SYSTEM AND METHOD FOR LOCATING PARKED VEHICLES

Field of the Invention

This invention relates to a system and method for locating a parked vehicle within a parking area. More particularly, this system is capable of capturing an image of parking lot which has unique information associated with the parking lot and determining the location of the parked vehicle by analysing the captured image and comparing the identified unique information with the predefined reference data.

Background of the Invention

When a driver parks his vehicle in a parking area, there is the possibility that the driver may forget where he parked his vehicle. Such occurrences tend to happen in a large parking area whereby all the parking lots look the same or in a multi-storey parking area whereby the driver may forget at which level and/or section of the multi-storey parking area he parked his vehicle.

The simplest method for avoiding this problem is that the vehicle driver notes down the location of his vehicle on a piece of paper. This method has disadvantages in situations when the driver is in hurry or he does not have pen and paper in the vehicle. Another common method is that the driver takes a few photos of the environment around the parking lot where he parked his vehicle using a camera or his mobile phone. This method also has disadvantages when the driver is in hurry and the environment photos taken for an outdoor parking area may look the same.

In view of the foregoing, there is a need to develop a system and method that allow a driver to easily determine the location of his parked vehicle within an indoor and outdoor parking area, particularly a large parking area or multi-storey parking area, and without the driver himself being actively engaged in the process.

Summary of the Invention

The above and other problems are solved and an advance in the art is made by the provision of a system and method for determining the location of a parked vehicle within a parking area efficiently in accordance with embodiments of the present invention. A first advantage of the present invention is that the system and method allow a driver to easily and rapidly locate his parked vehicle within an indoor/outdoor parking area, particularly a large parking area or multi-storey parking area. A second advantage is that the system and method can be easily implemented with minimum efforts and costs. Unlike those parking areas where high cost infrastructures are implemented to assist drivers in locating available parking lots or his parked vehicles, the present invention is relative simple whereby the existing rearview camera of the vehicle and the mobile phone of the driver could be used.

In accordance with some embodiments of the present invention, a system is provided for locating a vehicle parked in a parking lot within a parking area in the following manner. The system comprises an image capturing device attached to the vehicle to capture an image of markings and labels painted on the ground surface of the parking lot. The markings comprise a start marking and an end marking to indicate the start and end of the labels. The labels comprise a unique information associated with the location of the parking lot within the parking area. The unique information comprises a car park name, a section name, and a lot number which are predefined to the parking lot. The system also comprises a mobile communication device communicatively connected to the image capturing device via a communication network and capable of receiving the captured image from the image capturing device. Further, an image analysis module is in connection with the mobile communication device to perform image analysis on the captured image to identify the unique information of the parking lot. A database is in connection with the mobile communication device. The database comprises a floor map

of the parking area having a plurality of parking lots with each parking lot is associated with a predefined reference data.

In accordance with some embodiments of the present invention, a method is provided for locating a vehicle parked in a parking lot within a parking area. The method comprises the steps of: 1) establishing a communication link between an image capturing device and a mobile communication device; 2) capturing an image of markings and labels painted on the ground surface of the parking lot by the image capturing device, wherein the markings comprises a start marking and an end marking to indicate the start and end of the labels, wherein the labels comprises a unique information associated with the location of the parking lot within the parking area, wherein the unique information comprises a car park name, a section name, and a lot number which are predefined to the parking lot; 3) analysing the captured image by image analysis module to identify the unique information of the parking lot; 4) comparing the identified unique information with predefined reference data stored in a database, wherein the location of the parked vehicle is found if a data matching is established between the identified unique information and the predefined reference data; and 5) displaying the location of the parked vehicle on a floor map of the parking area on the mobile communication device.

Brief Description of the Drawings

The above and other problems are solved by features and advantages of a system and method for determining the location of a parked vehicle within a parking area in accordance with the present invention described in the detailed description and shown in the following drawings:

FIG.1 illustrating a schematic diagram of a system for determining the location of a parked vehicle within a parking area in accordance with an embodiment of the present invention; and

FIG. 2 illustrating a flow diagram of a method for determining the location of a parked vehicle within a parking area in accordance with an embodiment of the present invention.

Detailed Description of the Invention

The present invention relates to a system and method for locating a parked vehicle within a parking area. More particularly, the system is capable of capturing an image of a parking lot which contains unique information associated with the parking lot and determining the location of the parked vehicle by analysing the captured image. As such, the present invention is useful in helping a driver to easily locate his parked vehicle within a parking area.

FIG. 1 illustrates a schematic diagram of a system for locating a parked vehicle within a parking area in accordance with an embodiment of the present invention. System 100 comprises an image capturing device 110, a mobile communication device 120, an image analysis module 130, and a database 140. Image capturing device 110 is attached to a vehicle and communicatively connected with mobile communication device 120 via a communication network. Mobile communication device 120 is loaded with a car locating application which enables communication links with image capturing device 120, image analysis module 130, and database 140. The car locating application can be always active and running in the background of mobile communication device 120 so as the connection with image capturing device 120 may automatically be established when the vehicle driver of mobile communication device 120 enters the vehicle.

Image capturing device 110 may be a rearview camera installed at the rear of a vehicle as shown in FIG. 1. In other embodiments, an additional image capturing device may be placed at the front of a vehicle. Image capturing device 110 is capable of capturing an image (or video) of the markings and labels painted on the ground surface of a parking lot when a driver is driving his vehicle into the parking lot. The labels together

with the markings are called parking lot identifier which would be captured by image capturing device 110. The markings comprise a start marking 151 and an end marking 152 to indicate the start and end of labels 153 which placed between the markings. The markings may be in any suitable shapes, such as a long rectangular box as shown in FIG. 1. When a vehicle is driving into a parking lot, image capturing device 110 will first detect start marking 151 followed by end marking 152. When both markings are detected, image capturing device 110 will be triggered to take a photo of the markings and labels on the parking lot. The labels are simple words related to the location of a parking lot within a parking area, such as car park name, section name, lot number, floor number, etc. As an embodiment shown in FIG. 1, labels 153 include car park name 154, section name 155, and lot number 156. In other embodiments, labels 153 may comprise one or more information such as only the lot number if this information is sufficient to distinguish it from other parking lots. Labels 153 may be arranged in any suitable orders, with more/less information, and/or painted in any suitable colours. Labels 153 together form a unique information associated with a parking lot, which is different from other parking lots in the same parking area. Hence, the exact location of a parked vehicle in a parking lot within a parking area can be easily determined if the unique information of the parking lot can be successfully deciphered from the captured image. The image captured by image capturing device 110 is sent to mobile communication device 120 of the vehicle driver for image recognition process.

Image analysis module 130 receives the captured image from mobile communication device 120. Image analysis module 130 comprises a suitable image recognition technique to identify the unique information of the parking lot from the captured image. The unique information can be identified based on the shapes and/or colours of labels 153. Once the unique information is successfully identified, image analysis module 130 would retrieve a floor map of the parking area from database 140 and compare the identified unique information with the predefined reference data associated with the parking lots in the parking area. The floor map is a schematic floor

plan includes all the parking lots in the parking area with the predefined reference data indicated therein. The location of a parked vehicle can be determined if a data matching is established between the identified unique information and the predefined reference data. When a data matching is established, the floor map of the parking area with the determined parking lot indicated therein (e.g. using a colour different from other parking lots) may be sent to mobile communication device 120 upon request by the driver. Alternatively, the identified unique information/predefined reference data or the captured image of the parking lot may be sent to mobile communication device 120 upon request by the driver. Based on the received floor map, the driver can easily locate his parked vehicle even in a large parking area. The captured image and identified unique information may be stored in database 140.

Mobile communication device 120 may be a cellular phone, personal digital assistance, tablet computer, laptop computer, and other computing devices which is capable of establishing a communication link with image capturing device 110 and performing the functions as defined by the car locating application loaded in mobile communication device 120. When the car locating application is activated, image capturing device 110 will be activated to capture image of the parking lot. The captured image may be sent to mobile communication device 120 upon request by the vehicle driver. The unique information of the parking lot identified by image analysis module 130 may also be sent to mobile communication device 120 upon request by the vehicle driver. Further, a floor map of the parking area with the exact location of the parked vehicle being indicated therein may be sent to mobile communication device 120 upon request by the vehicle driver. With these information, the vehicle driver can determine the location of his parked vehicle and locate his vehicle easily in a large parking area.

Database 140 is memory storage and loaded with a floor map of the parking area which includes predefined reference data for all the parking lots. The images captured by image capturing device 110 and unique information identified by image analysis module 130 can be stored in database 140.

FIG. 2 illustrates a flow diagram of a method for determining the location of a parked vehicle within a parking area based on the system as described above. Method 200 comprises the following steps. At step 202, communication between image capturing device 110 and mobile communication device 120 is established. This step is to ensure that both devices are ready for performing their functions. At step 204, image capturing device 110 captures an image of the markings and labels painted on the parking lot. At step 206, the captured image is sent to mobile communication device 120 via a communication network. At step 208, image analysis module 130 performs an image analysis on the captured image to identify the unique information of the parking lot. At step 210, method 200 determines if the unique information is successfully identified by image analysis module 130. If the unique information is failed to be identified, a failure notification will be display on mobile communication device 120 to alert the vehicle driver (step 212). The driver may re-park his vehicle so that image capturing device 110 may capture a new image of the parking lot and steps 204 to 210 will be repeated. If the unique information is successfully be identified at step 210, mobile communication device 120 will perform data comparison between the identified unique information and the predefined reference data at step 214. If a data matching is established at step 216, the location of the parked vehicle is found. Otherwise, the data comparison process will be repeated until a data matching is established. The captured image by image capturing device 110 and the identified unique information by image analysis module 130 are saved in database 140 at step 218. At step 220, the exact location of parked vehicle on a floor map of the parking area will be displayed on mobile communication device 120 upon request by the vehicle driver. The car locating application loaded in mobile communication device 120 provides several display options to the driver for displaying different information to assist the driver to locate his vehicle.

While preferred embodiments of the present invention have been described and illustrated above, it is to be understood that they are exemplary of the invention and are not to be considered to be limiting. It is expected that those skilled in the art can and will

design alternative embodiments that infringe this invention as set forth in the following claims.

Claims

1. A system for locating a vehicle parked in a parking lot within a parking area, the system comprises:

an image capturing device attached to the vehicle to capture an image of markings and labels painted on the ground surface of the parking lot, the markings comprise a start marking and an end marking to indicate the start and end of the labels, the labels comprise a unique information associated with the location of the parking lot within the parking area, wherein the unique information comprises a car park name, a section name, and a lot number which are predefined to the parking lot;

a mobile communication device communicatively connected to the image capturing device via a communication network and capable of receiving the captured image from the image capturing device;

an image analysis module in connection with the mobile communication device to perform image analysis on the captured image to identify the unique information of the parking lot; and

a database in connection with the mobile communication device, the database comprises a floor map of the parking area having a plurality of parking lots with each parking lot is associated with a predefined reference data.

2. A method for locating a vehicle parked in a parking lot within a parking area, the method comprises:

establishing a communication link between an image capturing device and a mobile communication device;

capturing an image of markings and labels painted on the ground surface of the parking lot by the image capturing device, wherein the markings comprises a start marking and an end marking to indicate the start and end of the labels, wherein the labels comprises a unique information associated with the location of the parking lot within the

parking area, wherein the unique information comprises a car park name, a section name, and a lot number which are predefined to the parking lot;

analysing the captured image by image analysis module to identify the unique information of the parking lot;

comparing the identified unique information with predefined reference data stored in a database, wherein the location of the parked vehicle is found if a data matching is established between the identified unique information and the predefined reference data; and

displaying the location of the parked vehicle on a floor map of the parking area on the mobile communication device.