and attendance data based on a clock of the server.

23. The method of claim 20, further comprising completing time and attendance authentication of the mobile end user without requesting the mobile end user to actively execute

an identifying step, the identifying step comprising one or more of: (a) submitting a name, (b) entering a passcode, (c) swiping a keycard, (d) providing one or more biometric signatures, and (e) submitting a form of identity.

24. The method of claim 20, further comprising displaying, by a display, the time and attendance data to the mobile end user.

25. The method of claim 24, further comprising recording, by a camera, biometric information of the mobile end user by taking one or more biometric photographs.

26. The method of claim 25, wherein the display is further configured to indicate an action, the action comprising one or more of the following: (a) recording the biometric information of the mobile end user in a simultaneous or near-simultaneous or asynchronous recording and transmittal of a second set of the time and attendance data, (b) pressing a button or touching the display, and (c) speaking one or more sounds.

27. The method of claim 20, further comprising determining the mobile end user being correctly within premises for a time and attendance purpose, the determination comprising: (a) capturing geo-location data comprising free-form geographic coordinates representing a location in the world, and (b) comparing the geo-location data to permitted geo-location data, either locally on the system, or remotely via transmission of the geo-location data to the server.

28. The method of claim 27, wherein the permitted geo-location data is provisioned by an additional party in a process comprising: (a) entering of the permitted geo-location data into the database; (b) syncing of the permitted geo-location data with the system.

29. The method of claim 28, wherein the entering of the permitted geo-location data comprises entering of one or more geographic coordinate points on a digital map on a computer terminal to form a shape encompassing a target area for the permitted geo-location data.

30. The method of claim 27, wherein the permitted geo-location data is updated with a new set of permitted geo-location data and synced real-time with the system, providing a configurable and changing permitted premises for time and attendance authentication.

31. The method of claim 27, wherein the determining the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted user, via geo-location data of two users' mobile devices, or via short-range wireless communication between the two users' mobile devices, enabling a sufficient determination of a permitted proximity.

32. The method of claim 27, wherein the determining the mobile end user being correctly within the premises for the time and attendance purpose further comprises: comparing a proximity of the mobile end user to a permitted sensory device, via geo-location data of the system and the permitted sensory device, or via short-range wireless communication between the mobile end user and the permitted sensory device, enabling a sufficient determination of permitted proximity.

33. The method of claim 27, wherein the geo-location data:

(a) is created via an authentication of the mobile end user for the time and attendance purpose automatically, and

(b) creates a geo-fence perimeter around the mobile end user, wherein the mobile end user is allowed to clock out by physically exiting specific geo-location based conditions without having to actively enter clock out instructions, the mobile end user performing one or more of: (1) exiting outside geographic coordinates defined by a geo-fence perimeter; (2) exiting outside a wireless signal range of a sensory device; (3) exiting beyond a predefined distance from a second mobile device as measured by a signal between the system and the second mobile devices.

34. The method of claim 20, wherein the geo-location is checked at a regular interval or at a random interval, the checking of the location executed as part of an anti-spoofing process to ensure the mobile user remains compliant with a premises requirement based on one or more of the following: a time-denominated rule, and a location-denominated rule.

35. The method of claim 20, wherein the server comprises a smartphone, a tablet or a notebook, a stationary computing device, or a desktop.

36. The method of claim 20, wherein the time and attendance data is synchronized with a database in a third computing device.

37. The method of claim 36, wherein the third computing device comprises a manager of a workforce, the manager allowing a user of the third computing device to perform one or more of the following:

(a) viewing the time and attendance data;

(b) communicating directly with the mobile end user; and

(c) triggering a time and attendance authentication directly to the mobile end user.

38. The method of claim 37, wherein the time and attendance data is real-time updated or regularly-updated.

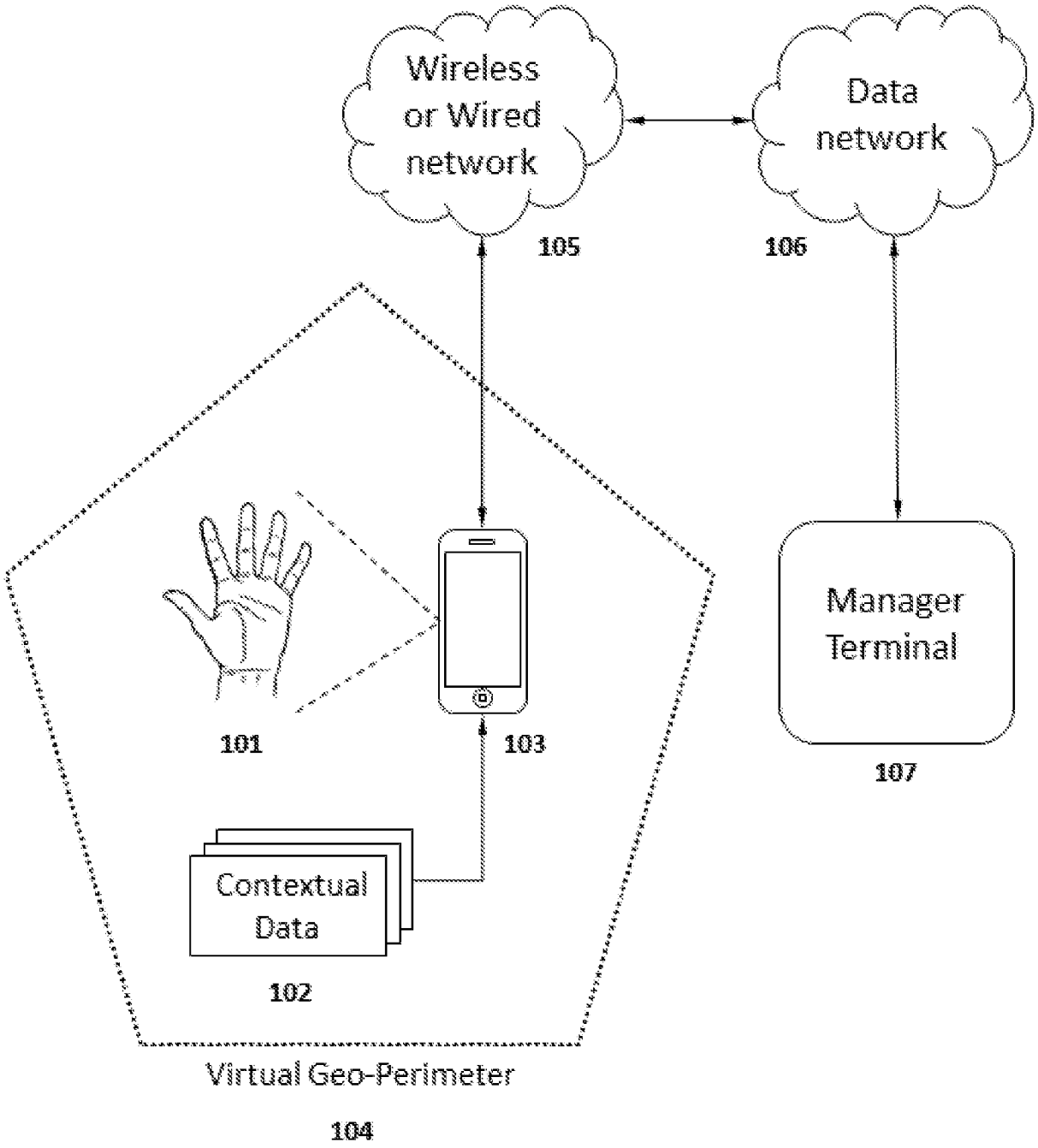
Wireless or Wired network
105
Data network
106
Manager Terminal
107
101
103
Contextual Data
102
Virtual Geo-Perimeter
104

FIG. 1A

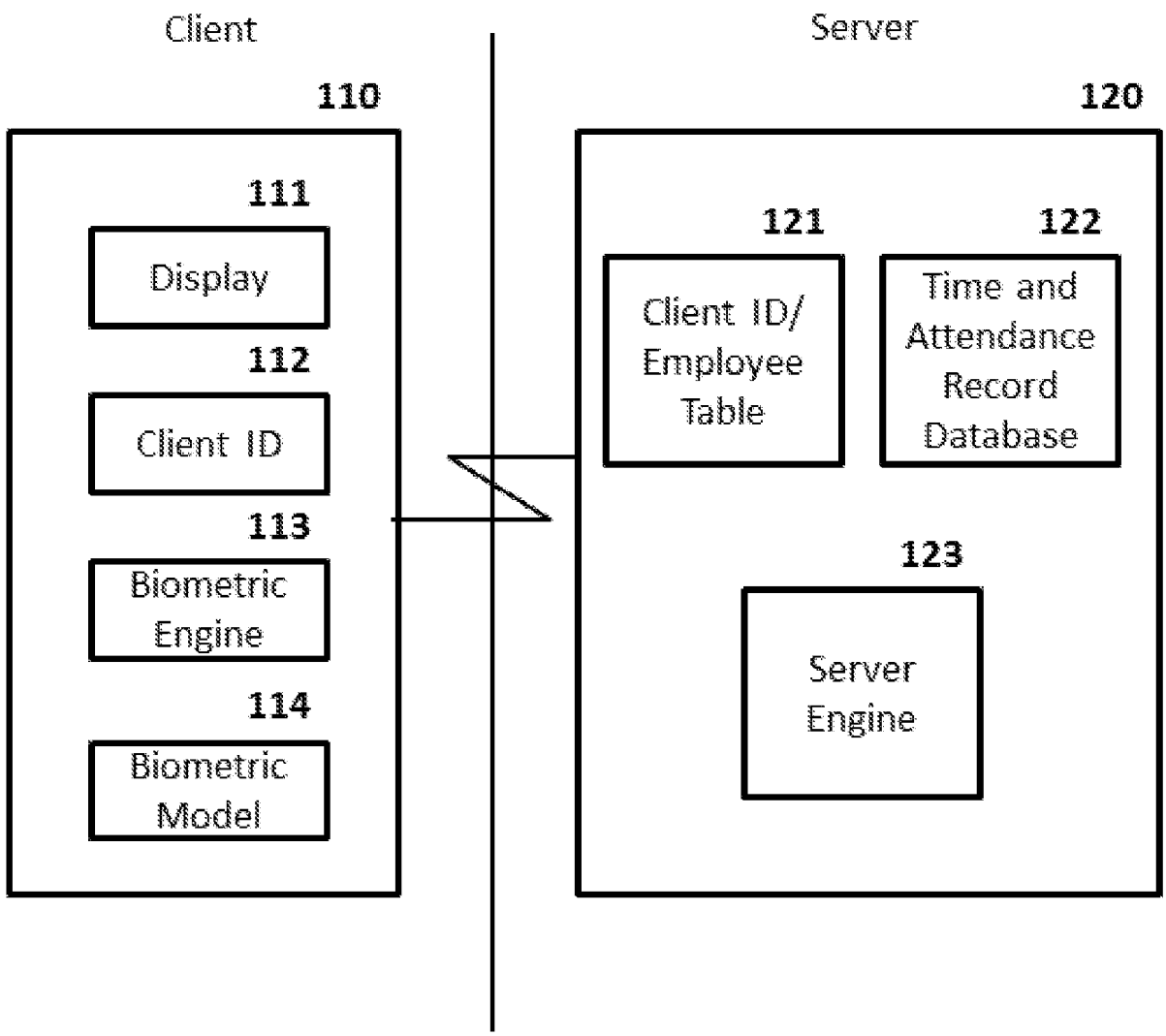
Client
110
111
Display
112
Client ID
113
Biometric Engine
114
Biometric Model
Server
120
121
Client ID/ Employee Table
122
Time and Attendance Record Database
123
Server Engine

FIG. 1B

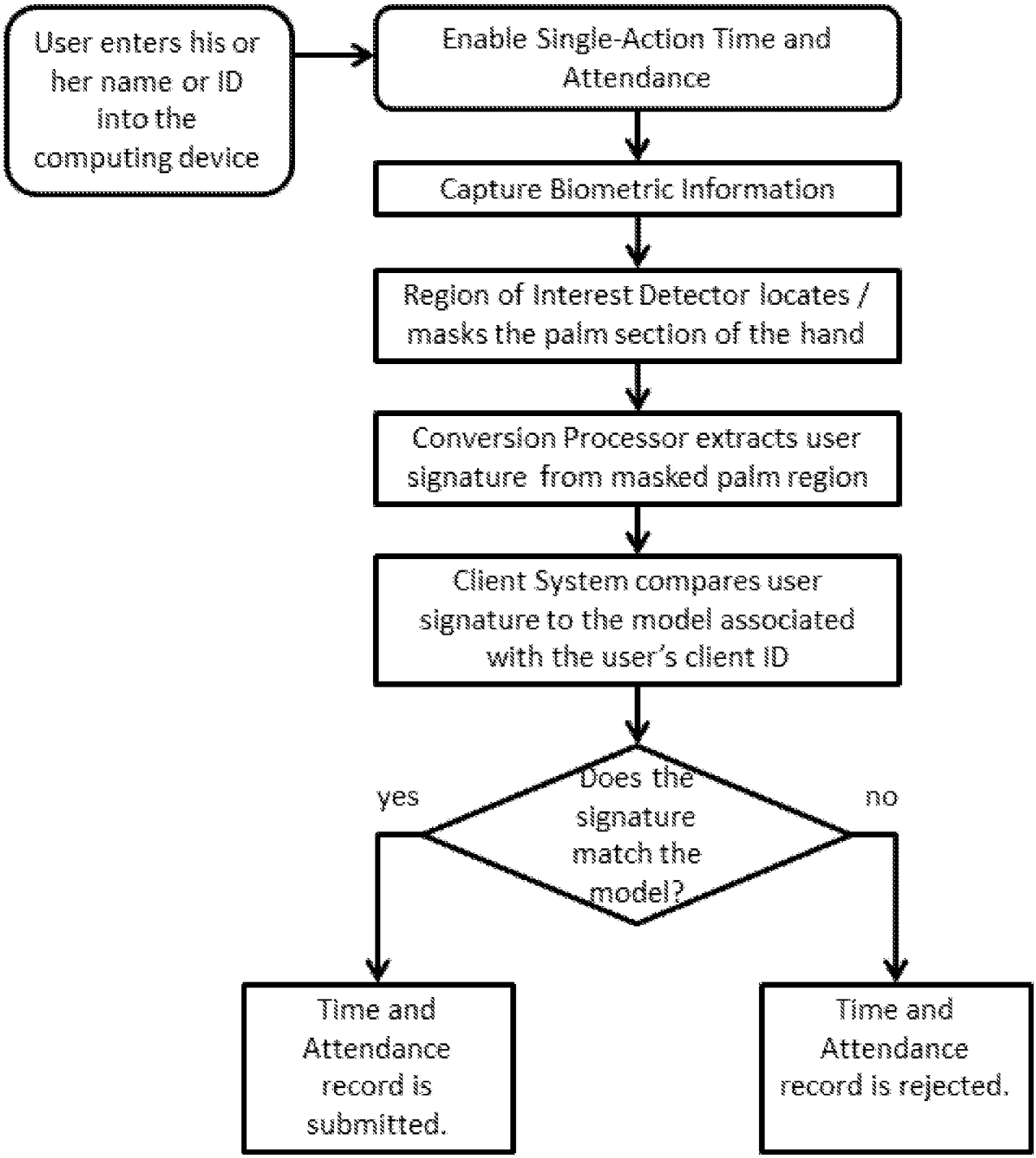
User enters his or her name or ID into the computing device
Enable Single-Action Time and Attendance
Capture Biometric Information
Region of Interest Detector locates / masks the palm section of the hand
Conversion Processor extracts user signature from masked palm region
Client System compares user signature to the model associated with the user's client ID
Does the signature match the model?
yes
no
Time and Attendance record is submitted.
Time and Attendance record is rejected.

FIG. 2

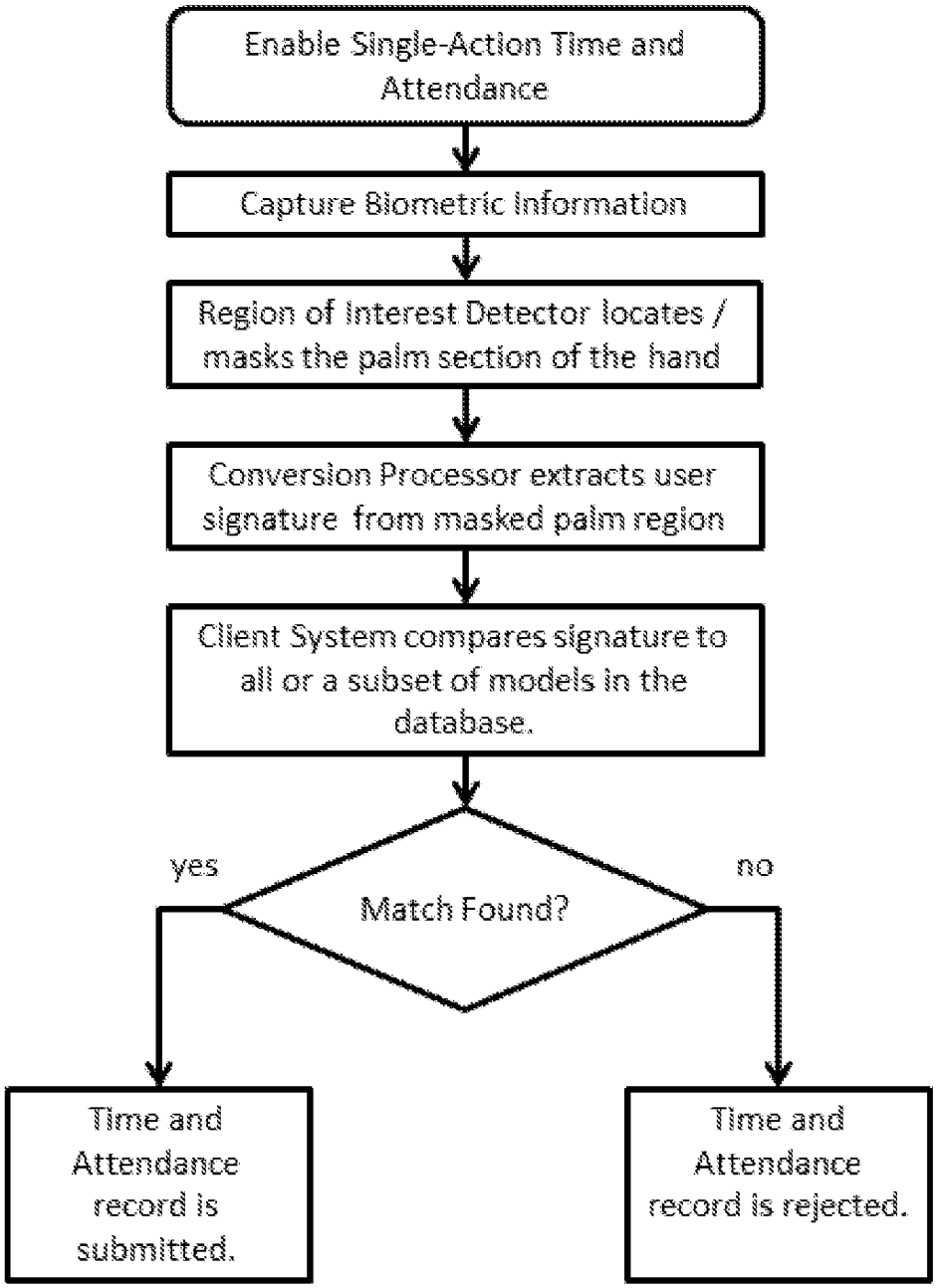
Enable Single-Action Time and Attendance
Capture Biometric Information
Region of Interest Detector locates / masks the palm section of the hand
Conversion Processor extracts user signature from masked palm region
Client System compares signature to all or a subset of models in the database.
Match Found?
yes
no
Time and Attendance record is submitted.
Time and Attendance record is rejected.

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/034077

A. CLASSIFICATION OF SUBJECT MATTER

H04L 9/32(2006.01)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)
H04L 9/32; G06F 3/048; G07C 9/00; G06Q 10/10; G07C 1/10; G06F 17/00; G06Q 40/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: time and attendance data, authentication, mobile, time, geo-location, cost coding

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013-0290154 A1 (ZR INVESTMENTS, LLC) 31 October 2013 See paragraphs [0036]-[0107]; and figures 1-9.	1-38
A	US 2014-0013252 A1 (STEFAN EHRLER et al.) 09 January 2014 See paragraphs [0047]-[0109]; and figure 1.	1-38
A	US 2013-0268418 A1 (ACCU-TIME SYSTEMS, INC.) 10 October 2013 See paragraphs [0012]-[0029]; and figures 1-3.	1-38
A	WO 2009-013526 A1 (UNIVERSITY OF WALES SWANSEA) 29 January 2009 See page 4, line 33 - page 6, line 23; and figure 1.	1-38
A	US 2008-0296364 A1 (ANTHONY H. PAPPAS et al.) 04 December 2008 See paragraphs [0032]-[0048]; and figures 1-3.	1-38

☐ Further documents are listed in the continuation of Box C.

☒ 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
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"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
25 September 2015 (25.09.2015)	**30 September 2015 (30.09.2015)**

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/034077

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2014-0013252 A1	09/01/2014	US 8869053 B2	21/10/2014
US 2013-0268418 A1	10/10/2013	None	
WO 2009-013526 A1	29/01/2009	GB 0714344 D0	05/09/2007
		GB 201004145 D0	28/04/2010
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		GB 2464903 B	12/12/2012
US 2008-0296364 A1	04/12/2008	US 8126788 B2	28/02/2012