

AUTOMATED TAXI/VEHICLE BOOKING AND DESPATCHING SYSTEM

FIELD OF THE INVENTION

The present invention relates to an automated vehicle booking system and in particular a fully automated taxi booking and despatching system for unmanned
5 call centre operation.

BACKGROUND OF THE INVENTION

Manual calling for taxi reservations has been and continues to be the main bulk source and use of taxi booking systems. These manual systems account for approximately 80% - 90% of all public users. Dealing with such a large number of
10 call bookings for taxis or other similar vehicles such as limousines requires a large number of operators or call takers to be employed. Taxi or vehicle booking systems are traditionally manned by human operators for two primary purposes, namely to take booking calls from commuters and input this information into the system, and secondly to facilitate locating a suitable vehicle to service the vehicle
15 reservation request of the booking call. This may include a consideration of the commuters special requirements, for example, pets to be transferred, handicapped taxi required, extra luggage etc.

This human interaction has been around since the use of radios to book vehicles. While some computer assisted systems are used such as tracking and
20 tracing of vehicles, the existence of human interaction has always been present.

Figure 1 shows a current booking system and its workflow. In the existing system it can be seen that a commuter calls 1 the booking centre for a vehicle or taxi. The call 1 is received by an operator 2 who gathers the information for the booking and inputs this information into the system. Most systems currently are
25 capable of knowing the relative locations of the various taxis or vehicles available for hire. Thus once the operator has inputted the booking information into the system, the system then locates 3 the closest available taxi and informs the driver of the booking. The driver is usually informed of the booking by various in vehicle equipment 4. The driver is then able to assess whether or not he wishes to
30 accept or decline the job 5. Should the driver reject 6 the booking the system would then locate the next available vehicle. Should the driver accept the booking 8 the driver would then proceed to the pick up point 7. Once the driver has accepted the booking 8 the system can then determine the likely time

required for the driver to reach the booking location 9. In some arrangements the booking system is able to then determine the pick up time 10 enabling the operator to inform 11 the commuter about the vehicle information and pick up point. It is noted that in some areas it is necessary for a commuter to receive
5 confirmation of the booking through some code or other means of identifying the correct driver. This ensures that once the commuter is at the pick up point 12 their safety is not compromised by inadvertently entering an unauthorised vehicle and also ensures that drivers do not lose a booked job.

This human interaction in both receiving the booking and then relaying
10 various information back to the commuter accounts for 80% of the overheads in the booking centre operations. For example, with a ratio of one operator or call taker to 100 taxis for a fleet of 2000 taxis, which could be considered a medium sized company, the operations of the booking centre will need a team of 20 staff
15 members manning the centre in three shifts so as to account for round the clock operation. Discounting the graveyard shift numbers a total of 45 staff would be required in three shifts for attending to the calls in the booking centre. With the current climate of competition and cost of manpower a more efficient system is desirable.

It is therefore an object of the present invention to provide a booking
20 system which does not require the same manpower overheads as existing conventional systems.

SUMMARY OF THE INVENTION

With the above object in mind the present invention provides a vehicle booking system including:

- 25 a voice communication means to enable a person to make a vehicular booking;
- an interactive voice response system to prompt the person for a booking request; and
- a voice clip recording system to record the booking request;
- 30 wherein the booking request recorded by the voice clip recording system is forwarded to a vehicle to fulfil the vehicular booking.

In a further aspect the present invention provides a vehicle booking system including:

- a vehicle including an in-vehicle device;
- a communication means to enable a voice clip of a booking request to be received by the vehicle, the voice clip being recorded by a voice clip recording system; and
- the in-vehicle device prompts a driver to play the voice clip.

In yet a further aspect, the present invention provides a method enabling a person to make a vehicular booking including the steps of:

- the person calling via a communications means;
- receiving the call and prompting said person for a booking request via an interactive voice response system;
- recording the booking request by a voice clip recording system; and
- forwarding the recorded booking request to a vehicle to fulfill the booking request.

The booking request may include a pick up location and other information provided by said person. The voice clip can be stored in a digital format.

Ideally the system will also include a positioning system to determine an approximate or estimated position of said person; and a location means for determining an available vehicle based on the position of the person. The positioning system can include a cell based triangulation system to determine the position of callers on a cell or mobile phone based system and/or a telephone directory look-up system to determine the address of a caller of a fixed line phone.

The preferred system may further include a voice recognition system to analyse the response when the positioning system is unable to position the person.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a current booking system and its respective workflow.

Figure 2 demonstrates the workflow of the preferred system of the present invention.

Figure 3 demonstrates system architecture for a call centre of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

The present invention seeks to minimise or largely reduce the manpower resources required for a taxi booking and despatch system. The workflow of the preferred system is shown in Figure 2. It is noted that from a user or commuter point of view that the system operates in a similar fashion to the existing manual system. That is, the commuter calls the booking system, provides a pick up location, and awaits the arrival of the taxi or limousine. However the intermediary steps are quite different.

When a public user makes a manual call-in 13 to the system to book a taxi, an interactive voice response system (IVR) 14 will first greet the customer. This IVR system can be an off-the-shelf product and as necessary can be customized to the needs of the particular taxi booking operation. The IVR system can also be configured to interact with the caller in a predefined manner with the use of different voice prompts. After greeting, the IVR system 14 will request the customer to provide verbally their pickup location and any other additional information which may be necessary or desired, such as an alternate pick up location. The customer's response can be provided after a beep sound to signify the start of a voice clip recording 15 for ten to thirty seconds or other pre-determined time interval. Ideally the size of the recorded voice clip will not exceed 30K Bytes for a duration of 10sec of voice message. Hence voice file compression capability is recommended to reduce the file size for better transmission purpose.

Once the voice recording is completed in the preferred embodiment, a call reference number shall be generated automatically by the Computer Telephony Interface System to associate the recorded voice clip file to a particular vehicle dispatch job number.

The voice clip can be generated in a number of ways including utilising a software based recording system including a web or internet based system, a phone voice recording system, or other system, terminal or devices that can perform voice clip recording.

During the process of answering the customer call, the taxi booking system shall automatically determine the caller's location 16 by inquiring a cell-based location triangulation system 16 if a hand-phone is being used. Such a cell based

location system is usually available and supplied by most telecommunication companies. The inquiry output of the cell-based location triangulation system can produce the current geocode values of the customer's location in terms of latitude and longitude according to GIS map format. Its usual response time upon
5 position request submission should take about 2~4 seconds to return the geocode values. In typical condition, the throughput of the cell-based location triangulation system can handle 15~20 position request in one second. In the case of a fixed line phone taxi reservation, a telephone address directory lookup system can be used for location enquiry. In an address lookup system, the
10 address information is usually obtainable from the local telecommunication company where they have a compiled database of the fixed line phone subscribers capturing the phone number and its associated phone installation address.

Therefore using both location inquiry systems, the location of the caller can
15 be matched with the captured caller ID.

Once the callers position or location is determined 19 the taxi booking system can locate any nearby and available taxi for job dispatch based on a pre-defined vehicle selection criteria. The taxi booking system should ideally always maintain the latest update of all available taxi locations using GPS and a wireless
20 communication network.

After an available taxi has been selected 21 with vehicle selection criteria 20 being met, the taxi dispatch system can send the recorded voice clip 22 to the taxi's in-vehicle device. On the in-vehicle device, a job message shall be prompted to the taxi driver with a voice "play" button being displayed.

25 Upon pressing the "play" button, the customer pickup location as recorded by the customer shall play back 23 to the taxi driver. The recorded voice clip can be replayed many times by the taxi driver for a clearer description of the customer pickup location.

In the preferred arrangement at the same time as playing the pickup
30 location voice clip, four "arrival time" buttons can be available to the taxi driver to reply back to the taxi booking system for the expected arrival time. The four selectable "arrival time" buttons are configurable from the booking system and they can be configured to, for example 5min, 7min, 10min & 15min.

Upon accepting the booking job, the customer call back telephone number can be made available but not visible to the driver for further pickup address clarification 25. If needed this can be done with caller ID included in the message to driver'.

5 After receiving the expected arrival time from the taxi driver, the taxi booking system can reply back 24 to the customer using the IVR system to provide Taxi vehicle number, and an Expected arrival time. It will be appreciated that in some installations the reply back is not required.

10 After hearing the taxi vehicle number and expected arrival time, the customer can hang up the phone and await the taxi 26.

 The system architecture for the above approach is depicted in Figure 3 and shall ideally require no operator/call taker to handle the customer call-in booking for taxi reservation. However in the case of the failure to locate the customer location 17, the recorded voice clip for customer pickup location can be
15 routed to a voice recognition system 18 to retrieve required pickup location data. From here, the dispatch cycle shall resume back to the cycle mentioned above.

 A real human operator/call taker need only be employed for handling exception calls, enquiry and resolving booking anomalies. For example in the case of an exception call, the operator/call taker can play back the voice clip and
20 help to locate a nearby available taxi by keying in the pickup location address to the automatic taxi dispatch system which will, in turn, route the recorded voice clip to the taxi driver.

 The system architecture of the unmanned call centre operation for vehicle booking and despatch system is exemplified in Figure 3. The ACD/PABX 27 is
25 used for automatic call distribution for all incoming and outgoing lines. It is expected that the phone extension lines would normally only be used by the few authorised call centre personnel handling the exception calls. The interactive voice response system 28 is used to provide interaction between the booking system and the caller with recorded voice prompts and the announcement of the
30 booking results. The voice recording system captures the caller's pick up location and any other additional request information in a voice clip and such voice clip 29 is for use in the vehicle despatch purpose. The voice recording system can include simple voice recording software running on a standard processor

interfacing to a PABX/ACD system which can transform analog voice signals into digital form and store in a file. This digital voice file could be played by audio player software. The voice clip can be saved in wave format or other formats can also be used but need to be compatible with the audio player software in the in-vehicle device. Once the voice recording is completed, a call reference number can be generated automatically by the Computer Telephony Interface System to associate the recorded voice clip file to a particular vehicle dispatch job number which can be created by the computer aided dispatch system during the dispatch. The overall system can be controlled by a computer aided despatch (CAD) server

5 35. The server 35 may be attached to a database 36 which is capable of capturing all vehicle related information, customer related information and booking related information. In each booking request, the CAD server system will automatically generate a vehicle dispatch job number for dispatch job progress tracking purpose. Therefore, every dispatch job can be tracked until the job is

10 done and the taxi driver picks up the customer. In some embodiments, further tracking of the dispatch job may be required until the taxi driver drops off the customer with the taximeter turned off.

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The server 35 does connect to the computer telephony interface system 30 which is used to provide an interface from the vehicle booking and despatch system to the telephone system. The telephone system can include the IVR

20 system 28, ACD/PABX 27, and voice recording system 33. The voice recognition system 33 is used to retrieve the customer pick up location information from the recorded voice clip when the system has been unable to determine the relative location of the customer. The voice recognition system can be used to extract

25 geographical or location information such as landmarks, street names and building name or number, from the voice clip. This location information can assist with map location matching. This information is then fed back to the automatic vehicle despatch system to locate the closest available vehicle.

For commuters using mobile or cell phones, the cell based location system

30 server 32 is used to locate the caller by requesting the cell phone position based on the captured cell phone caller ID and translates this information into a GIS map location format, for example latitude and longitude in WGS 84 map format. The GIS server 34 is then used to provide the geographical information for the

vehicle booking and despatch system and can be used to provide map information and an address database. For callers on a fixed line system, a telephone address directory lookup system 31 can be used to locate the registered address of the fixed line phone for the vehicle despatch purpose.

5 Once the voice clip of the caller has been recorded, and the system has determined the relative location of the caller through either cell based location, directory address lookup, or voice recognition, then the system can use an automatic vehicle location system (AVL) 37 in conjunction with pre-determined selection criteria to locate the closest available taxi. The AVL 37 can also be
10 used to capture and update the database with the latest vehicle location and status. The AVL system can be a module or sub-system capturing all reported vehicle positions on a regular basis or on a pre-defined condition basis. With any state change such as meter-on/off, ignition switch on/off, booking accepted/job on-call, crossing a predefined zone, etc as captured by the in-vehicle device, the
15 vehicle current position can be reported back to AVL system, including its state change. The reported position and status data can be updated and stored in a database maintaining each individual vehicle status and position information.

A communication server 38 can then be used to provide the link between the wireless communication network and the vehicle despatch system.

20 In this way it can be seen that the computer aided despatch server 35 can be used to automate the vehicle despatch process with automatic vehicle selection and booking management.

In summary the present invention provides an automated or substantially unmanned call centre operation for a vehicle booking and dispatch system. The
25 invention automates the human operator/call-taker's task by forwarding vehicle reservation call requests automatically to the nearest available vehicle/taxi within a search region. The invention uses a voice clip recording feature to achieve the automated vehicle booking and dispatch process, and a voice recognition system can also be used to supplement the automated process.

30 In the vehicle dispatch process, to find a nearby available vehicle, a cell-based location system and a telephone address directory enquiry system shall be deployed to provide the proximity location of the caller. This information will be

used by the computer aided dispatch system in conjunction with GIS map system to locate all available vehicles within cell proximity.

Once a vehicle has been selected, the customer booking request voice clip will be forwarded to the driver. The driver can play back the voice clip and
5 confirm the booking by replying the expected time of arrival.

The booking reservation is completed after the announcement of the expected time of arrival and the vehicle number to the customer if this is required.

With the use of the voice clip recording feature, the booking request of each individual customer can be forwarded to a nearby available taxi. In this
10 manner, the taxi driver can effectively resume some function of an operator to accept a job and this will, in turn, eliminate or at least substantially reduce human operator/call-taker for manual call-booking jobs.

A voice recognition system can supplement the automated call centre operation for those exception calls not being able to be located by the system for
15 vehicle dispatch. This voice recognition system will assist to retrieve the customer pickup location automatically and resume the automated vehicle dispatch process.

Under normal estimation, a 70% cut of staffing in the booking centre is possible, reducing the operation team with staff of 3 per 2000 vehicles and
20 around 8 for round-the-clock operations of the booking centre. This reduction is possible because the staff will be handling exception calls, enquiry and resolving booking anomalies and not standard booking.

The present invention therefore provides a number of benefits including a reduction of staff in the booking centre as the human intervention has been
25 reduced to a minimum in the use of voice recording of the location of the pickup, and the use of cell-triangulation of mobile phone commuters or address of fixed line commuters. Communications costs or call duration for a customer can be reduced largely due to less human intervention as the human intervention can be deployed to perform more communicative jobs or to resolve booking anomalies.

30 The present system is also unique in that without the necessity of a human operator the customer is able to communicate to the system and thereby driver, any special needs or additional information such as handicapped customer, additional large luggage, waiting at a certain location, additional help required,

animals to be fetched, or a larger cab etc. By virtue of capturing and forwarding the voice clip, this information can be provided directly to the driver.

The system can streamline booking operations, as the commuters and drivers are more involved in the booking operations as the drivers and commuters are in sync and able to communicate using a voice network. Voice calls are also possible as the phone numbers of the commuters are made available to the driver but ideally not visible.

The system should also effectively cut down on prank calls as the phone numbers of known prank callers can be barred from the system.

CLAIMS:

1. A vehicle booking system including:
 - a voice communication means to enable a person to make a vehicular booking;
 - 5 an electronic interactive voice response system to prompt the person for a booking request; and
 - a voice clip recording system to record the booking request;
 - wherein the booking request recorded by the voice clip recording system is forwarded to a vehicle to fulfill the vehicular booking.
- 10 2. A system as claimed in claim 1 wherein said booking request includes a pick up location provided by said person.
3. A system as claimed in claim 1 or 2, further including a positioning system to determine an approximate or estimated position of said person.
4. A system as claimed in claim 3 wherein said positioning system includes a
15 cell based triangulation system to determine the position of said person on a cell or mobile phone based system.
5. A system as claimed in claim 3 or 4 wherein said positioning system includes a telephone directory look-up system to determine the address of said person on a fixed line phone.
- 20 6. A system as claimed in any preceding claim further including a location means to determine an available vehicle based on the position of the person.
7. A system as claimed in any one of claims 3 to 6 further including a voice recognition system to analyse the booking request when said positioning system is unable to determine said position of said person.
- 25 8. A system as claimed in claim 1 wherein said voice clip is generated using a web or internet based recording system.

9. A system as claimed in claim 1 wherein said voice clip is generated using a software based recording system or a phone voice recording system.
10. A system as claimed in any one of the preceding claims wherein said voice clip is stored in a digital format.
- 5 11. A system as claimed in claim 1 or 8 wherein said voice clip is generated by a handphoned voice recording system.
12. A vehicle booking system including:
a vehicle including an in-vehicle device;
a communication means to enable a voice clip of a booking request
10 to be received by the vehicle, said voice clip being recorded by a voice clip recording system; and wherein
said in-vehicle device prompts a driver to play said voice clip.
13. A system as claimed in claim 12 including a positioning system to determine the vehicle location
- 15 14. A system as claimed in claim 12 wherein said in-vehicle device includes a display capable of displaying a plurality of arrival time buttons configurable from the booking system and selectable by a driver.
- 20 15. A system as claimed in claim 14 wherein once a driver has selected an arrival time the booking system can reply back to the person making the booking using the interactive voice response system, a vehicle number and expected arrival time.
16. A method enabling a person to make a vehicular booking including the steps of:
said person calling via a communications means;
25 receiving said call and prompting said person for a booking request via an interactive voice response system;
recording said booking request by a voice clip recording system; and

forwarding said recorded booking request to a vehicle to fulfill said booking request.

17. A method as claimed in claim 16 wherein said interactive voice response system prompts said person for said persons pick up location.

5 18. A method as claimed in claim 16 or 17 further including the step of determining the position of a person, wherein said position is determined by a cell based triangulation system for calls received from a cell or mobile phone based system, or by a telephone directory look up system for fixed line phones.

10 19. A method as claimed in claim 18 further including the step of locating an available vehicle via an automatic vehicle location system based on the position of said person.

20. A method as claimed in claim 18 or 19 further including forwarding said recorded booking request to a voice recognition system.

15 21. A system substantially as hereinbefore described with reference to the accompanying figures.

22. A method substantially as hereinbefore described with reference to the accompanying figures.