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Vacant Parking Slot Detection and Tracking - Sensor Fusion

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ABSTRACT:

The ability of detecting the vacant parking slot detection and tracking system that fuses the sensors of an Around View Monitor (AVM) system and an ultrasonic sensor-based automatic parking system. This system consists of three stages: parking slot marking detection, occupancy classification and tracking. The parking slot marking detection stage recognizes various types of parking slot markings in AVM image sequence. It detects parking slots in individual AVM images by exploiting a hierarchical tree structure of parking slot markings and combines sequential detection results. The parking slot occupancy classification stage identifies vacancies of detected parking slots using ultrasonic sensor data. Parking slot occupancy is probabilistically calculated by treating each parking slot region as a single cell of the occupancy grid. This stage continuously estimates the position of the selected parking slot while the ego-vehicle is moving into it. During tracking, AVM images and motion sensor-based odometer are fused together in the chamfer score level to achieve robustness against inevitable occlusions caused by the ego-vehicle

INTRODUCTION :

Due to the growing interest and demand for automatic parking, a great deal of research on parking assist system is being carried out. Parking space designation is one of the essential parts of the parking assist system. Most of the parking assist systems on the market designate parking spaces by utilizing a user interface-based approach via a touch screen or a free space-based approach via ultrasonic sensors. However, the former has a drawback of repetitive driver operations and the latter highly depends on the existence and poses of adjacent vehicles. To overcome the drawbacks of the previous methods, this paper proposes a sensor fusion-based parking assist system that is able to recognize and track various types of parking slot markings.

The proposed system consists of three stages: parking slot marking detection, parking slot occupancy classification, and parking slot marking tracking. The parking slot marking detection stage recognizes various types of parking slot markings using AVM image sequences. It detects parking slots in individual AVM images by utilizing a hierarchical tree structure of parking slot markings and combines sequential detection results. The parking slot occupancy classification stage identifies vacancies of detected parking slots using ultrasonic sensor data. Parking slot occupancy is accurately determined by calculating weighted sum of ultrasonic sensor outputs in each parking slot region. Weights are determined according to the relative direction between parked vehicle and moving vehicle. The parking slot marking tracking stage continuously estimates the location and orientation of the selected parking slot while the ego-vehicle is moving into it. During tracking, AVM images and motion sensor-based odometry are fused in the chamfer score level to achieve robustness against occlusions caused by the ego-vehicle.

LITERATURE REVIEW:

In the previous parking system driver manually selects the parking slot and drive into it. This method is useful as a backup tool for failure cases of automatic parking system methods. Manpower is needed for each car parking slot to select a parking slot manually and give direction to drive properly into the slot[1] . There is need of manpower, so this system is replaced by the ultrasonic sensor based system. In this system, two ultrasonic based sensors are mounted on both sides of the front bumper. Adjacent vehicles are detected by using ultrasonic sensor data. These ultrasonic sensor find the adjacent vehicles and driver properly drive into the free space between that adjacent vehicle. Using the multiple echo function, parking space detected more accurately in real parking environment. These method fail when there is no adjacent vehicles and in slanted parking situations where adjacent vehicle surfaces are not perpendicular to the heading directions of ultrasonic sensors[1] [4].

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Another method is Parking slot Marking -based method. In this method vehicle mounted cameras ,are used. It simply tracks the parking slot marking present on the road. The distance between point and line-segment is used to distinguish guideline from recognized marking line segments. Once the guideline is successfully recognized, T shape template matching easily recognizes dividing marking line-segments. This method fails where parking slot marking are not present[1] [5]. Scanning Laser Radar-Based system is implemented between vehicles to recognize free space parking slot. This system consist of range data preprocessing, corner detection, and target parking position designation. The major disadvantage of this system is the expensive price of the sensor [7].A Photonic -Mixer-Device (PMD) camera is used to scan parking-scene to detect free parking slot. PMD sensor allows referring to a large number of spatial point measurements detailed representing cuts of the observed scene[6]. So we moved onto Infrastructure based method. In this method, bird-eye view camera is used which helps to track the vacant parking slot[1][8]

3 PROJECT DESCRIPTIONS:

The parking slot detection and tracking system that fuses the sensors of an Around View Monitor (AVM) system and an ultrasonic sensor-based automatic parking system. This system consists of three stages: parking slot marking detection, occupancy classification and tracking.

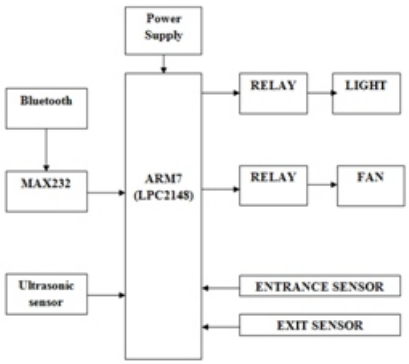

Fig 1 Block Diagram of Proposed System

3.1 PARKING SLOT MARKING DETECTION :

In the parking slot marking detection based approach recognizes the various types of parking slots markings using around view monitoring image sequences.

It detects parking slots in individual AVM images by exploiting a hierarchical tree structure of parking slot markings and combines sequential detection results. In this project we are using the In the Hierarchical tree structure focus on the four types of parking slot markings are parking slot markings, slots, junctions and corners. In this proposed system we are using the junction type of slots. The junctions can be composed of four types of slots are the T-junction, L-junction, Y-junction, and I-junction. In these junctions we are using the Y-junctions.In the parking slot detection stage at the entrance we place the IR sensors when the IR sensor is detects the vehicle the information should be sended to the CPU in this it checks the vehicle details and it should be allot the parking slot. The allotted parking slot information should be displayed in the LCD display. In the LCD display 'E' will represent the vehicle is full and 'F' will represents the slot should be empty. The allotted information should be getting in voice also.

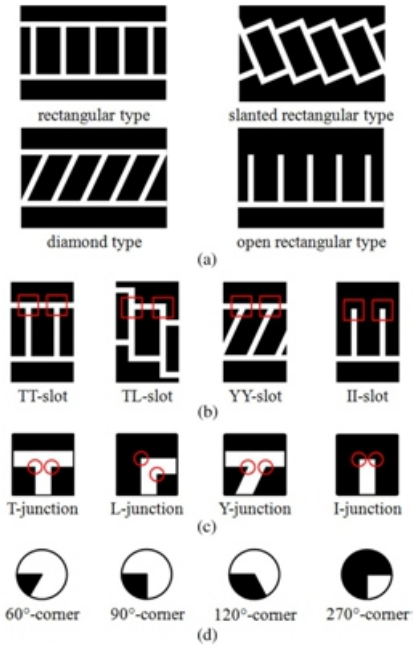

Fig..2: Hierarchical tree structure of parking slot markings

3.2 PARKING SLOT OCCUPANCY CLASSIFICATION:

The parking slot occupancy classification stage identifies vacancies of Detected parking slots using ultrasonic sensor data. Parking slot occupancy is probabilistically calculated by treating each parking slot region as a single cell of the occupancy grid.

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The occupancy classification results, parking slot with green color indicate the vehicle we have to park and red color will indicate the already vehicle is parked. In this project we are using the LED to represent the slot is empty or occupied.The occupancy of the slot will also be shown at the LED indicator. When the slot will be allotted for the vehicle it gives the voice information about the slot and LCD indication also where the vehicle should be placed.

3.3 PARKING SLOT MARK TRACKING:

The parking slot mark tracking stage continuously estimates the position of the selected parking slot while the ego-vehicle is moving into it. Here we are using the IR sensors, whenever IR sensor detects the vehicle then only parking should be successfully completed. When vehicle is not properly parked then it gives the buzzer alert. The vehicle it returns back, at the exit gate the exit sensors also detects the vehicle then only exit gate will open.

3.4.SCHEMATIC DIAGRAM OF PROPOSED SYSTEM:

Switch on the power supply to the transmitter section after making necessary connections. A 230/50Hz ac is stepped down to 12V/50Hz ac. This voltage is fed to a bridge rectifier & a filter circuit. The output of filter circuit is fed to IC-7805. The output of IC-7805, in turn is connected to Micro controller module which works with +5v dc supply. As, soon as we give the supply to transmitter section, the module indicates the user that, it is ready by means of a glowing LED. When the vehicle is entered at the entrance gate

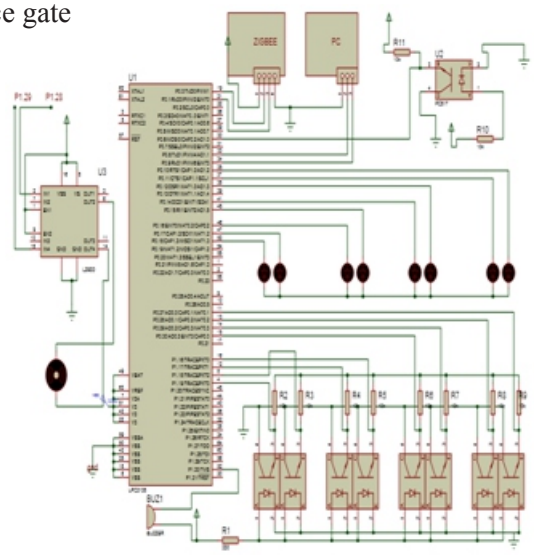

Fig: 3 – Schematic Diagram of Proposed System

4 RESULTS:

The people are interest in parking aid products, automatic parking system. Target position designation is one of the primary components of automatic parking systems. In the parking area, when the vehicle is entered at the entrance is detects the vehicle and captures the vehicle number. The captured vehicle number if should having any issues or problems can be identified through using the MATLAB code (already we giving the authorised and unauthorised vehicle numbers). If no issues is there for the vehicle then only it should allot the slot. The allotted slots will show in the LCD display, in the LCD 'E' will shows the slot should be empty and 'F' will shows the slot will be full.

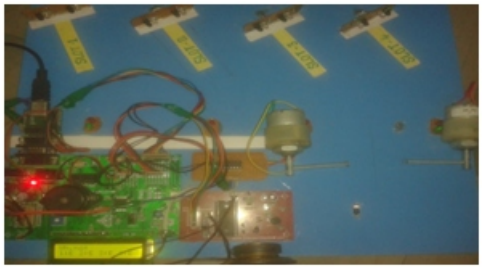

Fig.4: The parking area should having all the empty slots.

Fig.5: the camera will capture the vehicle number.

Fig.7.3: The authorized vehicle can be allotted for the slot-1 and opens the entrance gate.

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CONCLUSION:

Parking slot marking detection and tracking system can recognizes the positions and occupancies of various types of parking slot markings and stably track them under practical situations in a real-time manner are successfully implemented. This System is expected to help drivers conventionally select one of the available parking slots and supports the parking slot system by continuously updating the designated target positions.

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