AVM System and Ultrasonic Sensor - based Automatic Parking Slot

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***Abstract*-This paper proposes a better parking environment to the driver to prevent the collision and detection of vacant slot using AVM system and an ultrasonic sensor. The proposed system consists of three major methods (i)timer slot for user (ii) CO monitoring in the smoke of the vehicle(iii)Detection of faults in the vehicle with in the parking area. The timer slot method provides the user required time limit control. (i.e.) When the user enters the limit according to their need, the timer started. After a certain time limit, the user receives a message from the current server that the time limit going to exist soon. If the user want the additional time limit then the user should reply for that message and the time limit will increases. CO monitoring method will analyse the CO and CO2 content in the vehicle. Detection of faults method will be used to detect the faulted vehicle in the parking slot. The proposed system is expected to help drivers conveniently select one of the available parking slots and also to choose their own time limit for the parking. During tracking, AVM images and motion sensor-based odometry are fused together in the chamfer score level to achieve robustness against inevitable occlusions caused by the ego-vehicle. In the experiments, it is shown that the proposed method can recognize the positions and occupancies of various types of parking slot markings and stably track them under practical situations in a real-time manner. The proposed system is expected to help drivers conveniently select one of the available parking slots and support the parking control system by continuously updating the designated target positions.**

Keyword- AVM system, Ultrasonic sensor, CO2 sensor, GSM sim, LCD display.

I. INTRODUCTION

Due to the rapidly growing interest in car parking aid products, automatic parking systems have been extensively researched. Target position destination is one of the primary components of automatic parking systems. This has been explored in a variety of ways that can be categorized into four types: user interface-based, free space-based, parking slot marking-based, and infrastructure-based approaches. Most of the (semi-) automatic parking system products on the market designate target position by utilizing a user interface-based approach via a touch screen or a free space- based approach via ultrasonic sensors (usually mounted on both sides of the front bumper). Once the target position is designated, the system generates a path from the initial position to the target position and autonomously controls streering to follow the path. For this purpose, it continuously estimates the ego-vehicle position using in-vehicle portion sensor-based odometry. Meanwhile, an

Around View Monitor (AVM) system has become popular as a parking aid product, and most car makers have started to produce vehicles equipped with this system. An AVM system produces a bird's–eye view image for the 360 surroundings of the vehicle by stitching together a number of images acquired by three or four cameras. Displaying AVM images helps drivers easily recognize parking slot markings and obstacles around the vehicle during the parking maneuver.

This paper proposes a vacant parking slot detection and tracking system that fuses the sensors of a AVM system and an ultrasonic sensor-based automatic parking system. Since the above all mentioned technologies are only inbuilt in the upcoming cars it wont be suitable for every users. Thus we go for implementing all these technologies in the parking area inorder to make it reliable to all the users and is also economical for everybody. Once a driver searches for a parking slot, at the enterance of the parking area an LCD display is placed to display the current states of every parking slot with the results of ultrasonic proximity sensor. In addition to that it also determines the engaged timing of that particular slot by means of the timer IC DS1307. Besides that to determine the faults of the cars within the parking area to the maintainer we use the AVM system under the path. Also nowadays the value of the pollution content has been increased, so inorder to avoid that a gas sensor named MQ2 sensor has been placed in each parking slot to alert the user about their car's gas excreation level.This paper deals with parking guidance system and information system based on wireless sensor system. This system consists of parking space monitoring nodes, routing nodes, sink node, parking guidance display and an information and management center. The nodes transmit the information through wireless sensor network by treelike topological structure with non-standard protocol we developed. After analyzing and processing the data, the information and management centre would distribute the parking information by LCD screen and displays for the drivers. And the results of the experiment show that the performance of the system can satisfy the requirements of parking guidance.

First, the parking space monitoring nodes consists of ultrasonic proximity sensor individually for each slot which continuously senses its respective slot to determine whether it is engaged or free for users to make them convenient to identify the vacant parking slot.

Second, the routing node system is to represent the map of the parking area to the drivers to avoid their confusion in selecting path to their respective slot. Third, parking guidance display system is the main system which has been implemented in our project to guide the driver to park his car within the boundaries of his particular parking slot. This avoids the situation of collision of one's car with the others and provides a smooth parking service to the user. The final part is the information and the management center, in our proposing paper there may be a chance for a situation of fault detection at some occasion, so to avoid it we go for this system. Sometimes when a system gets out of its parking boundary, it becomes out of range for sensor thus, the display at the entrance states that particular slot as vacant. But if the car gets any breakdown or some other technical failure it doesn't able to move from that place which creates a disturbance or traffic for the both incoming and the outgoing vehicles of the parking area. Hence we are placing an AVM system under the path of the parking area, which recognizes the failed car and sends an immediate signal to the maintainer of the parking area. Thus it avoids the fault detection situation.

The proposed system has the following advantages:1) The customer can readily determine space availability prior to entering the garage and/or parking level.2) The customer can plan for their transit to public transportation with such smart parking systems employed at Park and Rides.3) The parking operator can use the system data to develop or improve pricing strategies.4) The parking operator can use this system data to predict future parking patterns and trends.5) The parking operator can use this system data to prevent vehicle thefts.6) The parking operator can reduce the staffing requirements for traffic control within the facility.7) The system significantly reduces traffic-and the resulting vehicle emissions-by decreasing the time required for customers to locate open spaces. To cap it all the main advantage of this paper is, since this system proposes everything that are going to be placed/built only in the parking area this system can be used by everybody irrespective of their car brands and is user friendly.

This paper has the following contributions:

1) It presents a novel system that fuses the sensors of an AVM system and an ultrasonic sensor-based automatic parking system and shows that the proposed system can detect and track parking slot marking more effectively than individual systems.
2) It proposes an efficient parking slot occupancy classification method that probabilistically identifies occupancies of detected parking slots based on ultrasonic sensor data by treating each parking slot region as a single cell of the occupancy grid.
3) It serves an efficient maintenance system that identifies the faults in the detection of vacancy slot by means of the AVM system under the parking area.
4) The timer system provides a convenience for the drivers to know how long a slot is engaged and it provides a facility to extend the timing of parking slot by adding a GPS technology with the timer. By feeding his mobile number in the GPS system, it sends an alert message to the user before his parking time expires and allows him to extend the timing if he needs.

II.EXSISTING METHOD

In the modern world the usage of vehicle is rapidly increasing day by day.Due this there is a heavy shortage in the parking area. To over come this difficulties, many projects and idea's are implemented in the society. But there is no exact system to provide the best outcome of the parking system in this society. In this exsisting system, AVM system technique is implemented to monitor the available parking slots and also to park the vehicle automatically into the slot. Due this the vehicle can be parked with or without the help of the driver into the slot.

By this method, we can detect only the vacant slot in the parking area and we can place the vehicle in the slot using AVM system. The AVM system detects the slot and displays in the LED screen. If the driver is available they place the vehicle in the corresponding slot. If the driver is not available by using automatic parking system the vehicle is placed in the right slot. If the vehicle is not placed in the right slot then it indicates to the parking operator. This System only reduces the collision vehicles in the parking slot by providing right slot to the user. But it does not provide accurate timing that when the slot will become vacant.

III. PROPOSED METHOD

This project provides a parking information and guiding system using wireless system. This system consists of parking space monitoring slot, routing slot, sink node, parking guidance display and an information and management system center. The slots transmit the information through wireless sensor network by treelike topological structure with non-standard protocol we developed. By using this system, we can easily recognize the vacant parking slot and also the system can able to provide the timing to the user which helps the driver to make the exact timing of return to the parking area. This method also sends the text based information to the driver using GSM module to indicate that the timing of the parking going to expire. If the driver wants to extend the timing of the parking, the driver should reply to that text information through the mobile device. After examining and processing the information data, the information and guiding system will display the parking status through LCD display to the driver.

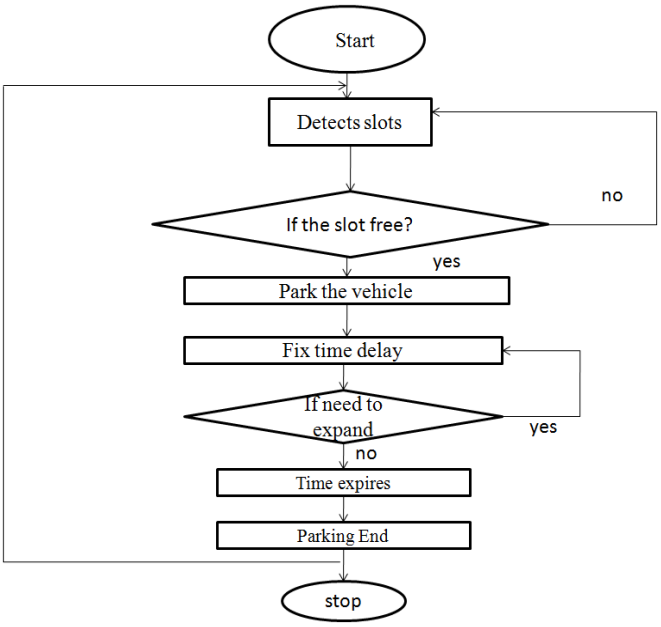

Fig:1 Flowchart for the automatic vacant slot detection system.

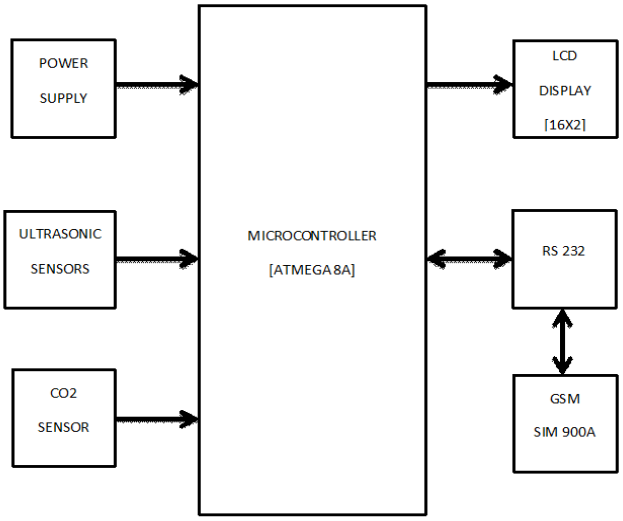

Fig:2 Block diagram parking information and guidance system.

This project also provides the CO content of the vehicle by using CO2 sensor which is placed in the parking slot. When the vehicle starts by observing the smoke,the CO2 sensor indicates the CO content in the vehicle through display. By using this system, the parking operator can use the system data to develop or improve pricing strategies and the system data to predict future parking patterns and trends. The operator can also use this system data to prevent vehicle thefts.

L WORKING METHODOLOGY

The working methodology of previous system is upgraded by providing time delay based control to the user. In this system we are using Ultrasonic sensors and AVM system monitor which is connected to the microcontroller. The program feeded in the ATMEGA 8A analysis the input from the sensor and provide the necessary solution.

A. ATMEGA 8A Microcontroller

There are many families in the microcontroller but here the ATMEGA 8A is used because it provides the high output with low input.

ATMEGA 8A PIN CONFIGURATION

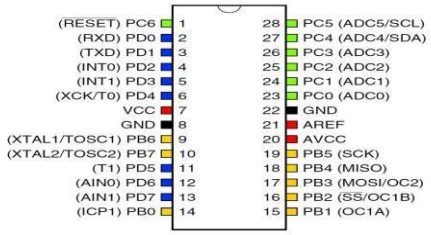

Fig3: PIN configuration of ATMEGA 8A

The operating voltage of the ATMEGA is 2.2-5.5 volts where the consuming input is low compared to other.It is performing with advanced RISC architecture with non- volatile memory segments.It allows 130 instructions which is normally high compared to other and it comprises of 16 bit address with 8 bit data. The data retention of the ATMEGA 8A is 20 years at 85^0 C and 100 years at 25^0C.The peripheral features includes two 8-bit Timer/Counters with Separate pre scalar, one Compare Mode One 16-bit Timer/Counter with Separate Pre scalar, Compare Mode, and Capture Mode. One of the special features of controller is Power-on Reset and Programmable Brown-out Detection with Internally Calibrated RC Oscillator.It can be varied with five sleep modes like Idle, ADC Noise Reduction, Power-save, Power-down, and Standby.

B. IR Sensor

IR sensor can acts as an object sensor . An linear IR sensor can cover the distance from few meter to hundred kilometer. It consist of both transmitter and receiver unit which are contolled with the help of microcontroller. The unit measured by this technique are ppm.

C.RS 232

Due to its relative simplicity and low hardware overhead (as compared to parallel interfacing), serial communications is used extensively within the electronics industry. Today, the most popular serial communications standard in useis certainly the EIA/TIA–232–E specification. This standard, which has been developed by the Electronic Industry Association and the Telecommunications Industry Association (EIA/TIA), is more popularly referred to simply as “RS–232” where “RS” stands for “recommended standard”. In recent years, this suffix has been replaced with “EIA/TIA” to help identify the source of the standard. We use the common notation “RS– 232”.

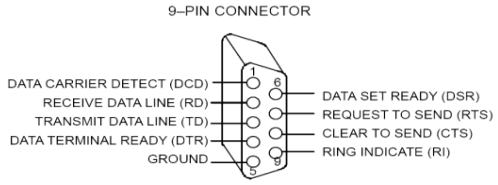

Fig 4. DB-9 Connector

D. LCD

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystaltwists the polarization of light entering one filter to allow it to pass through the other.

E. ULTRASONIC SENSORS HC-SR04

The HC-SR04 is an active ultrasonic sensor and contains a transmitter and a receiver. It is used to measure distance at which, objects are placed in front of it. The ultrasonic sensor transmits high frequency sound waves and waits for the reflected wave to hit the receiver. The distance is calculated based on the time taken by the ultrasonic pulse to travel a particular distance. The working principle of this device is shown in figure 2. There are different types of ultrasonic sensors with different transmission ranges and angles of detection. The HC-SR04 sensor work at frequency of 40 KHz and can measure distances of the objects in the range 2 to 400 cm with a 15° angle of detection.

I. CONCLUSION

In this paper, the vacant parking slot is detected based on the AVM system and the ultrasonic sensor. The ultrasonic sensor which is connected to the microcontroller will control and analysis the sensor and produce the appropriate result and displays in the LCD. The main advantage of this paper is providing time delay based parking. By using this the operator can find the exact timing of the slot to get vacant. In addition to this CO_2 sensor is placed in the parking slot to detect the CO content of the vehicle and it is informed to the driver.

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