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COMPLETE SPECIFICATION

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Title of invention:

A SYSTEM AND METHOD FOR SELF-ADAPTING VIRTUAL STRUCTURING OF UNSTRUCTURED PARKING IN REAL-TIME

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The following specification describes the invention and the manner in which it is to be performed.

CROSS-REFERENCE TO RELATED APPLICATIONS AND PRIORITY

The present application does not claim priority from any patent application.

TECHNICAL FIELD

The present subject matter described herein, in general, relates to a system and method for self-adapting virtual structuring of unstructured parking in real-time.

BACKGROUND

The subject matter discussed in the background section should not be assumed to be prior art merely because of its mention in the background section. Similarly, a problem mentioned in the background section or associated with the subject matter of the background section should not be assumed to have been previously recognized in the prior art. The subject matter in the background section merely represents different approaches, which in and of themselves may also correspond to implementations of the claimed technology.

In today's scenario, structured parking lots having well-marked grids exist only in a small fraction of urban and technologically informed organizations. Most organizations or institutes, all over the world, rely on open unmarked grounds to solve their parking needs. Current solutions to the parking availability issue, heavily rely on technologies that focus on structured parking lots. There is a dependency on hardware systems like cameras and sensors. Hence, the infrastructural cost to procure, install and develop these systems is very high. Further, the computational power required to process the inputs received from the plurality of sensors and video feeds is high as well as introduces a small amount of delay. Also, due to external environmental conditions, maintaining such sensor-based systems in open ground areas is an issue as they may get damaged due to the fluctuations in environmental conditions. Scaling such systems also serves as an issue, as well.

Existing systems focus only on the structured parking slots. The existing systems, especially the ones employing cameras and sensors, aren't suitable to be deployed

on large open grounds, due to environmental hazards as well as the cost of maintenance. The installation of sensors in open areas also restricts the usability of grounds. Moreover, the sensor-based systems don't provide efficiency when one or more sensors don't work in coordination with others. Calibration issues arise when such a plurality of sensors are deployed for the working of the system. The areas of the slots are fixed, with no real-time changes in nature (area of individual slots) of the parking systems. There is no provision to dynamically update grid slots according to the incoming vehicle's characteristics in real-time. Thus, the existing systems lack flexibility in the allocation of parking slots. The vehicles may include mopeds, cars, trucks, and a combination thereof.

Thus, the existing systems fail to reduce the issue of finding and managing parking slots in and around complexes. The existing systems also fail to efficiently and dynamically convert any open vacant space into a structured parking lot depending upon an organisation's need.

Moreover, in India, a variety of festivals are celebrated yearly. People visit specific places in the cities to celebrate or watch the celebration of such festivals. During this time, these specific locations in the city get crowded, and the space for parking, which is usually allotted doesn't prove adequate to accommodate the massive number of vehicles. These festivals may include the Ganesh festival, Durga Puja, Navratri festival, Christmas, etc. During such situations, the open grounds available in the nearby vicinity may be used for parking space. However, currently, there isn't any system that would transform such an unstructured open space into parking without employing any human resources and external sensor-based automated system.

Therefore, there is a long-standing need of a system and method for self-adapting virtual structuring of unstructured parking in real-time which employs least number of sensor devices or no external sensors at all and is flexible enough to dynamically generate and update a virtual grid on a geographical map interface, considering the

boundary points plotted by the system, in an open unstructured space and to accommodate all types of vehicles in any number of combinations.

SUMMARY

This summary is provided to introduce concepts related to a system and method for self-adapting virtual structuring of unstructured parking in real-time, and the concepts are further described below in the detailed description. This summary is not intended to identify essential features of the claimed subject matter, nor is it intended for use in determining or limiting the scope of the claimed subject matter.

In one implementation, a system for self-adapting virtual structuring of unstructured parking in real-time is illustrated in accordance with the present subject matter. In one embodiment, the system comprises a processor. A memory coupled to the processor, wherein the processor is configured to execute instructions stored in the memory. The processor may execute instructions for receiving, a geographical map interface based on geolocation. The processor may execute instructions for locating, a vacant area on the geographical map interface, wherein the vacant area is utilised for parking one or more vehicles. The processor may execute instructions for determining, capacity and type of one or more vehicles for accommodation in the parking. The processor may execute instructions for plotting, a plurality of virtual boundary points on parking space in the located vacant area. The processor may execute instructions for creating a plurality of virtual parking slots based on the capacity and type of one or more vehicles, wherein a plurality of virtual parking slots is created by plotting a plurality of virtual grids inside the virtual boundary points. The processor may execute instructions for receiving information about one or more vehicles when one or more vehicles are in the vicinity of the parking space. The processor may execute instructions for assigning one or more vacant virtual parking slots from a plurality of virtual parking slots to one or more vehicles for parking the respective vehicles based on the capacity and type of one or more vehicles. The processor may execute instructions for displaying, an associated navigation path towards the one or more vacant virtual parking slots from the

plurality of virtual parking slots on one or more user devices of one or more users of the one or more vehicles. The processor may execute instructions for extracting and mapping, geolocation of the one or more vehicles with geolocation of one or more vacant virtual parking slots from the plurality of virtual parking slots in order to verify a parking position and orientation of the one or more vehicles parked in the assigned one or more vacant virtual parking slots from the plurality of virtual parking slots. The processor may execute instructions for dynamically updating the plurality of virtual parking slots in real-time, based on occupancy or vacancy of the plurality of virtual parking slots.

In another implementation, a method for self-adapting virtual structuring of unstructured parking in real-time is illustrated in accordance with the present subject matter. The method may comprise receiving, via a processor, a geographical map interface based on geolocation. The method may comprise locating, via the processor, a vacant area on the geographical map interface, wherein the vacant area is adapted for parking one or more vehicles. The method may comprise determining, via the processor, capacity and type of the one or more vehicles for accommodation in the parking. The method may comprise plotting, via the processor, a plurality of virtual boundary points on parking space in the located vacant area. The method may comprise creating, via the processor, a plurality of virtual parking slots based on the capacity and type of the one or more vehicles, wherein a plurality of virtual parking slots is created by plotting a plurality of virtual grids inside the virtual boundary points. The method may comprise receiving, via the processor, information of the one or more vehicles when one or more vehicles are in the vicinity of the parking space. The method may comprise assigning, via the processor, one or more vacant virtual parking slots from a plurality of virtual parking slot to the one or more vehicles, for parking the respective vehicles, based on the capacity and type of the one or more vehicles. The method may comprise displaying, via a display, an associated navigation path towards the one or more vacant virtual parking slots from the plurality of virtual parking slots on one or more user devices of one or more users of the one or more vehicles. The method may

comprise extracting and mapping, via the processor, geolocation of the one or more vehicles with geolocation of one or more vacant virtual parking slots from the plurality of virtual parking slots in order to verify a parking position and orientation of the one or more vehicles parked in the assigned one or more vacant virtual parking slots from the plurality of virtual parking slots. The method may comprise dynamically updating, via the processor, the plurality of virtual parking slots in real-time, based on occupancy or vacancy of the plurality of virtual parking slots.

BRIEF DESCRIPTION OF DRAWINGS

The detailed description is described with reference to the accompanying Figures. In the Figures, the left-most digit(s) of a reference number identifies the Figure in which the reference number first appears. The same numbers are used throughout the drawings to refer to features and components.

Figure 1 illustrates an implementation 100 of a system 101 for self-adapting virtual structuring of unstructured parking in real-time, in accordance with an embodiment of the present disclosure.

Figure 2 illustrates components of the system 101 for self-adapting virtual structuring of unstructured parking in real-time, in accordance with an embodiment of the present disclosure.

Figure 3a and figure 3b illustrate a mid-region 311 and user's orientation 310 respectively, in accordance with an embodiment of the present disclosure.

Figure 4a and 4b illustrates a partial vacant and occupied virtual grid plot 400, in accordance with an embodiment of the present disclosure.

Figure 5 illustrates a flexible virtual grid plot 500, in accordance with an exemplary embodiment of the present disclosure.

Figure 6 illustrates method 600 for self-adapting virtual structuring of unstructured parking in real-time, in accordance with the present disclosure.

Figure 7 illustrates a polygonal parking space 700, in accordance with the present disclosure.

Figures 8a, 8b, and 8c illustrate correct orientations 800 of the vehicle, in accordance with the present disclosure.

Figures 9a and 9b illustrate minor and major orientations errors 901, 903 of the vehicle, in accordance with the present disclosure.

DETAILED DESCRIPTION

Reference throughout the specification to "various embodiments," "some embodiments," "one embodiment," or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, appearances of the phrases "in various embodiments," "in some embodiments," "in one embodiment," or "in an embodiment" in places throughout the specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

Figure 1 illustrates a network implementation 100 of system 101 for self-adapting virtual structuring of unstructured parking in real-time, in accordance with an embodiment of a present subject matter. In one embodiment, the system 101 may be implemented as a server (hereinafter the system 101 is interchangeably referred to as server 101). In an embodiment, the server 101 may be connected to a user device 103 over a network 102. It may be understood that the server 101 may be accessed by multiple users through one or more user devices 103-1,103-2,103-

3…103-n, collectively referred to as user device 103 hereinafter, or user 103, or the applications residing on the user device 103. In one embodiment, the network implementation 100 may comprise an admin system, wherein the admin system may be configured to access the one or more user devices 103. The admin system may also be configured to mark-up coordinates of the parking area using geotagging. In cases when there are modifications in the fields available for parking, the admin can explicitly set or reserve specific regions. The admin system may be configured to reserve or set such specific regions based on input from a user interface provided by the admin. This is done by any personnel with roles but not limited to operational or maintenance administrator of the parking, through a terminal physically attached to the system or remotely from any terminal that has network connectivity to the system, after proper authentication of the personnel. The personnel will be presented with a user interface where existing policies can be edited or deleted and new policies can be added based on the authorization rules applicable to the personnel. The admin system can also set the dimensions of various lots. Along with this, the admin system can override and take control of the automatic or self-adapting system if needed. The admin can decide parking rates and penalties and timings during which the parking lot is functional. It also has access and control over the historical data and will be able to clean noisy data periodically. Through the admin system, provisions are made to continuously monitor the occupancy and details of which vehicle has been parked into a particular lot. Admin can also block the passage of unauthorized vehicles or individuals that might pose a threat to others. The admin system might also have provisions to update and upgrade the system, server, and the underlying software. The admin system also possesses the right to revoke and provide access to servers to particular functionalities in the system. The user 103 may be any person, machine, software, automated computer program, a robot or a combination thereof.

In an embodiment, though the present subject matter is explained considering that the system 101 is implemented as a server, it may be understood that the system 101 may also be implemented in a variety of user devices, such as a but are not

limited to, a portable computer, a personal digital assistant, a handheld device, a mobile, a laptop computer, a desktop computer, a notebook, a workstation, a mainframe computer, and the like. In one embodiment, the system 101 may be implemented in a cloud-computing environment, and the business services follow a microservice architecture model. In an embodiment, the network 102 may be a wireless network, a wired network, or a combination thereof. The network 102 can be accessed by the user device 103 using wired, or wireless network connectivity means including updated communications technology.

In one implementation, the network 102 may be a wireless network, a wired network, or a combination thereof. The network 102 can be accessed by the device using wired or wireless network connectivity means including updated communications technology.

In one implementation, the network 102 may be a wireless network, a wired network, or a combination thereof. The network 102 can be implemented as one of the different types of networks, cellular communication network, local area network (LAN), wide area network (WAN), the internet, and the like. The network 102 may either be a dedicated network or a shared network. The shared network represents an association of the different types of networks that use a variety of protocols, for example, Hypertext Transfer Protocol (HTTP), Transmission Control Protocol/Internet Protocol (TCP/IP), Wireless Application Protocol (WAP), and the like, to communicate with one another. Further, the network 102 may include a variety of network devices, including routers, bridges, servers, computing devices, storage devices, and the like.

In one embodiment, system 101 for self-adapting virtual structuring of unstructured parking in real-time may facilitate the creation of a virtual grid for providing optimum parking space utilization in unstructured or unmarked areas. A vacant space may be located by the system 101. The system 101 may be configured to set the appropriate boundary points for transforming the resulting area into a parking

space. The system is required to decide the appropriate number of two, three, four-wheeler, or multiple wheeled vehicles to be parked in the parking space. In one embodiment, the system may be configured for employing a virtual grid of parking slots on the area plotted, thereby dividing the area into marked slots for the necessary number of different types of vehicles, i.e. two-wheelers or four-wheelers or such like. In one embodiment, after the virtual grid formation of the parking space, the user of the user device 103 who may be a person who intends to park his vehicle in the parking slot, receives a real-time scenario of the entire parking space and the appropriate empty parking slot on his user device. Such a scenario may be visible to the user when the user may be in the vicinity of the parking space. The system 101 may facilitate in assisting the user to park his vehicle in a physical parking slot corresponding to the allotted virtual parking slot with correct orientation to utilize the physical parking slot space. In one embodiment, the system 101 is configured to make real-time updates or changes such as changing the boundary points and changing the number and type of vehicles to be accommodated. These changes may be reflected on the user devices 103 immediately. The virtual grid-based system 101 eliminates the need for any hardware-based solutions currently deployed and introduces simplicity yet flexibility in the parking issue.

Now referring to Figure 3a and figure 3b, a mid-region 311 of a singular vehicle parking slot 300 and user's orientation 310 respectively, is illustrated, in accordance with an embodiment of the present disclosure. In one embodiment, a singular vehicle parking slot 300 is illustrated, wherein the singular vehicle parking slot 300 comprises four corners 305, 306, 307, 308. The singular vehicle parking slot 300 would be occupied by a vehicle which is to be parked in said slot. The mid-region 311 is the area required for a vehicle to be parked inside the singular vehicle parking slot 300. Thus, in other words, mid-region 311 may comprise a parked vehicle or is the region where the vehicle will be parked in the singular vehicle parking slot. The figure 3a illustrates mid-point sectioning analysis of the singular vehicle parking slot 300. The processor 201 is configured to locate the user device 103 in

the singular vehicle parking slot 300. The user device 103 is equipped with a GPS module. The user device 103 may be located by capturing the geo-coordinates of the user device 103 by the GPS module. The geo-coordinates or the geolocation of the user device 103 is captured by the system 101 in order to locate the vehicle in a parking space. It is evident that the user device 103 is with the user when the user is in or on a user vehicle wherein the vehicle may be in the singular vehicle parking slot 300. In one embodiment, the user device 103 may be in the nearest vicinity of the user. The user device 103 is located by mid-point sectioning analysis of the area of the singular vehicle parking slot 300, wherein the type and dimensions of the vehicle are captured by the system 101 when a vehicle enters the parking area. The mid-point sectioning of the singular vehicle parking slot 300 is performed by the processor of the system 101. In one embodiment, the mid-point sectioning analysis of the singular vehicle parking slot is performed by initially locating the midpoints 301, 302, 303, 304 of the singular vehicle parking slot 300. Four rectangular slots are thus formed within the singular vehicle parking slot 300. Midpoint sectioning of these rectangular slots is further done by locating further midpoints of said rectangular slots. The mid-point sectioning continues until it is computationally not possible to calculate the difference between two different geocoordinates in the singular vehicle parking slot 300. A mid-region 311 is obtained by the system 101, after performing the mid-point sectioning of the singular vehicle parking slot 300, wherein the mid-region 311 is the area that comprises the vehicle and wherein eventually the user device 103 may lie. The system 101 is then configured to track and locate geolocation of the user device 103 in said mid-region 311 via the GPS module. If the system 101 verifies the geolocation of the user device 103 to be in the mid-region 311, then it may be determined that the car is parked correctly in a singular vehicle parking slot 300, wherein obtaining the location of the parked vehicle by mid-point section analysis is one criterion for locating correct parking of the vehicle. Thus, in one embodiment, if the system 101 verifies the geolocation of the user device 103 is in the mid-region 311, then such geolocation of the user device 103 is considered to be the geolocation of the vehicle.

In one embodiment, figure 3b illustrates the user's orientation 310, wherein the user's orientation 310 is along 180 degrees, i.e. parallel with the length of a parking slot.

Figure 700 illustrates a polygonal parking space 700, in accordance with the present disclosure. The system 101 may be configured to locate the vacant area adapted for parking via a geographical map interface. The system 101 is then configured to decide the vehicle capacity and type based on the available parking space. The system 101 is further configured to create a virtual polygon in the vacant area through the geographical map interface, wherein the virtual polygon may cover maximum possible space, for parking, in the vacant area. Thus, such a virtual polygon is termed as polygonal parking space 700. Further, the system 101 may be configured to select the biggest rectangle 701 fitting inside the polygonal parking space 700. The system 101 is then configured to plot a plurality of virtual parking slots inside the biggest rectangle 701. The plurality of virtual parking slots is equidistant, symmetric and structured parking. The biggest rectangle 701 may majorly comprise virtual parking slots for four-wheelers 704. Now, the system 101 is configured to extract remaining pieces in the polygonal parking space 700, which may be measured as follows:

(Polygon parking space 700) – (biggest rectangle area 701)

Further, the system 101 is configured to check whether the area of the remaining piece is less than the area required for parking of at least one two-wheeler, then the pieces may be discarded from further plotting of the virtual parking slots. Such pieces are referred to as discarded area 702. In one embodiment, the system 101 may also be configured to check whether the area of the remaining pieces has an area greater than the area of required for parking of a four-wheeler, then the system 101 plots the virtual parking slots for parking four-wheelers 704 in the newly formed biggest rectangle 705. In case the area of the remaining piece is lesser than the area required to park a four-wheeler, then a virtual parking slot for one or more two-wheelers 703 may be plotted. In a preferred example, the length of a Fortuner, which is an SUV vehicle is 4795 mm and width is 1855 mm. The length of a Pulsar,

which is a two-wheeler has a length of 1999 mm and a width of 765 mm. Thus, in one embodiment, the virtual parking slot for one 4-wheeler may also be split and utilized to park 4 two-wheelers, based upon the requirement. Thus, the system 101 is configured to plot and allot virtual parking slot flexibly. The system 101 is configured to plot the virtual parking slots on the geographical map interface after locating the vacant area and deciding the number and type of vehicles to be parked in such vacant areas. Thus, the system 101 is configured to allot an available physical parking slot to the vehicle of the user by displaying the allotted parking slot with virtual grids and boundaries to the user on the corresponding user device 103. Therefore, the system 101 is configured to allot and verify if the user has parked the vehicle in an appropriate parking slot with appropriate orientation, in the physical parking slot.

Referring figure 4a and 4b, a partially vacant and occupied virtual grid plot 400, is illustrated in accordance with an embodiment of the present disclosure. In one embodiment, the system 101 is further configured to plot a plurality of virtual boundary points 407, 408, 409, 410 on a parking space 406 through the geographical map interface. The system 101 is further configured to create a plurality of parking slots 401, 402, 403, 404, 405. Each of the plurality of parking slots 401, 402, 403, 404, 405 is equal to the singular vehicle parking slot 300 illustrated in figure 3a. Thus, each of the plurality of parking slots 401, 402, 403, 404, 405 comprises the mid-region 311 where the vehicle is parked or will be parked. The figure 4b illustrates occupied parking slots 401, 402, 403, 404 and vacant parking slots 405 (unshaded rectangles). The virtual parking slots 401, 402, 403, 404, and 405 are created by marking a plurality of virtual grids inside the boundary points 407, 408, 409, 410. In a preferred embodiment, the system 101 may always be configured to plot virtual parking slots that may occupy maximum possible four-wheelers. Thus, the system 101, in one embodiment, may be configured to plot a rectangular parking space (Structured parking area).

In one embodiment, the system 101 is configured to create a plurality of virtual parking slots 401, 402, 403, 404, 405 within the boundary points 407, 408, 409, 410

by extracting, the length of the singular vehicle parking slot 300 from any one of the plurality of boundary points 305, 306, 307, 308 and dividing the length of a rectangular parking space formed with a plurality of virtual boundary points 407, 408, 409, 410 by the length of a singular vehicle parking slot 300, thereby generating one or more rows of the plurality of virtual parking slots 401, 402, 403, 404, 405 parallel to the length of the rectangular parking space. Similarly, the width of the rectangular space is divided by the width of singular vehicle parking slot 300 which yields the number of such slots that can fit in the rows generated. In another embodiment, the system 101 is configured to create a plurality of virtual parking slots 401, 402, 403, 404, 405 within the boundary points 407, 408, 409, 410 by extracting, a length of the singular vehicle parking slot 300 from any one of the plurality of boundary points 305, 306, 307, 308 and dividing the width of the rectangular parking space formed with a plurality of virtual boundary points 407, 408, 409, 410 by the length of singular vehicle parking slot 300, thereby generating one or more rows of the plurality of virtual parking slots 401, 402, 403, 404, 405 parallel to the width of the rectangular parking space. Similarly, the length of the rectangular space is divided by the width of singular vehicle parking slot 300 which yields the number of such slots that can fit in a single row that was generated. An area of the parking space 406 unable to create one or more singular vehicle slots 300 are discarded. In one embodiment, the dimensions of the singular parking slot 300 are equal to the dimensions of an SUV.

In a preferred embodiment, a single physical parking slot may be of the following measurements:

The length of the parking slot = average length of an SUV (Sports Utility Vehicle) + offset to manoeuvre;

and

The breadth of the parking slot = average width of an SUV + offset to manoeuvre

This measurement of the physical parking slot is stored in the memory of the system 101. Corresponding to the measurements mentioned above, virtual parking slots

401, 402, 403 404, 405 are plotted on the geographical map interface by the system 101.

In one embodiment, the system 101 may be configured to allot virtual parking slots for the four-wheelers adjacent to each other until the four-wheelers completely occupy either one single row or one single column. Thus, virtual parking slots 401, 402, 403, and 404 are occupied with one four-wheeler each.

In one embodiment, the plurality of virtual parking slots 401, 402, 403 404, 405 may accommodate four-wheeler vehicles such as mini hatchbacks, hatchbacks, compact sedans, sedans, mini SUVs, SUVs, and luxury sedans. The user of the user device 103 may park the vehicle in at least one of the physical parking slots corresponding to virtual parking slots 401, 402, 403 404. The system 101 utilizes geocoding to plot the boundary points 407, 408, 409, 410 and virtual parking slots 401, 402, 403 404 in the geographical map interface. Once the user has parked the vehicle and leaves the physical parking slot the user device is carried by him. In the system, it will show that the car has been parked and will update only when the user phone leaves the premises and that is detected by the system. Thus, the occupancy or vacancy of the plurality of virtual parking slots 401, 402, 403, 404 and 405 is updated when the user device leaves the premises.

Referring to figure 4a, the figure illustrates the parking space 406 comprising virtual parking spaces 401, 402 within the boundary points 407, 408, 409, 410. In one embodiment, the virtual parking slots 401, 402 for a few vehicles may be plotted in the parking space 406 by the system 101. Referring to figure 4b, the figure illustrates the virtual parking slots 401, 402, 403, 404 for a higher number of vehicles in the same parking space 406 may be plotted by the system 101. Thus, the system 101 is configured to flexibly plot virtual parking slots for a lesser or greater number of vehicles in the same parking space 406. In one embodiment, each virtual parking slots 401, 402, 403, 404 may accommodate a vehicle. Thus, according to figure 3a and figure 3b, a mid-region 311 of the singular vehicle parking slot 300 and user's orientation 310 is calculated and obtained.

In one embodiment, the virtual parking slots 401, 402, 403, 404 may be symmetrical.

In some embodiment, the parking space 406 can fit 8 two-wheelers and 8 four-wheelers but the administrator may be enabled to provide inputs as to fit 10 two-wheelers and 10 four-wheelers to the system 101. In such a case, the system 101 may only mark the slots for 8 two and four-wheelers. (i.e. maximum number of two and four-wheeler slot that the plotted area can fit). Similarly, if the parking space 406 can hold 10 two and four-wheelers each, and the administrator may be enabled to provide inputs of 8 two and 8 four-wheelers then the system will plot slots for 10 two and four-wheelers and adapt according to in the changing requirement in the future time. In other words, the system 101 plots a maximum number of two and four-wheeler slots that the parking space 406 can accommodate.

Referring to figure 5, a flexible virtual grid plot 500, is illustrated in accordance with an exemplary embodiment of the present disclosure. In a preferred embodiment, each of the virtual parking slots 401, 402, 403 and 404 may be subdivided further into 4 parking slots each, to accommodate 4 two-wheelers in each parking slot 401, 402, 403 and 404. The virtual parking slot 501 may be allotted to accommodate one eight-wheeler such as a bus. The mid-region 311 is shown for the virtual parking slot 501 wherein the bus is parked inside the virtual parking slot 501 in the mid-region 311. Therefore, the system 101 is configured to allot at least 4 virtual parking slots 401, 402, 403, 404 of 4 four-wheelers to accommodate a bus. According to figure 3a and figure 3b, a mid-region 311 and user's orientation 310 of the eight-wheeler is calculated and obtained. Thus, a dynamic and flexible updation of the virtual parking slots 401, 402, 403, 404 and 405 is performed to accommodate a maximum number of vehicles along with the different types of vehicles.

In one embodiment, the system 101 is configured to dynamically split the virtual parking slots of 'n' four-wheelers into virtual parking slots for '4n' two-wheelers.

Further, the virtual parking slots of ‘4n’ four-wheelers are dynamically merged to into virtual parking slots for ‘n’ eight-wheelers.

Referring to figure 8a, 8b, and 8c, correct orientations 800 of the vehicle, are illustrated in accordance with the present disclosure. In order to ascertain the optimal occupancy of the parking space, it is of utmost importance that the users park their vehicles and align them properly. With a lot of misaligned vehicles, the wasted space piles up to form a significant amount of misused area and compromises one of the major goals of the proposed system.

Referring to figure 7 and 8a, 8b and 8c, once the user parks the respective vehicle 300 in the physical parking slot corresponding to respective virtual parking slot, the geo-coordinates of the user device 103 are extracted by the system 101. The system 101 also simultaneously extracts the geo-coordinates of the respective virtual parking slot 401. Said virtual parking slot 401 may be interchangeably referred to as one of the virtual parking slot in 405 when occupied with a vehicle. In one embodiment, the virtual parking slot 405 is vacant at a time instance, at another time instance the virtual parking slot 405 may be occupied and some other virtual parking slot 403, 404, or 402 may be vacant. The system 101 is configured to check whether the geo-coordinates of the user device 103 lie within the mid-region 311 of the virtual parking slot 401, in order to ensure accurate parking of the vehicle of the user in the corresponding physical parking slot.

In one embodiment, the orientation of the vehicle, which is parked, is achieved by obtaining a directional header 803 visible in the geographical map interface of the system 101, wherein such directional header 803 may also be visible to the user of the vehicle on the user device 103. The system 101 may verify if the directional header 803 is parallel (considering an offset of error in both the directions) to the longer dimension of the virtual parking slot 401, the vehicle is considered as parked properly in the corresponding physical parking slot. The directional header 803 depicts the orientation of the user, which may also be used to obtain the direction

of the corresponding vehicle. The arrows 805 depict the direction along a longer dimension of the virtual parking slot 401. In one embodiment, the system 101 may continuously instruct the user regarding the orientation of the user and vehicle, through the user device 103. Such extraction of, both the geo-coordinates of the user device 103 and orientation of the user and further mapping or matching such extracted data with the virtual parking slot 401, may enable the system 101 to check whether the vehicle of the user is parked correctly in the physical parking slot.

In one embodiment, the midpoint 803 of the singular vehicle parking slot 300 may be obtained initially as illustrated in figure 3a. The directional header 803, as shown in Figures 8b and 8c, depicts the frontal portion 804 of the vehicle. The directional header 803 may be obtained by extracting the geolocation of the user device 103.

Figure 9a represents a correctly oriented vehicle allowing a minor deflection in orientation is illustrated, in accordance with the present disclosure. Figure 9a illustrates a minor orientation error of the vehicle by the angular measurement 902. The direction 805 along a longer dimension of the virtual parking slot 401 is a correct or accurate orientation in which the vehicle is supposed to be parked. But a minor tilt 901 of the vehicle from the correct orientation is depicted. Such a minor tilt 901 may be calculated by angular measurement 902 which is facilitated by extracting the geolocation of the user device 103.

Figure 9b depicts a significant orientation error of the vehicle by angular measurement 904. A significant tilt 903 of the vehicle from the correct orientation is depicted. In one embodiment, figure 9b illustrates the wrong orientation of the vehicle.

In one embodiment, the system 101 may be configured to offer incentives or rewards to the users who park the vehicles correctly and may penalize the users who deliberately park the vehicles in the wrong position and orientation, thereby ensuring the efficacy of the system 101. Such offering of rewards and penalising the user may mandate the users to follow instructions like using the allotted parking

space to them, maintaining a proper distance from adjacent vehicles, strictly following orientations while parking and hence helping in maintaining the parking system. In one embodiment, the offering of rewards and incentives may be in the form of virtual points to the users. Similarly, the users who violate the instructions and alerts provided by the system 101 may be charged with negative points or penalties. The users with several penalties would lose many perks and provisions that the system 101 provides. Such virtual points may be used in numerous ways. Example: priority while booking a parking slot, discount in case the parking is paid, early notifications of vacancies or in the case where parking lots are filling up fast and other customizations. In one embodiment, coupons from other stores or discount in nearby shopping areas and service centers may be offered as a reward.

In one embodiment, the system 101 is configured to provide flexibility through dynamic updation of the virtual parking slots 401, 402, 403, 404, 405. In one embodiment, the dynamic updation may be obtained by replacing at least four or more virtual parking slots of four-wheelers for one or more buses. Similarly, replacing at least one virtual parking slots of four-wheelers for two-wheelers or three-wheelers. Thus, it is evident that the plotting of the virtual parking slots 401, 402, 403, 404 and 405 is done to accommodate maximum four-wheelers. However, such virtual parking slots may be dynamically updated and allotted to two, three, four, eight-wheelers, and so on as per requirement. Moreover, the system 101 is also configured to dynamically update the virtual parking slots by extracting information about real-time occupancy and vacancy of the parking slots and making the virtual parking slots available for a new user or marking the parking slot to be occupied and displaying the same to the on the user device 103.

In one embodiment, the system 101 is configured to dynamically update the virtual parking slots 401, 402, 403, 404, 405 by retuning. The system 101 is configured to retune the virtual parking slots 401, 402, 403, 404, 405 by at least moving, adding or removing the grid points used for forming the virtual parking slots. Thus, the system 101 enables to create new grid points for forming virtual parking slots and

the whole virtual grid plot 400 is dynamically updated. Similarly, the flexible virtual grid plot 500 and the polygonal parking space 700 may also be dynamically updated.

The dynamic updation is performed in real-time by the system 101.

In one embodiment, the system 101 receives information regarding the incoming vehicle by extracting the geolocation of the user device 103, wherein the user device 103 is registered with the system 101 and the details regarding the type of the vehicle comprising the user device 103 is submitted during registration by the user. The system 101 may be configured to extract the geolocation of the user device 103 when the corresponding vehicle reaches the vicinity of the entrance of the parking. The user device 103 is in the nearest vicinity of the user when the user is in or on the vehicle. As the user device 103 is registered with the system 101, the system 101 is enabled to extract details of the vehicle on identifying that the vehicle has reached the vicinity of the parking. In one embodiment, the user of the user device 103 may send inputs to the system 101 on reaching, with the vehicle, at the entrance of the parking. The user may send such inputs via user device 103 to the system 101. The user input may comprise a vehicle parking request. The system 101 may be configured to extract details of the vehicle on receiving such a vehicle parking request. Thus, based upon the dimensions and type of the incoming vehicle, the system 101 may allot an available virtual parking slot for the vehicle and display the allotted virtual parking slot on the user device 103, in order to guide the user to park the vehicle in the corresponding physical parking slot in the parking space. In one embodiment, the system 101 may be configured to employ image capturing means such as camera or CCTV along with the extraction of geolocation, to capture images of the vehicle to obtain the dimensions and type of the vehicle of the user. The image capturing means may be employed at the entrance of the parking. The system 101 may be able to identify the incoming vehicle's length and breadth from a real-time camera feed. Based on such camera feed, the system 101 may

automatically make appropriate changes in the virtual parking slot (marked previously) to accommodate the incoming vehicle.

For example, the virtual parking slots are initially plotted for 2 and 4 wheelers explicitly, and a bus enters the parking in real-time, the camera may capture the image of the bus and send such a camera feed to the system 101. The system 101 may determine the length and breadth of this vehicle in real-time and then combine the 4 or 2 four-wheeler parking slots to accommodate the bus depending upon the size of the bus. This eliminates any need for an external administrator to make explicit changes in the system 101.

In another embodiment, the system 101 may be configured to employ Audio QR along with the extraction of geolocation. Wireless and intelligent systems like Audio QR may be embedded in order to track vehicles entering a parking lot or a parking area. In one embodiment, the Audio QR request is exchanged at the entrance of the parking space 406. An Audio QR is an ultrasound with encoded unique identification information. After coming into each other's proximity, two ubiquitous devices, acting as transmitters and receivers, exchange data. This data remains encrypted.

Hence, the user does not have to wait at the entrance and an appropriate parking slot. Based on the vehicle – a two-wheeler slot for a two-wheeler and four-wheeler slot for a four-wheeler may be allotted to the user.

In the case of a new user, the user can explicitly enter the details of his vehicles in the system through the corresponding user device 103. The details encompass the type of vehicle (SUV, Sedan, a bike or a bus).

In such cases which are mentioned above, there is no requirement of any kind of sensor. But, in case of failure of these two situations, the cameras may be used as a fallback option in order to ensure the proper functioning of the system.

In any way, the system 101 may employ only a single camera/sensor at each entrance as compared to other systems that rely on extensive use of one or the other type of sensors.

In one embodiment, once the user parks properly according to the orientation, the geolocation of the user's phone will be no longer obtained. When the user wishes to vacate the parking premises (leave the premises with his car) the user can inform about vacating the area through the user device. The system may then start tracking the user device's geolocation. Once, the user leaves the parking space, the corresponding Audio QR may capture such a situation and geolocation of the vehicle may be detected to be outside the parking area, hence, it will be confirmed that the user has actually left and that particular spot which the user's vehicle was occupying will be updated as vacant.

Also, if the user doesn't specify through the user device that he would be vacating and leaves the parking area then the Audio QR captures such a situation and thereby updating the parking slot as vacant.

This enables to monitor the entry of vehicles in and out of the parking space without human intervention and the need to deploy bulky sensors which add to operational and maintenance costs. Any ubiquitous modern-day device, such as a phone, could be used. Also, this eliminates the delays caused due to the system handled by humans. In other words, to punch in a vehicle that is entering, a human operator would perform more or less, some or all of these tasks - record the identification for a vehicle, issue a token, collect the fees, return the change and open and close the barricades. Taking into account the time and effort spent by a single person in logging one car, can be easily eliminated by an Audio QR enabled system. Similarly, other sensors currently available in the market, such as proximity sensors, sound sensors, etc., are required to be specially installed at the entrances and serve no other purpose. They need expert maintenance and incur repair costs.

In one embodiment, the system 101 is configured to learn about vehicle capacity over time analysing the previous records/events. The system 101 collects data regularly to enhance machine learning. That is, a trend in the in-flow and out-flow of vehicles into the parking is analysed by the system 101. Based on this, a record of traffic in and out of the parking lot is maintained for different times of the day, different days of the weeks, festivals, public holidays, etc. In a preferred embodiment, on any typical day in a school, lot of people prefer to travel by two-wheelers, however, if an event, such as an annual gathering is to be hosted in the school premises, there would be a lot more four-wheelers than two-wheelers and additional vans as well as mini-buses. The system 101 thus learns about the type and number of vehicles coming in the parking space depending upon the nature of the event or occasion and in the future makes appropriate changes to the virtual parking slots to ease the user experience. The system 101 is thus is flexible (adapts to the implicit requirement) yet is 'intelligent' enough to come up with an optimized structure analysing the need and nature of various events. Therefore, the system 101 is configured to store the data of events as historical data. In one embodiment, the historical data is stored in the data repository 214. Similarly, during the Ganesh Festival in India, the structured parking available in the cities prove insufficient for parking. Thus, the grounds of schools in the nearby vicinity of the festival pandals may be utilized for parking during the evening time. Moreover, any other open spaces available in the nearby vicinity may be used for parking four-wheelers and two-wheelers. The system 101 may then be employed in such unstructured parking areas such as grounds and open spaces. The system 101 is configured to learn such data about the festivals and events and such unstructured parking spaces allotted during these festivals and events. Thus, when such an event my again appear, the system 101 may have the historical data and immediately allot the parking slots in such previously used unstructured parking spaces by plotting virtual parking slots. In one embodiment, the user may also be able to use the virtual points obtained as incentives or a pre-disclosed fee to reserve a parking slot well in advance. While visiting places which are always crowded or are likely to be packed during a specific time, the user may book a parking slot for an interval even before arriving at the

parking area through the user device 103. With this provision, the system 101 may be configured to identify in advance information about the vehicles that are expected to arrive and can, therefore, allot parking slots efficiently. Vehicles that have booked slots for a later time would be allotted slots by the system 101 only sometime before their arrival in order to keep the space available for other vehicles. Thus, the system 101 in one embodiment is configured to pre-allocate an available parking slot based on a pre-allotment request from at least one user device 103. Also, with the knowledge of the type of vehicle expected to arrive, the parking slot may be allotted deep inside so that now the proposed method deals with only a smaller area that is preferably located near the entry gates. Thus the system 101 facilitates pre-booking of the virtual parking slots 401, 402, 403, 404, 405.

In one embodiment, in case if a tree or debris falls down in an open parking area, the area remains vacant yet no longer available. The system 101 may be configured to capture the coordinates and calculate the area occupied by a tree or any such detritus. This area is excluded, and only the remaining area is divided into parking slots. Upon removal of the debris from the area, it can be included again and re-divided dynamically. Furthermore, this works similarly for other obstacles as well as when specific sub-areas within the parking are under maintenance.

Referring to Figure 2, components of the system 101, comprises at least one processor 201, an input/output (I/O) interface 202, a memory 203, modules 204 and data 212 In one embodiment, at least one processor 201 is configured to fetch and execute computer-readable instructions stored in the memory 203.

In one embodiment, the I/O interface 202 implemented as a mobile application or a web-based application may include a variety of software and hardware interfaces, for example, a web interface, a graphical user interface, and the like. The I/O interface 202 may allow the system 101 to interact with the user devices 103. Further, the I/O interface 202 may enable the user device 103 to communicate with other computing devices, such as web servers and external data servers (not shown).

The I/O interface 202 can facilitate multiple communications within a wide variety of networks and protocol types, including wired networks, for example, LAN, cable, etc., and wireless networks, such as WLAN, cellular, or satellite. The I/O interface 202 may include one or more ports for connecting to another server.

In an exemplary embodiment, the I/O interface 202 is an interactive platform that may provide a connection between users 103 and system 101.

In an implementation, the memory 203 may include any computer-readable medium known in the art including, for example, volatile memory, such as static random-access memory (SRAM) and dynamic random-access memory (DRAM), and/or non-volatile memory, such as read-only memory (ROM), erasable programmable ROM, flash memories, hard disks, optical disks, and memory cards. The memory 203 may include modules 204 and data 213.

In one embodiment, the modules 204 include routines, programs, objects, components, data structures, etc., which perform particular tasks, functions or implement particular abstract data types. In one implementation, the modules 204 may include a data receiving module 205, a navigation module 206, a determination module 207, a plotting module 208, an assignment module 209, an extracting and mapping module 210, a display module 211 and an updation module 212. The data 213 may further comprise a data repository 214 and other data 215.

In one embodiment, the data receiving module 205 may receive data. The system 101 is configured to receive a geographical map interface based on geolocation, wherein the geographical map interface may comprise data including location name, latitude, longitude, geolocation, routes, vacant area, occupied and vacant parking spaces and such data.

In one embodiment, the navigation module 206 is configured to navigate and locate a vacant area adapted for vehicle parking on the geographical map interface. The located vacant area corresponds to a physical vacant area at the location depicted

on the geographical map interface. The vacant area may be tagged as parking space 406, wherein the parking space 406 is now available for physically parking one or more vehicles. In one embodiment, the parking space 406 may be inside a vacant area adapted for parking.

In one embodiment, the determination module 207 is configured to determine the vehicle capacity and type. In one embodiment, the vehicle capacity may refer to number of vehicles to be parked in the parking space 406 and the type of vehicles being parked in the parking space 406, wherein the type of vehicles may comprise but may not be limited to automobiles such as two-wheelers, three-wheelers, four-wheelers, eight-wheelers and such like. In one embodiment, the two-wheelers may include mopeds, geared bikes, and such like. The eight wheelers may include buses, trucks, and such like.

In one embodiment, the plotting module 208 is configured to plot a plurality of virtual boundary points 407, 408, 409, and 410 in the parking space 406 displayed on the geographical map interface. Such located virtual boundary points 407, 408, 409 and 410 resemble the corresponding physical boundary points in the geolocation of the parking space 406. In one embodiment, referring to figure 7 and figure 4, the parking space 406 may interchangeably be polygonal parking space 700. In one embodiment, the polygonal parking space 700 may be inside the parking space 406.

Further, the plotting module 208 is also configured to create a plurality of virtual parking slots 401, 402, 403, 404, 405 by plotting a plurality of virtual grids inside the boundary points 407, 408, 409 and 410, on the geographical map interface, based upon the vehicle capacity and vehicle type. Referring to figure 7 and figure 4, the virtual parking slots 401, 402, 403, 404, and 405 may interchangeably be virtual parking slots 702, 703, 704. The virtual parking slots 401, 402, 403, 404, correspond to physical parking slots in the physical boundary area.

In one embodiment, the data receiving module 205 is configured to receive data about an incoming vehicle in the parking. In one embodiment, the data receiving

module 205 may receive such data by obtaining a vehicle parking request from one or more user devices 103. The users of the vehicle may be registered, authenticate and authorize vehicles with the system 101 via corresponding user device 103. The user may send such a vehicle parking request through respective user device 103. The vehicle of the user may be registered by providing details about the vehicle used by the user. Such data may be stored in the data repository 214. The data of the vehicle may comprise the vehicle number, type of vehicle and such like. The data receiving module 205 may fetch the data of the incoming vehicle, from the data repository 214, in the real-time after receiving such a request from the registered user. In another embodiment, the data receiving module 205 may be configured to receive information about the incoming vehicle by tracking the geolocation of the incoming vehicle. Once the vehicle reaches the entrance of the parking, the data of such an incoming vehicle is directly fetched from the data repository 214, in the real-time. In another embodiment, the data receiving module 205 may fetch the data of the incoming vehicle by capturing real-time images of the incoming vehicle along with geolocation of the vehicle. In yet another embodiment, the data receiving module 205 may fetch the data of the incoming vehicle by capturing an Audio QR associated with the vehicle, at the entrance of the parking, along with geolocation of the vehicle.

In one embodiment, the assigning module 209 is configured to assign a vacant and available virtual parking slot 405 to the incoming vehicle for parking based on the type of the vehicle. Such assigning of the available parking slot is performed on the geographical map interface, wherein the available parking slot on the geographical map interface corresponds to a physically available parking slot in the associated geolocation. In one embodiment, referring to figure 5 and 7, any one of the virtual parking slots 501, 701, and 703 may be assigned based on the type of the incoming vehicle. In one embodiment, the assigning module 209 is configured to assign an available parking slot based on the information received by the data receiving module 205 and the available vacant parking slots 405.

In one embodiment, the display module 211 is configured to display an associated navigating path towards the one or more vacant virtual parking slots 405 on the user device 103 in order to enable the user of vehicle to park the vehicle in the physical parking slot corresponding to the vacant virtual parking slots 405 on the geographical map interface.

In one embodiment, the extraction and mapping module 210 is configured to extract and map a parking position and orientation of the vehicle parked in the physical parking slot. Referring figures 3a, 3b, 4, 8 and 9 the geolocation of the vehicle is extracted and mapped with the geolocation of the assigned virtual parking slot 405 in order to verify the parking position and orientation of the parked vehicle. In one embodiment, such assigned virtual parking slot 405 were vacant during the assignment.

In one embodiment, the updation module 211 is configured to dynamically update the plurality of virtual parking slots 401, 402, 403, 404, 405 based on occupancy or vacancy of the plurality of virtual parking slots 401, 402, 403, 404, 405. Referring to figure 5 and 7, in one embodiment, the virtual parking slots may interchangeably be virtual parking slots 702, 703, 704 and 501.

Thus, system 101 for self-adapting virtual structuring of unstructured parking in real-time may be utilized by various entities likes corporate companies, malls, educational institutes, societies, complexes or any establishment. The advantage of system 101 is that system 101 does not utilize a large number of external sensors. Thus, a huge amount of data which is generated from a plurality of sensors is not required to be stored, thereby enhancing the memory storage capacity and processing time of the processor. The power consumption of the system 101 is less. Therefore, the maintenance of the system 101 is inexpensive as the system is less vulnerable to damages.

Now referring to Figure 6, a method 600 for self-adapting virtual structuring of unstructured parking in real-time, is illustrated in accordance with an embodiment of the present disclosure.

At step 601, the data receiving module 205 is configured for receiving data. The system 101 is configured to receive a geographical map interface based on geolocation, wherein the geographical map interface may comprise data including location name, latitude, longitude, geolocation, routes, vacant area, occupied and vacant parking spaces and such data.

At step 602, the navigation module 206 is configured for navigating and locating a vacant area adapted for vehicle parking on the geographical map interface. The located vacant area corresponds to a physical vacant area at the location depicted on the geographical map interface. The vacant area may be tagged as parking space 406, wherein the parking space 406 is now available for physically parking one or more vehicles 300. In one embodiment, the parking space 406 may be inside a vacant area adapted for parking.

At step 603, the determination module 207 is configured for determining the vehicle capacity and type.

At step 604, the plotting module 208 is configured for plotting a plurality of virtual boundary points 407, 408, 409, 410 on a parking space 406 in the located vacant area through the geographical map interface. Further, at step 605, the plotting module 208 is also configured to creating, a plurality of virtual parking slots 401, 402, 403, 404, 405, based on the capacity and type of the one or more vehicles 300, wherein the a plurality of virtual parking slots 401, 402, 403, 404, 405 are created by plotting a plurality of virtual grids inside the virtual boundary points 407, 408, 409, 410.

At step 606, the data receiving module 205 is configured for receiving vehicle information when the one or more vehicles are in the vicinity of the parking space 406. The vehicles of the users of the user devices 103 may be registered, authenticated and authorized users with the system 101.

At step 607, the assigning module 209 is configured for assigning a vacant parking slot. In one embodiment, the assigning module 209 is configured for assigning, one or more vacant virtual parking slots 405 from a plurality of virtual parking slots 401, 402, 403, 404, 405, to the one or more vehicles, for parking the respective vehicles 300, based on the capacity and type of the one or more vehicles.

At step 608, the display module 211 is configured for an associated navigation path towards the one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405, on one or more user devices 103 of one or more users of the one or more vehicles.

At step 609, the extraction and mapping 210 is configured for extracting and mapping, geolocation of the one or more vehicles with geolocation of one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405, in order to verify a parking position and orientation of the one or more vehicles parked in the assigned one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405.

At step 610, the updation module 212 is configured for dynamically updating the plurality of parking slots 401, 402, 403, 404, 405 based on occupancy or vacancy of the plurality of virtual parking slots 401, 402, 403, 404, 405. In one embodiment, in real-time, the plurality of virtual parking slots 401, 402, 403, 404, 405 are is visible on the display of the system 101 and the interface of the user devices 103. In one embodiment, the user of the vehicle may be directed to vacant and closest parking slot in the parking space. The system 101 is configured to monitor the

vacant 405 continuously and occupied parking slots 401, 402, 403, 404 in real-time, in order to update the real-time vacancy and occupancy of the parking slots.

Although implementations of the system 101 and method 600 for self-adapting virtual structuring of unstructured parking in real-time have been described in language specific to structural features and/or methods, it is to be understood that the appended claims are not necessarily limited to the specific features or methods described. Instead, the specific features and methods are disclosed as examples of implementations of system 101 and method 600 for self-adapting virtual structuring of unstructured parking in real-time.

WE CLAIM:

1. A system 101 for self-adapting virtual structuring of unstructured parking in real-time comprising:

a processor 201; and

a memory 203 coupled to the processor 201, wherein the processor 201 is configured to execute instructions stored in the memory 203 for:

receiving, a geographical map interface based on geolocation;

locating, a vacant area on the geographical map interface, wherein the vacant area is adapted for parking one or more vehicles;

determining, capacity and type of the one or more vehicles for accommodation in the parking;

plotting, a plurality of virtual boundary points 407, 408, 409, 410 on a parking space 406 in the located vacant area;

creating, a plurality of virtual parking slots 401, 402, 403, 404, 405, based on the capacity and type of the one or more vehicles , wherein the a plurality of virtual parking slots 401, 402, 403, 404, 405 are created by plotting a plurality of virtual grids inside the virtual boundary points 407, 408, 409, 410;

receiving, information of the one or more vehicles when the one or more vehicles are in the vicinity of the parking space 406;

assigning, one or more vacant virtual parking slots 405 from a plurality of virtual parking slots 401, 402, 403, 404, 405, to the one or more vehicles, for parking the respective vehicles, based on the capacity and type of the one or more vehicles;

displaying, an associated navigation path towards the one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405, on one or more user devices 103 of one or more users of the one or more vehicles;

extracting the geolocation of the one or more vehicles and mapping said geolocation of one or more vehicles with geolocation of one or more vacant virtual parking slots 405 from the plurality of virtual

parking slots 401, 402, 403, 404, 405, in order to verify a parking position and orientation of the one or more vehicles parked in the assigned one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405; and

dynamically, updating the plurality of virtual parking slots 401, 402, 403, 404, 405, in real-time, based on occupancy or vacancy of the plurality of virtual parking slots 401, 402, 403, 404, 405.

2. The system 101 as claimed in claim 1, wherein the geographical map interface comprises details of the location - name, latitude, longitude, geolocation, routes, vacant areas, occupied and vacant parking spaces.

3. The system 101 as claimed in claim 1, wherein the capacity of the one or more vehicles is the number of vehicles to be parked in the parking space 406 and the type of the one or more vehicles comprise two-wheelers, three-wheelers, four-wheelers, eight wheelers.

4. The system 101, as claimed in claim 1, is configured to:

plot a plurality of virtual boundary points for a polygonal parking space 700 in the parking space 406;

select a biggest rectangle 701 fitting inside the polygonal parking space 700;

create a plurality of virtual parking slots inside the biggest rectangle 701 by plotting a plurality of virtual grids;

extract one or more remaining pieces in the polygonal parking space 700 leaving the biggest rectangle 701;

check whether the area of the one or more remaining pieces is less than an area required for parking at least one two-wheeler and discarding such remaining pieces as discarded area 702;

check whether the area of the one or more remaining pieces is a greater area than the area required for parking a four-wheeler and plotting the virtual parking slots for parking one or more four-wheelers 704 in such area; and

check whether the area of the one or more remaining pieces is lesser than the area required for parking a four-wheeler and plotting the virtual parking slots for parking one or more two-wheelers 703 in such area.

5. The system 101 as claimed in claim 1 is configured to create the virtual parking slots 401, 402, 403, 404 based on a historical data stored in the data repository 214, wherein the historical data comprises data including the geographic location of at least one of the events, festival celebrations.

6. The system 101 as claimed in claim 1 is configured to register the one or more vehicles by enabling a user of the one or more vehicles to provide details about the one or more vehicles via one or more corresponding user devices 103, wherein the details of the one or more vehicle comprises at least one of vehicle number, type of vehicle, dimensions of vehicle, wherein the details of the one or more vehicles are stored in data repository 214.

7. The system 101, as claimed in claim 1, is configured to receive information of the one or more vehicles by performing at least one of:

extracting the geolocation of the one or more vehicles, and fetching the details of the one or more vehicles when the one or more vehicles reach at an entrance of the parking space 406, wherein the geolocation of the one or more vehicles is obtained by fetching the geolocation of the one or more corresponding user devices 103, wherein such one or more corresponding user devices 103 are in the nearest vicinity of the users, when the users are in or on the one or more vehicles;

receiving, via the processor 201, one or more inputs from the one or more corresponding user devices 103 when the one or more vehicles reach at the entrance of the parking space 406 and fetching the details of the one

or more vehicles, wherein the one or more inputs comprises one or more respective vehicle parking requests;

capturing, via an image capturing means, one or more images of the one or more vehicles entering the parking space 406, in order to obtain dimensions and type of the one or more vehicles, wherein the one or more images are processed via the processor 201, along with the corresponding geolocation of the one or more vehicles;

extracting, an Audio QR request associated with the one or more vehicles along with corresponding geolocation of the one or more vehicles and fetching the details of the one or more vehicles from the Audio QR request, wherein the Audio QR request is extracted at the entrance of the parking space 406.

8. The system 101 as claimed in claim 1, wherein the system 101 is configured to extract the geolocation of the one or more vehicles by capturing the geolocation of the corresponding one or more user devices 103, wherein the geolocation of the corresponding one or more user devices 103 is obtained by wireless communication with a GPS module associated with each one or more user devices 103, wherein the one or more user devices 103 comprise at least one of mobiles, laptops, tablets, or computing systems.

9. The system 101, as claimed in claim 1, the system 101 is configured to extract the parking position of each one or more vehicles by extracting the geolocation of corresponding one or more user devices 103, wherein the geolocation of corresponding one or more user devices 103 is extracted by checking whether the corresponding one or more user devices 103 lie in a mid-region 311 of one or more singular vehicle parking slots 300, wherein such mid-region 311 is obtained by a mid-point sectioning analysis of the area of each of the one or more singular vehicle parking slots 300 individually, wherein the mid-point sectioning analysis comprises locating one or more midpoints 301, 302, 303, 304 of each one or more singular vehicle parking

slots 300 from a plurality of boundary points 305, 306, 307, 308 of each singular vehicle parking slots 300 and forming at least four rectangular slots within each singular vehicle parking slot 300, wherein further mid-point sectioning of said rectangular slots is enabled by locating midpoints of said rectangular slots, wherein the mid-point sectioning is continued until it is computationally not possible to calculate the difference between two different geo-coordinates in the singular vehicle parking slot 300 wherein, the mid-region 311 is determined to be inside the boundary points 305, 306, 307, 308 of each one or more singular vehicle parking slot 300, wherein the mid-region 311 is the area comprising the corresponding vehicles, wherein the corresponding one or more user devices 103 lies in the vehicle.

10. The system 101 as claimed in claim 1, configured to create a plurality of virtual parking slots 401, 402, 403, 404, 405 by at least one of:

extracting, a length of the singular vehicle parking slot 300 from any one of the plurality of boundary points 305, 306, 307, 308 and dividing the length of a rectangular parking space formed with a plurality of virtual boundary points 407, 408, 409, 410 by the length of a singular vehicle parking slot 300, thereby generating one or more rows of the plurality of virtual parking slots 401, 402, 403, 404, 405 parallel to the length of the rectangular parking space;

extracting, a length of the singular vehicle parking slot 300 from any one of the plurality of boundary points 305, 306, 307, 308 and dividing the width of the rectangular parking space formed with a plurality of virtual boundary points 407, 408, 409, 410 by the length of singular vehicle parking slot 300, thereby generating one or more rows of the plurality of virtual parking slots 401, 402, 403, 404, 405 parallel to the width of the rectangular parking space;

wherein an area of the parking space 406 unable to create one or more singular vehicle slots 300 are discarded.

11. The system 101, as claimed in claim 1, wherein the system 101 is configured to verify the orientation of each of the one or more vehicles parked in the virtual parking slots 401, 402, 403, 404, 405 by mapping at least one directional header 803, wherein the directional header 803 illustrates the orientation of the one or more vehicles, in a parallel direction to a longer dimension of the virtual parking slots 401, 402, 403, 404, 405, wherein the directional header 803 is displayed on the corresponding one or more user devices 103 in order to guide for achieving such orientation.

12. The system 101, as claimed in claim 1, is configured for dynamically updating the plurality of virtual parking slots 401, 402, 403, 404, 405 by at least one of:

retuning the virtual parking slots 401, 402, 403, 404, 405 via the processor 201, wherein retuning comprises at least moving, adding or removing of the plurality of virtual grids forming the virtual parking slots 401, 402, 403, 404, 405, thereby enabling creation of new virtual grids for forming new virtual parking slots;

splitting, via the processor 201, the virtual parking slots of 'n' four-wheelers into the virtual parking slots for '4n' two-wheelers;

merging, via the processor 201, the virtual parking slots of '4n' four-wheelers into the virtual parking slots for 'n' eight-wheelers.

13. The system 101 as claimed in claim 1, wherein the virtual parking slots 401, 402, 403, 404, 405 on the geographical map interface corresponds to one or more physical parking slots located at physical geolocation illustrated on the geographical map interface.

14. A method 600 for self-adapting virtual structuring of unstructured parking in real-time comprising:

receiving, via a processor 201, a geographical map interface based on geolocation;

locating, via the processor 201, a vacant area on the geographical map interface, wherein the vacant area is adapted for parking one or more vehicles;

determining, via the processor 201, capacity and type of the one or more vehicles for accommodation in the parking;

plotting, via the processor 201, a plurality of virtual boundary points 407, 408, 409, 410 on a parking space 406 in the located vacant area;

creating, via the processor 201, a plurality of virtual parking slots 401, 402, 403, 404, 405, based on the capacity and type of the one or more vehicles 300, wherein the a plurality of virtual parking slots 401, 402, 403, 404, 405 are created by plotting a plurality of virtual grids inside the virtual boundary points 407, 408, 409, 410;

receiving, via the processor 201, information of the one or more vehicles when the one or more vehicles are in the vicinity of the parking space 406;

assigning, via the processor 201, one or more vacant virtual parking slots 405 from a plurality of virtual parking slots 401, 402, 403, 404, 405, to the one or more vehicles, for parking the respective vehicles, based on the capacity and type of the one or more vehicles;

displaying, via a display, an associated navigation path towards the one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405, on one or more user devices 103 of one or more users of the one or more vehicles;

extracting the geolocation of the one or more vehicles and mapping said geolocation of one or more vehicles with geolocation of one or more vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405, in order to verify a parking position and orientation of the one or more vehicles parked in the assigned one or more

vacant virtual parking slots 405 from the plurality of virtual parking slots 401, 402, 403, 404, 405; and

dynamically updating, via the processor 201, the plurality of virtual parking slots 401, 402, 403, 404, 405, in real-time, based on occupancy or vacancy of the plurality of virtual parking slots 401, 402, 403, 404, 405.

15. The method as claimed in claim 14, wherein the plurality of virtual parking slots 401, 402, 403, 404, 405 are assigned to the one or more vehicles in an adjacent manner until either a single row or a single column is entirely occupied by the one or more vehicles.

16. The method as claimed in claim 14, wherein a plotting module 208 is configured for:

plotting a plurality of virtual boundary points for a polygonal parking space 700 in the parking space 406;

selecting a biggest rectangle 701 fitting inside the polygonal parking space 700;

creating a plurality of virtual parking slots inside the biggest rectangle 701 by plotting a plurality of virtual grids;

extracting one or more remaining pieces in the polygonal parking space 700 leaving the biggest rectangle 701;

checking whether the area of the one or more remaining pieces is less than an area required for parking at least one two-wheeler and discarding such remaining pieces as discarded area 702;

checking whether the area of the one or more remaining pieces is a greater area than the area of required for parking a four-wheeler and plotting the virtual parking slots for parking one or more four-wheelers 704 in such area; and

checking whether the area of the one or more remaining pieces is lesser than the area required for parking a four-wheeler and plotting the virtual parking slots for parking one or more two-wheelers 703 in such area.

17. The method as claimed in claim 14, wherein an extraction and mapping module 208 is configured for:

extracting the parking position of each one or more vehicles by extracting the geolocation of corresponding one or more user devices 103, wherein the geolocation of corresponding one or more user devices 103 is extracted by checking whether the corresponding one or more user devices 103 lie in a mid-region 311 of one or more singular vehicle parking slots 300, wherein such mid-region 311 is obtained by a mid-point sectioning analysis of the area of each of the one or more singular vehicle parking slots 300 individually, wherein the mid-point sectioning analysis comprises locating one or more midpoints 301, 302, 303, 304 of each one or more singular vehicle parking slots 300 from a plurality of boundary points 305, 306, 307, 308 of each singular vehicle parking slots 300 and forming at least four rectangular slots within each singular vehicle parking slot 300, wherein further mid-point sectioning of said rectangular slots is enabled by locating midpoints of said rectangular slots, wherein the mid-point sectioning is continued until it is computationally not possible to calculate the difference between two different geo-coordinates in the singular vehicle parking slot 300, wherein the mid-region 311 is the area comprising the corresponding vehicles, wherein the corresponding one or more user devices 103 lies in the vehicle.

18. The method as claimed in claim 14, wherein an updation module 212 is configured for either at least one of:

retuning the virtual parking slots 401, 402, 403, 404, 405 via the processor 201, wherein retuning comprises at least moving, adding or removing of the plurality of virtual grids forming the virtual parking slots 401, 402, 403, 404, 405, thereby enabling creation of new virtual grids for forming new virtual parking slots;

splitting, via the processor 201, the virtual parking slots of ‘n’ four-wheelers into the virtual parking slots for ‘4n’ two-wheelers;

merging, via the processor 201, the virtual parking slots of ‘4n’ four-wheelers into the virtual parking slots for ‘n’ eight-wheelers.

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ABSTRACT

A SYSTEM AND METHOD FOR SELF-ADAPTING VIRTUAL STRUCTURING OF UNSTRUCTURED PARKING IN REAL-TIME

Disclosed is a system and method for self-adapting virtual structuring of unstructured parking in real-time comprising a processor 201 and a memory 203. The processor is configured to execute instructions stored in the memory. The processor 201 receives a geographical map interface and locates a vacant area adapted for vehicle parking. The processor determines vehicle type and capacity. The processor plots virtual boundary points 407, 408, 409, 410 on a parking space 406. The processor creates parking slots 401, 402, 403, 404, 405 by plotting virtual grids inside the boundary points. The processor receives information of the incoming vehicle. The processor assigns a vacant parking slot 401 to the vehicle and further displays a navigating path towards it. The processor extracts and maps the geolocation of the parked vehicle with geolocation of the assigned parking slot. The processor dynamically updates the virtual parking slots in real-time.

[To be published with Figure 4]