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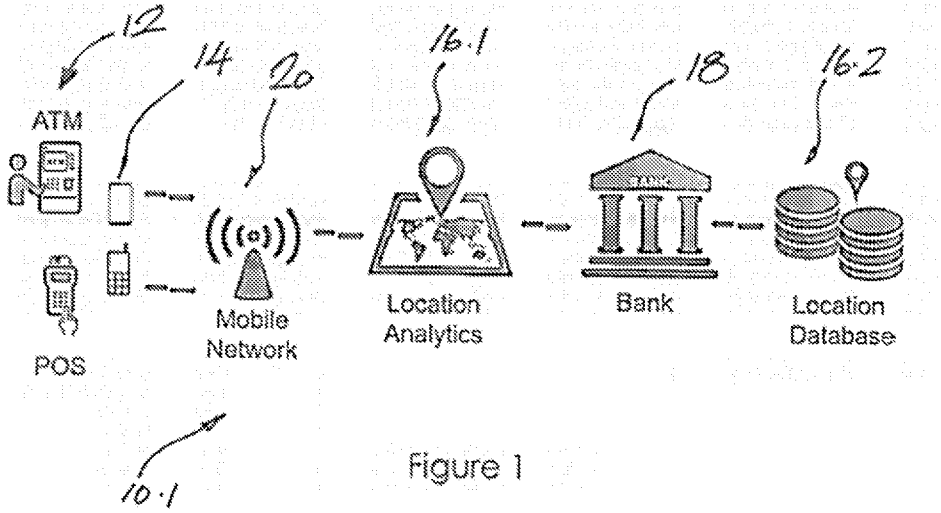

Figure 1

(57) Abstract: This invention relates to location-based services in the financial services, payments- and related industries and, in particular, to the geospatial location of financial transaction devices. The invention provides a geospatial location process and system 10 that makes use of cellular mobile devices 14 operating on a cellular mobile network 20 to locate financial transaction devices 12, such as Automated Teller Machines (ATMs) and Point Of Sales (POS) terminals.

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TRANSACTION DEVICE LOCATION SYSTEM

FIELD OF THE INVENTION

[001] This invention relates to location-based services in the financial services, payments- and related industries and, in particular, to the geospatial location of financial transaction devices.

BACKGROUND TO THE INVENTION

[002] In this specification, the invention is described with reference to Automated Teller Machines (ATMs) and Point of Sale (POS) terminals as transaction devices, as non-limiting examples.

[003] An automated teller machine (ATM) is an electronic telecommunications device that enables customers of financial institutions to perform financial transactions, such as cash withdrawals, deposits, transfer funds, or obtaining account information, at any time and without the need for direct interaction with bank staff. On most modern ATMs, customers are identified by inserting a plastic ATM card (or some other acceptable payment card, such as a credit card) into the ATM, with authentication being by the customer entering a personal identification number (PIN), which must match the PIN stored in the chip on the card (if the card is so equipped), or in the issuing financial institution's database.

[004] Whilst older generation ATMs are typically permanently incorporated into built environment structures, the advent of so-called convenience ATMs, which are typically installed in retail, petrol station forecourt, leisure and hospitality locations, has given rise to ATMs that are not permanently located in one location, with convenience ATMs often being relocated, for instance if the ATM in its original location, does not experience the financial traffic anticipated by the financial institution.

[005] In addition, both older generation and convenience ATMs are now of modular construction, which enables the removal and replacement of the core ATM equipment that determines the "identity" of the ATM. If the core ATM equipment is removed, for maintenance or for relocation, for instance, and a replacement core is installed in its place, the identity of the ATM in that location is automatically changed. To all intents and purposes, in such a case, the ATM and that location is now a different ATM.

[006] Even with the best administration, it is often difficult for financial institutions to keep track of all such ATM movements.

[007] Often the same difficulties are experienced with POS systems. These are systems, often card-based, that facilitate the processing and recording of transactions between a vendor and its customers, on location and in real time as the goods or services are purchased. POS systems rely on terminals that range from built-in, through on-counter devices, to fully mobile, hand-held terminal devices. Besides the vendor being able to move POS terminals around, the modular construction of these terminals introduces the same administrative overhead as modern ATMs in that the core modules of the POS terminals can be removed and replaced, thereby changing the identity of the POS terminal in that particular location.

[008] It is an object of this invention to address these concerns.

SUMMARY OF THE INVENTION

[009] According to this invention, a transaction device geospatial location process comprises:

in a preliminary process, the steps of:

storing, in a data store implemented in system programmable logic means, data pertaining to a plurality of participating transaction devices in a transaction network, the data including unique identifier data and geospatial location data in respect of each participating transaction device;

storing, in the data store, data pertaining to a plurality of participating users, the data including unique identifier data pertaining to a cellular mobile device associated with each participating user;

storing, in the data store, data pertaining to a transaction initiating device associated with each participating user, the data including unique identifier data pertaining to the transaction initiating device; and

programmatically linking each participating user's cellular mobile device data to that user's transaction initiating device data;

in the geospatial location process, the steps of:

when a transaction is initiated on a transaction device using a transaction initiating device, generating a location verification query that specifies at least the identity of the transaction device originating the transaction and the identity of the transaction initiating device used to initiate the transaction;

forwarding the location verification query to the system programmable logic means; and

resolving the location verification query by:

looking up, in the system programmable logic data store, the data pertaining to the transaction initiation device specified in the location verification query;

looking up, in the system programmable logic data store, the identifier data pertaining to the cellular mobile device programmatically linked to the transaction initiation device specified in the location verification query;

performing a cellular mobile network query on the cellular mobile network serving the programmatically linked cellular mobile device to determine the geospatial location of the cellular mobile device at the transaction origination time; and

geospatially locating the transaction device specified in the location verification query relative to the geospatial location of the programmatically linked cellular mobile device at the transaction origination time.

[0010] In the final query resolution step, it is not assumed that the transaction device specified in the location verification query is in the same geospatial location as the programmatically linked cellular mobile device.

[0011] The transaction device location process preferably includes a preparatory process in which transaction devices are registered (as participating transaction devices) for participation in the process, the preparatory registration process including the steps of:

monitoring the transaction network for transactions initiated on transaction devices in the transaction network;

when a transaction is initiated on a transaction device using a transaction initiating device, generating a location verification query that specifies at least the identity of the transaction device originating the transaction and the identity of the transaction initiating device used to initiate the transaction;

forwarding the location verification query to the system programmable logic means; and

resolving the location verification query by:

looking up, in the system programmable logic data store, the data pertaining to the transaction initiation device specified in the location verification query;

looking up, in the system programmable logic data store, the identifier data pertaining to the cellular mobile device programmatically linked to the transaction initiation device specified in the location verification query;

performing a cellular mobile network query on the cellular mobile network serving the programmatically linked cellular mobile device to determine the geospatial location of the cellular mobile device at the transaction origination time;

geospatially locating the transaction device specified in the location verification query relative to the geospatial location of the programmatically linked cellular mobile device at the transaction origination time; and

storing the geospatial location data of the transaction device in the system programmable logic means data store.

[0012] In the final query resolution step, it is assumed that the transaction device specified in the location verification query is in the same geospatial location as the programmatically linked cellular mobile device.

[0013] The invention includes a transaction device geospatial location system comprising:

system programmable logic means including a data store configured to store:

data pertaining to a plurality of participating transaction devices, the data including unique identifier data and geospatial location data in respect of each participating transaction device;

data pertaining to a plurality of participating users, the data including unique identifier data pertaining to a cellular mobile device associated with each participating user; and

data pertaining to a transaction initiating device associated with each participating user, the data including unique identifier data pertaining to the transaction initiating device;

the programmable logic means being programmed:

programmatically to link each participating user's cellular mobile device data to that user's transaction initiating device data;

when a transaction is initiated on a transaction device using a transaction initiating device, to generate a location verification query that specifies at least the identity of the transaction device originating the transaction and the identity of the transaction initiating device used to initiate the

transaction;

to forward the location verification query to the system programmable logic means;

to look up, in the system programmable logic data store, the data pertaining to the transaction initiation device specified in the location verification query;

to look up, in the system programmable logic data store, the identifier data pertaining to the cellular mobile device programmatically linked to the transaction initiation device specified in the location verification query;

to perform a cellular mobile network query on the cellular mobile network serving the programmatically linked cellular mobile device to determine the geospatial location of the cellular mobile device; and

geospatially to locate the transaction device specified in the location verification query relative to the location of the programmatically linked cellular mobile device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The invention will be further described with reference to the accompanying drawings in which:

Figure 1 is an outline block diagram illustrating the system and process of the invention; and

Figure 2 is a similar outline block diagram illustrating the system and process of the invention using a cellular mobile device application

or app.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0015] In essence, the invention provides a geospatial location system that makes use of cellular mobile devices operating on a cellular mobile network to locate financial transaction devices.

[0016] In this specification:

a "cellular mobile device" is any cellular mobile network communications-capable computing device including a cell phone or cellular mobile phone and cellular mobile network communications-enabled portable computers, including laptop and tablet computers;

a "cellular mobile network" is a cellular communications network — a radio frequency network divided into geospatially distributed cells;

A "communications network" is a network, typically implemented on the combination of a cellular mobile network and an Internet backbone, by means of which the transaction devices are connected for communication with institution/s that own or operate the transaction devices;

a "transaction device" is a communications- and transaction-capable digital electronic device owned or operated by an institution such as a financial institution, that has a known or knowable geospatial location and a known or knowable identity, "communication-capable" meaning that the transaction device is capable of communicating on the communications network and

"transaction-capable" meaning that a transaction, particularly a financial transaction can be undertaken with the use of the transaction device, examples of transaction devices including ATMs and Point Of Sale (POS) terminals;

a "transaction initiating device" is any device by means of which a transaction is initiated, typically a bank card, such as a credit card, debit card or the like, but it could also include a transaction-enabled device, such as a cellular mobile device with QR code-scanning or Near Field Communication (NFC) capabilities;

a "transaction network" is a plurality of transaction devices, the computers and network communications equipment of the institution/s that own and/or operate the transaction devices and a communications network to which the transaction devices, computers and network communications equipment are connected, the transaction network be configured for the purposes of conducting, communicating and processing transactions, particularly financial transactions;

the "transaction origination time" is the time when a transaction is originated on a transaction device, which could include the transaction initiation time, the transaction end time or the time during the duration of the transaction; and

a "transaction process" is typically, but not exclusively, a financial transaction process.

[0017] Cellular mobile device tracking techniques and procedures are in ubiquitous use in cellular mobile networks.

[0018] In cellular mobile networks the cells are served by cellular mobile network elements constituted by transceiver apparatus, such as cell phone towers or base transceiver stations (BTSs). The cell towers create the "cells" in

the cellular mobile network. Each cell tower serves a cell in the cellular mobile network by transmitting and receiving radio frequency transmissions to and from cellular mobile devices located within the cell. The cell towers have unique identities as well as known geographic locations and location-specific characteristics, such as a serving cell footprint, all of which can be recorded and stored in a database.

[0019] Certain techniques are entirely network-based and make use of the mobile network operator's network infrastructure. The advantage of network-based techniques, from a service provider's point of view, is that they can be implemented non-intrusively without affecting cellular mobile devices. Network-based techniques were developed many years prior to the widespread availability of GPS on cellular mobile devices.

[0020] Using the subscriber identity module (SIM) in GSM and Universal Mobile Telecommunications System (UMTS) cellular mobile devices, it is possible to obtain raw radio measurements from the cellular mobile device. Available measurements include the serving Cell ID, round-trip time, and signal strength, all of which are used to determine a relatively accurate approximation of the location of the cellular mobile device.

[0021] In addition to network-based location techniques, a number of location-based services are capable of disclosing the geospatial coordinates of a mobile phone. These location-based services rely on client software installed on the cellular mobile device which range from techniques that determine the location of the mobile device by cell location and identification combined with determinations of the cell signal strength, through to GPS location, with most smartphones today being GPS-enabled.

[0022] Crowdsourced Wi-Fi data can also be used to identify a cellular mobile device's location. The poor performance of the GPS-based methods in indoor environments and the increasing popularity of Wi-Fi have

encouraged companies to design methods to carry out Wi-Fi-based indoor positioning.

[0023] Hybrid positioning systems use a combination of network-based and handset-based technologies for location determination. One example would be some modes of Assisted GPS, which can both use GPS and network information to compute the location. Both types of data are thus used by the seller of the mobile device to make the location determination more accurate. Alternatively tracking with both systems can also occur by having the mobile device determine its GPS-location directly from the satellites and then having the information sent via the network to the location-based service that is attempting to locate the mobile device, such as mapping and travel routing apps including Google Maps™, WAZE™ and the like.

[0024] Since mobile device users, particularly cellular mobile phone users typically have their mobile device on their person at all times, the relatively accurate locating services described above can be used to determine the location of the cellular mobile device at all times and, by implication, the location of the person associated with the cellular mobile device.

[0025] By extension, when the associated person conducts a transaction on a transaction device, a real time determination of the geospatial location of the cellular mobile device should provide a determination of the geospatial location of the transaction device with a high degree of confidence.

[0026] The process and system of the invention make use of these characteristics of cellular mobile networks.

[0027] The invention includes a transaction device geospatial location system 10 which is illustrated, in outline, in the drawings. In each case, the system 10 comprises a plurality of participating transaction devices 12, participating users, each operating a participating cellular mobile device 14,

a location analytics engine 16 and a participating financial institution 18.

[0028] The system 10.1 illustrated in Figure 1 makes use of network-based location techniques exclusively and relies entirely on mobile network infrastructure 20, whereas the system 10.2 illustrated in Figure 2 makes use of handset-based location techniques alternatively or in addition to network-based location techniques and relies on the Internet 22 alternatively or in addition to mobile network infrastructure.

[0029] The location analytics engine 16 includes the computers and databases necessary to implement the transaction device location system 10 and is preferably implemented on an Internet-connected or cloud-based server 16.1 that incorporates a data store or database 16.2, programmable logic means and mapping or geographic Information Systems (GIS) software.

[0030] The database 16.2 is used to store data pertaining to the transaction devices 12 managed by means of the system 10.

[0031] To enable management of the transaction devices 12, the transaction devices 12 are registered on the system 10 for participation in the management system 10 in a preparatory data capture process.

[0032] This constitutes a substantial improvement on current transaction device management and administration systems. In this regard, financial institutions seldom take responsibility for the administration and management of transaction devices such as ATMs and POS terminals, which, typically, are supplied and serviced by third party transaction device equipment and service providers. The third party service providers assume responsibility for the location, relocation, replacement and repair of ATMs, convenience ATMs, POS terminals and, whilst the financial institution is typically provided with a management system or management dashboards to assist in managing and administering the ATMs and POS terminals, it will be

appreciated that the sheer number of terminals involved and the frequency with which the terminals are moved combined to create a substantial administrative overhead

[0033] The geospatial device location system 10 all but automates the process of registering participating transaction devices 12 for participation in the management system 10. To this end, the management system 10 and process of the invention include a preparatory process in which unique identifier data and geospatial location data (at the very least) are captured in respect of each participating transaction device 12.

[0034] This process is preparatory in the sense that it is undertaken as a pure data capture exercise prior to full implementation of the system 10, without any transaction location verification being undertaken. This will only be done when the system 10 is taken into production or goes live.

[0035] In this data capture process, the system 10 monitors the transaction network for transactions initiated on the transaction devices 12 connected (for communication) into the transaction network. The system programmable logic is programmed to generate and run the location verification query process described below, to locate the transaction device 12 geographically relative to the geospatial location of the cellular mobile device 14 of the transaction initiating user. In this case "relative to" means "at". The system programmable logic is programmed to assume that, when a transaction is initiated on a transaction device 12, that the cellular mobile device 14, at the time of the transaction, is on the person of the user associated with the bank card (transaction initiating device) programmatically associated with the cellular mobile device 14 and that the transaction device (ATM or POS terminal) 12 is at the same, known location as the cellular mobile device 14.

[0036] The geospatial locations of the transaction devices 12 are

determined and then stored in the database 16.2, which is built up and maintained automatically and in real time, with only minimal administrative intervention being required.

[0037] The system 10 is configured for management and operation by the financial institution which provides the financial institution, without any real administrative overhead, with direct oversight over the transaction network and, by extension, oversight over the administration of the transaction network. In current practice, any such oversight requires the assistance of the third party transaction device equipment and service provider, which somewhat defeats the object, since such oversight is intended to manage the performance of the service provider concerned.

[0038] In a similar data capture process, data pertaining to a plurality of participating users is captured. At the very least, data identifier data pertaining to a cellular mobile device 14 associated with each participating user is captured. This data capture process can be conducted as a user recruitment and registration process conducted online and using the users' cellular mobile device user interfaces and interactive communication or a downloadable app to engage with the users.

[0039] In the user recruitment and registration process, data pertaining to at least one transaction initiating device associated with each participating user is captured. In most cases, the transaction initiating device will be a bank card or payment card. The data to be captured will include, at the very least, unique identifier data pertaining to the transaction initiating device.

[0040] The server 16.1 is programmed programmatically to link each participating user's cellular mobile device data to that user's transaction initiating device data.

[0041] When, in use, a transaction is initiated on a transaction device, such as an ATM or a POS terminal 12, the participating user, typically, will interface the transaction initiating device with the transaction device — in the example given above, the user inserts a bank card into an ATM or a POS terminal 12, which initiates a transaction that will be processed by the bank 18 across the bank's transaction network.

[0042] The server 16.1 is in communication with the transaction network and is programmed, when such a transaction is initiated on a transaction device 12, to generate a location verification query that specifies at least the identity of the transaction device (the ATM or POS terminal) 12 originating the transaction and the identity of the transaction initiating device (a bank card, in this example) used to initiate the transaction.

[0043] The server program then runs a first lookup in the database 16.2 to locate and retrieve the data pertaining to the bank card specified in the location verification query. It then runs a second lookup in the database 16.2 to locate and retrieve the identifier data pertaining to the cellular mobile device 14 programmatically linked to the bank card specified in the location verification query. The server 16.1 is in communication with the cellular mobile network serving the programmatically linked cellular mobile device 14 and it is programmed to perform a location-based services query on the cellular mobile network to determine the geospatial location of the cellular mobile device at the transaction origination time (the time of the transaction identified in the location verification query).

[0044] The cellular mobile network response provides a relatively accurate determination of the geospatial location of the cellular mobile device 14 at the time of the transaction.

[0045] It can be assumed, with a high degree of confidence, that the cellular mobile device 14, at the time of the transaction, will be on the person of the

user associated with the bank card (transaction initiating device) programmatically associated with the cellular mobile device 14, it is highly likely that the transaction device (ATM or POS terminal) 12 is at the same, known location as the cellular mobile device 14.

[0046] The system 10 therefore serves to determine the geospatial locations of the transaction devices 12 on the transaction network.

[0047] It will be appreciated that, for each transaction device (ATM or POS terminal) 12, this process will be repeated many times during the course of many days, thereby increasing the degree of confidence and accuracy of the location of the transaction device 12. Over time, therefore, the system 10 will build up (and store in the database 16.2) an accurate record of the identities and geospatial locations of all the transaction devices (ATMs and POS terminals) 12 managed by the system 10.

[0048] The resolution of the location verification query, besides providing the geospatial location of the transaction device 12, can also be used to verify and secure the transaction itself.

[0049] Typically, such a transaction verification process will be undertaken by the financial institution. In practice, the resolution of the location verification query typically has one of two potential results:

excluding any other verification criteria, the transaction can be verified in that:

the transaction device 12 and the user's cellular mobile device (the mobile device 14 programmatically associated with the user's bank card (transaction initiating device) are in the same geographic location;

it can be assumed with a degree of confidence that the

transaction device 12, the bank card and the person of the user associated with the bank card are in the same geographic location; and

location verification is confirmed under the transaction can be verified and confirmed; or

excluding any other verification criteria, the transaction can not be verified in that:

the transaction device 12 and the user's cellular mobile device (the mobile device 14 programmatically associated with the user's bank card (transaction initiating device) are not in the same geographic location;

it can be assumed with a degree of confidence that the transaction device 12, the bank card and the person of the user associated with the bank card are not in the same geographic location; and

location verification cannot be confirmed and, unless otherwise checked and verified, the transaction cannot be verified.

[0050] To verify and secure the transaction itself requires a separate process. Typically, such a transaction verification process will be undertaken by the financial institution in which the financial institution (or the system 10), upon conclusion of the location verification query process, locates the transaction device 12 geographically relative to the geospatial location of the cellular mobile device 14 of the transaction initiating user. In this case "relative to" means "might be at" and no assumptions are made regarding the relative locations of the transaction device 12 or the cellular mobile device 14 at the time of the transaction. Instead, a comparison is made between the relative locations of the transaction device 12 and the mobile device 14 and any

mismatch exceeding a predetermined location matching threshold is flagged as potentially problematic, thereby enabling the financial institution to implement its conventional transaction security protocols.

[0051] The system 10 could be programmed to anticipate the transaction verification process and, with a view to reducing network traffic and latency, to impose a predeterminable transaction verification threshold, below which no transaction verification is undertaken. The transaction verification threshold could be predetermined by the system 10, the financial institution or, preferably, specified at the option of the user, with user options being included to set the value of the threshold. To this end, any transaction that is of a value lower than the transaction verification threshold will not trigger the transaction verification query. However, and even though the transaction verification process is not undertaken, the system 10 nevertheless monitors and stores the outcomes of all location verification query processes to maintain and enhance data integrity across the system 10.

[0052] The system 10, automatically, in real time and without any significant financial institution overhead, constantly updates the geospatial locations of the transaction devices 12 on the transaction network. If a transaction device (an ATM or POS terminal) 12 is removed or relocated, for instance for repair or replacement purposes, the system 10 is programmed to institute a device relocation process.

[0053] In practice, it will not be necessary to record any such removal or relocation, since the location of the relocated device 12 will raise a system alarm when the relocated device 12 is first used after relocation. The system alarm will either flag failure of the location verification process or, more typically, failure of the transaction verification process. This is because, even though the transaction initiating user, quite correctly, is in the geospatial location of the transaction initiating transaction device at the time of the transaction, this geospatial location will differ from the device location

recorded in the database 16.2, as a result of which the system flags a location mismatch.

[0054] In practice, the financial institution transaction security protocols will result in the implementation of a transaction verification process that, after several repeats (several transactions involving several users) will confirm that the transaction initiating user, in each case, is in the geospatial location of the relocated transaction device 12, thereby confirming relocation of the device 12 and the new location of the device 12. The system programmable logic 16 is programmed to record the new location of the relocated transaction device 12, thereby automatically updating the database 16.2.

[0055] In addition, the server 16.1 may be programmed to correlate the removal and relocation of the transaction device 12 against device maintenance schedules and to raise an appropriate alert. If the relocation of the device 12 is not approved and authorised, the unauthorised relocation of the transaction device 12 can be flagged for the appropriate intervention, for instance by bank security personnel.

[0056] In addition, the server 16.1 may be programmed to monitor the usage statistics of the devices 12 on the system 10 and to raise an appropriate alert if usage of a device 12 is reduced below a pre-programmed threshold, indicating either that the device 12 is malfunctioning or that it might have been removed from its present location. In either case the alert can be used to trigger appropriate intervention. For instance, if the device 12 is malfunctioning, the server 16.1 may be programmed to trigger an alert for intervention by bank maintenance personnel. Alternatively, if usage of the device 12 reduces to zero and correlation with device maintenance schedules fails (there is no appropriate reason for such a reduction), the server 16.1 could be programmed to trigger an alert for intervention by the bank's security personnel, since this might indicate unauthorised removal of the transaction device 12 from its present location.

CLAIMS

A transaction device geospatial location process comprising:

in a preliminary process, the steps of:

storing, in a data store implemented in system programmable logic means, data pertaining to a plurality of participating transaction devices in a transaction network, the data including unique identifier data and geospatial location data in respect of each participating transaction device;

storing, in the data store, data pertaining to a plurality of participating users, the data including unique identifier data pertaining to a cellular mobile device associated with each participating user;

storing, in the data store, data pertaining to a transaction initiating device associated with each participating user, the data including unique identifier data pertaining to the transaction initiating device; and

programmatically linking each participating user's cellular mobile device data to that user's transaction initiating device data;

in the geospatial location process, the steps of:

when a transaction is initiated on a transaction device using a transaction initiating device, generating a location verification query that specifies at least the identity of the transaction device originating the transaction and the identity of the transaction

initiating device used to initiate the transaction;

forwarding the location verification query to the system programmable logic means; and

resolving the location verification query by:

looking up, in the system programmable logic data store, the data pertaining to the transaction initiation device specified in the location verification query;

looking up, in the system programmable logic data store, the identifier data pertaining to the cellular mobile device programmatically linked to the transaction initiation device specified in the location verification query;

performing a cellular mobile network query on the cellular mobile network serving the programmatically linked cellular mobile device to determine the geospatial location of the cellular mobile device at the transaction origination time; and

geospatially locating the transaction device specified in the location verification query relative to the geospatial location of the programmatically linked cellular mobile device at the transaction origination time.

The transaction device geospatial location process of claim 1 which includes the preparatory process of registering transaction devices as participating transaction devices, the preparatory registration process including the steps of:

monitoring the transaction network for transactions initiated on transaction devices in the transaction network;

when a transaction is initiated on a transaction device using a transaction initiating device, generating a location verification query that specifies at least the identity of the transaction device originating the transaction and the identity of the transaction initiating device used to initiate the transaction;

forwarding the location verification query to the system programmable logic means; and

resolving the location verification query by:

looking up, in the system programmable logic data store, the data pertaining to the transaction initiation device specified in the location verification query;

looking up, in the system programmable logic data store, the identifier data pertaining to the cellular mobile device programmatically linked to the transaction initiation device specified in the location verification query;

performing a cellular mobile network query on the cellular mobile network serving the programmatically linked cellular mobile device to determine the geospatial location of the cellular mobile device at the transaction origination time;

geospatially locating the transaction device specified in the location verification query relative to the geospatial location of the programmatically linked cellular mobile device at the transaction origination time; and

storing the geospatial location data of the transaction device in the system programmable logic means data store.

A transaction device geospatial location system comprising:

system programmable logic means including a data store configured to store:

data pertaining to a plurality of participating transaction devices, the data including unique identifier data and geospatial location data in respect of each participating transaction device;

data pertaining to a plurality of participating users, the data including unique identifier data pertaining to a cellular mobile device associated with each participating user; and

data pertaining to a transaction initiating device associated with each participating user, the data including unique identifier data pertaining to the transaction initiating device;

the programmable logic means being programmed:

programmatically to link each participating user's cellular mobile device data to that user's transaction initiating device data;

when a transaction is initiated on a transaction device using a transaction initiating device, to generate a location verification query that specifies at least the identity of the transaction device originating the transaction and the identity of the transaction initiating device used to initiate the transaction;

to forward the location verification query to the system programmable logic means;

to look up, in the system programmable logic data store, the data pertaining to the transaction initiation device specified in

the location verification query;

to look up, in the system programmable logic data store, the identifier data pertaining to the cellular mobile device programmatically linked to the transaction initiation device specified in the location verification query;

to perform a cellular mobile network query on the cellular mobile network serving the programmatically linked cellular mobile device to determine the geospatial location of the cellular mobile device; and

geospatially to locate the transaction device specified in the location verification query at the location of the programmatically linked cellular mobile device.

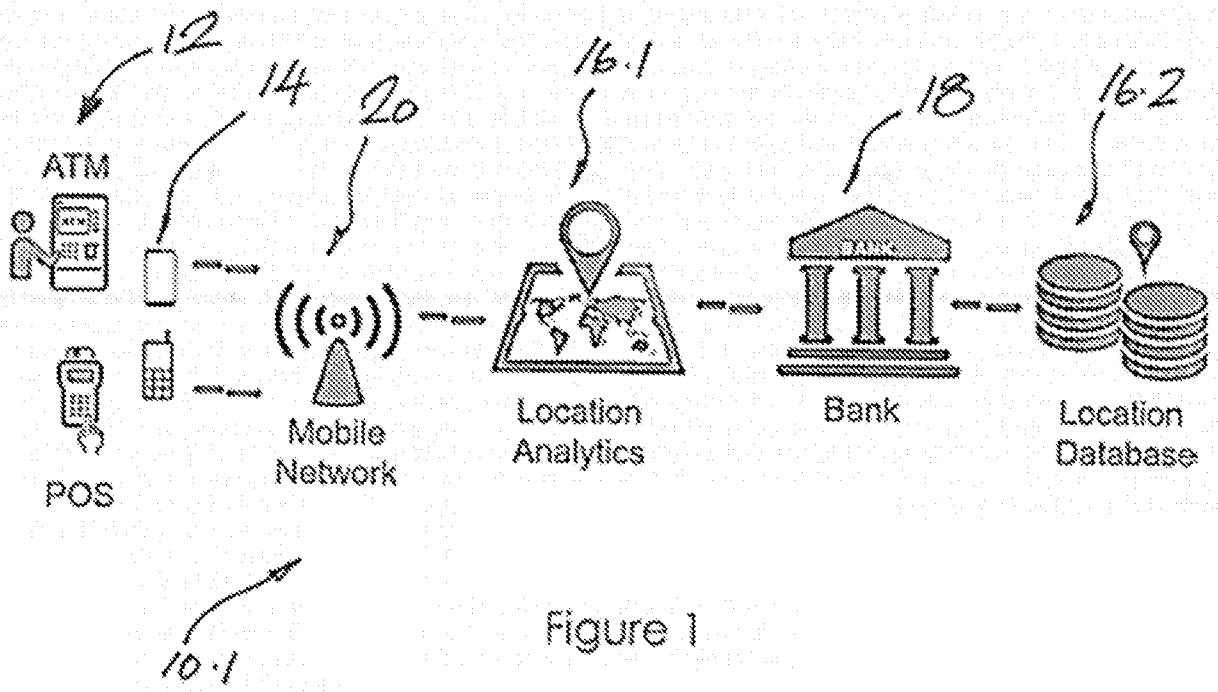

Figure 1

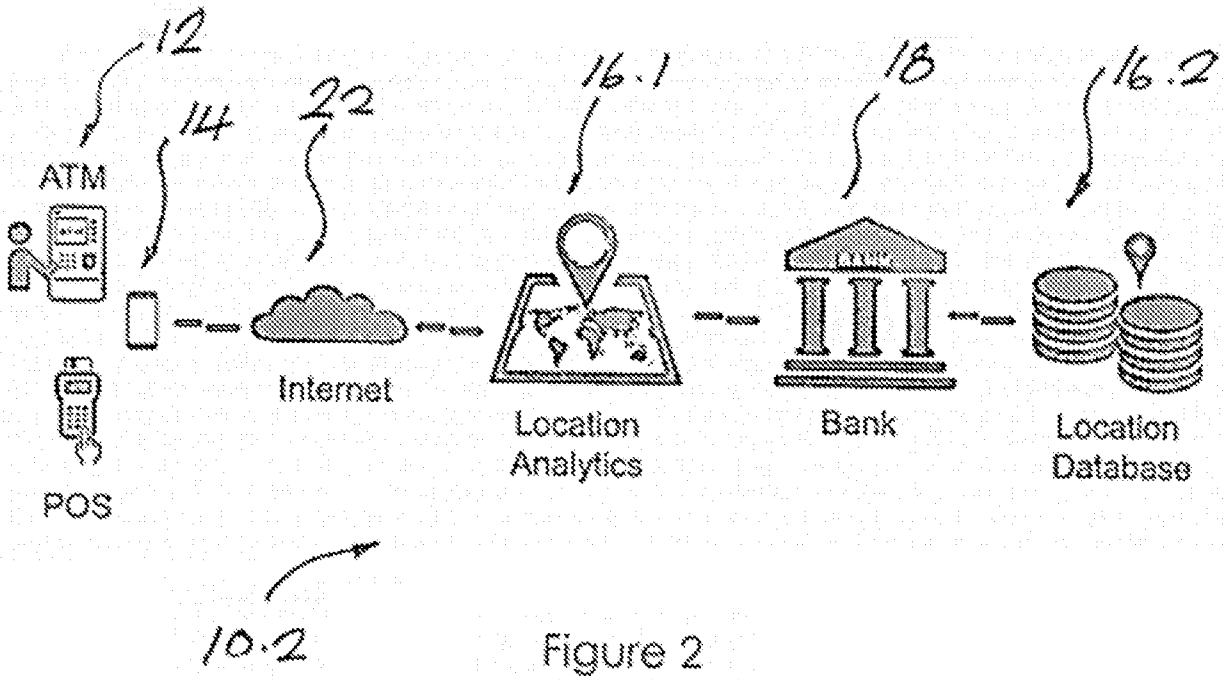

Figure 2