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Intelligent Parking and management system using wireless sensor network

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***Abstract*— This paper introduces intelligent parking and management system with Raspberry pi. As we can see the number of 4 wheeler users in metro cities are day by day increasing and hence the parking problem in metro cities is also a major issue which need to be resolve, by this we can save the time and fuel consumption as well. My system will try to resolve this problem in an effective way The system will first detect the vacant parking slot and then display it on the lcd monitor and provide guidance to the driver using GUI and audio also.**

***Index Terms*— GUI(graphic user interface) ,Parking guidance system, management system, raspberry pi, VSDS(vacant slot detection system), WSN(wireless sensor network).**

I. INTRODUCTION

As day by day the population of the world is increasing and the life style of people are also changing due to the advancement of the automobile industry the numbers of vehicle users are also increases day by day. So in today's scenario it is very difficult to find a vacant slot in parking lot the problem become more severe if go in any metropolitan city. Because there is the shortage of parking space the owner of the car find it very difficult to get a vacant parking lot which leads to unnecessary wastage of fuel and time which increases air pollution also. My system provides an effective solution to this problem this system will help the driver to reach the vacant slot in minimum time The system uses wireless sensor network to send the data wirelessly

In today's scenario most of the parking lot have data for the number of vehicles that are coming and leaving the parking lot but proper management of parking lot is not considered. This paper proposed a system which will manage the parking lot such that the vacant parking lot can be managed very efficiently and it will guide the driver to the vacant parking lot through GUI and audio command also Here we have proposed a software implementation using wireless sensor network for management of car parking system without entering into the parking lot.

This system consist of IR sensors which will detect how many parking slots are empty. This information whether the slot is vacant or engaged is send through wireless sensor to the raspberry via microcontroller.

This system is especially true in the telematics field where WSNs can be used to provide useful information such as road condition and traffic speed and occupancy of a parking lot.

Currently, these information are detected using loop detectors and sensors which are wired. Furthermore, they are very expensive and it is difficult to install and maintain them.

Here, we present the WSN based Intelligent Parking and management system architecture which consists of the WSN based The Vehicle detection sub-system is used to detect the occupancy of a parking lot and report the result to the management sub-system. The management sub- system processes the gathered information and provides the information to the drivers. To evaluate the system, we implemented the WSN based Vehicle detection and experimented on the system with various kinds of cars. In addition**.**

The organization of this paper is as follows. In section 2 we focuses on the related work topics. In section 3 The block diagram of the system is. In section 4 the design of network is introduced section 5 will have the experimental results and interfacing of hardware structure conclusion in section 6.

II. RELATED WORKS

Lee, Yoon and Ghosh proposed a hybrid approach [1] For an intelligent parking system using a combination of ultrasonic and magnetic sensor. They demonstrated positive results through various real world experiments and showed that these hybrid solution are more practical and accurate. Though the aim goal was to count the number of vehicles on each floor and provide a cheap and accurate solution, the scope of their work restricts itself to vehicle detection using WSN than providing a smarter parking management solution

S. V. Srikanth [3], Proposed a Smart Parking (SPARK) Management System which provides advanced features like remote parking monitoring, automated guidance & parking reservation mechanism. Though prototype system, they proposed the architecture which satisfies the car parking management system requirement

Vipin Kumar verma,[6], proposes distributed traffic monitoring and controlling model using sensors and dedicated traffic servers. This model is described as basic role-oriented processes communicating though primitive interaction protocols. The model is aimed to provide an enabling communications framework upon which multi- agent system models can be organized and built to be used for an simulation of an road map and to estimate the traffic behavior (to provide information about the best routes). The model assists the drivers to get the desired destination taking into account the current situation of traffic characteristics. It gives the estimated arrival time and the corresponding distance between a start and an arrival point. Current traffic position information is obtained position using sensors. The information given by the advisory system has the form of self generated message according to the condition of traffic using the given algorithm

Iris-net, [12], Proposed a scheme using video cameras, microphones and motion detectors. These sensing devices were used to detect the availability of parking spaces. It acquires real time parking information through their web applications. However, it generate large amount of data resulting in high power scavenging and communication bandwidth. The main limitation of the system is high power consumption and may suffer from technical aspects.

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III. BLOCK DIAGRAM

TRANSMITTER

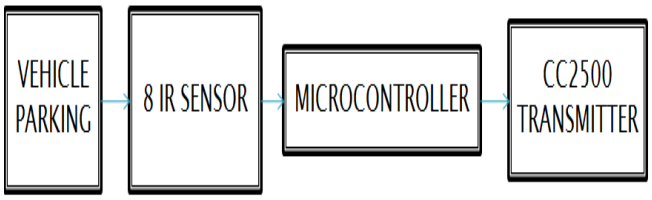


Fig 1 Transmitter side

RECEIVER

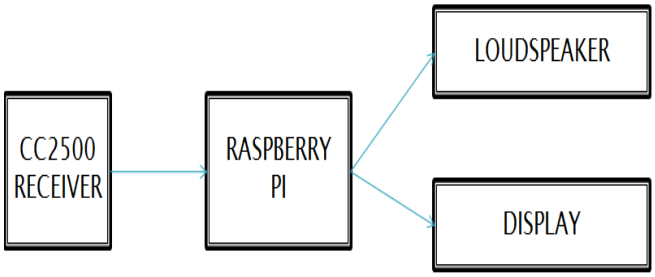


Fig 2 Receiver side

FLOW CHART

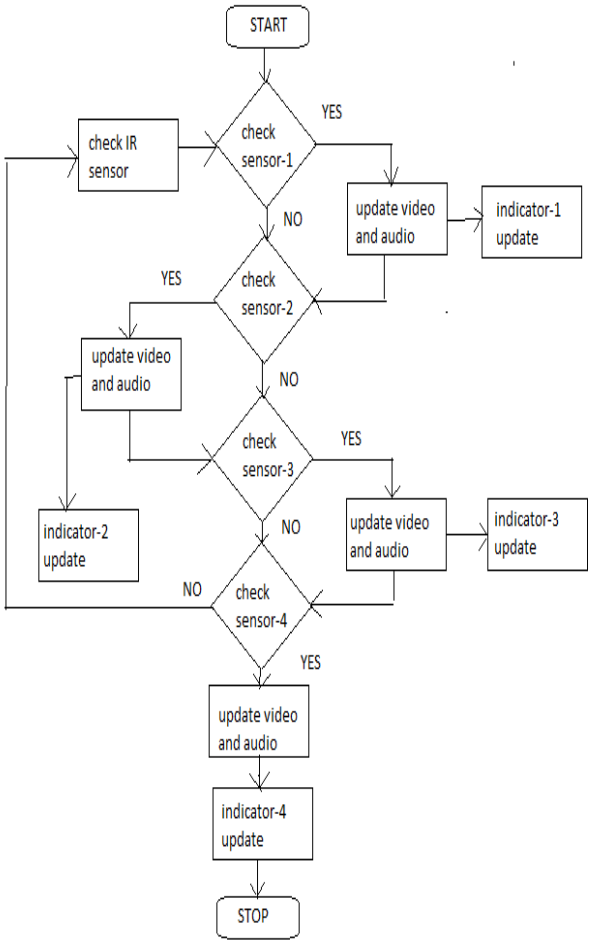


Fig 3 Flow chart

IV. DESIGN OF THE NETWORK

INFRARED SENSOR

An infrared sensor is an electronic device that emits and/or detects infrared radiation in order to sense some aspect of its surroundings. Infrared sensors can measure the heat of an object, as well as detect motion. Many of these types of sensors only measure infrared radiation, rather than emitting it, and thus are known as passive infrared (PIR) sensors. All objects emit some form of thermal radiation, usually in the infrared spectrum. This radiation is invisible to our eyes, but can be detected by an infrared sensor that accepts and interprets it. In a typical infrared sensor like a motion detector, radiation enters the front and reaches the sensor itself at the center of the device. This part may be composed of more than one individual sensor, each of them being made from pyroelectric materials, whether natural or artificial. These are materials that generate an electrical voltage when heated or cooled. These pyroelectric materials are integrated into a small circuit board. They are wired in such a way so that when the sensor detects an increase in the heat of a small part of its field of view, it will trigger the motion detector's alarm. It is very common for an infrared sensor to be integrated into motion detectors like those used as part of a residential or commercial security system. An infrared sensor can be thought of as a camera that briefly remembers how an area's infrared radiation appears. A sudden change in one area of the field of view, especially one that moves, will change the way electricity goes from the pyroelectric materials through the rest of the circuit. This will trigger the motion detector to activate an alarm. If the whole field of view changes temperature, this will not trigger the device. This makes it so that sudden flashes of light and natural changes in temperature do not activate the sensor and cause false alarms.

This sensor can be used for most indoor application where no important ambient light is present. For simplicity this sensor doesn't provide ambient light immunity. However, this sensor can be used to measure the speed of object moving at a very high speed, like in industry or in tachometer. In such applications, ambient light ignoring sensor, which rely on sending 40 KHz pulsed signals cannot be used because there are time gaps between the pulses where the sensor is 'blind'.

OBJECT DETECTION USING IR SENSOR

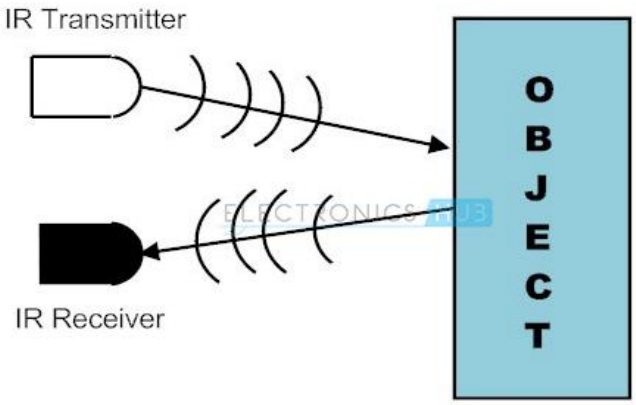


Fig 4 Obstacle detection using IR sensor

It is the same principle in All Infra-Red proximity sensors. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor.

ELECTRONIC CIRCUIT OF IR SENSOR

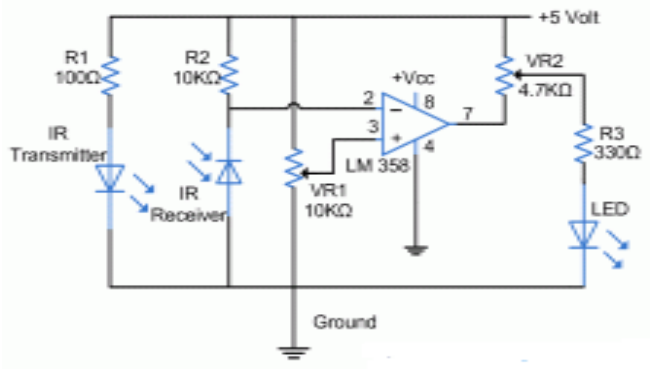


Fig 5 Electronic circuit of IR sensor

The transmitter section include an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, Therefore this output can be fed to a comparator circuit. Here an operational amplifier of LM 358 is used as comparator circuit.

when the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM358). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM358) goes high and the LED starts glowing. Resister R1 (100), R2 (10K) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like photodiode and normal LEDs respectively. Resistor VR1(preset=10k) is used to set the sensitivity of the circuit Diagram.

V. EXPERIMENTs AND RESULT

Hence the displaying of the vacant slot and path along with the audio command is shown using this hardware configuration.

After the arrangement of IR sensors and comparator circuit this is our hardware looks like

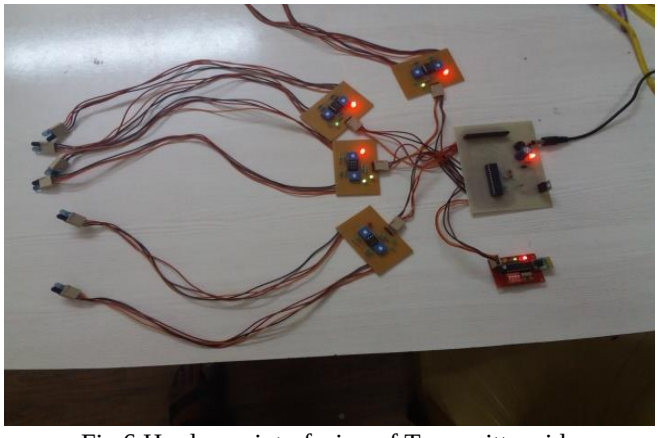


Fig 6 Hardware interfacing of Transmitter side

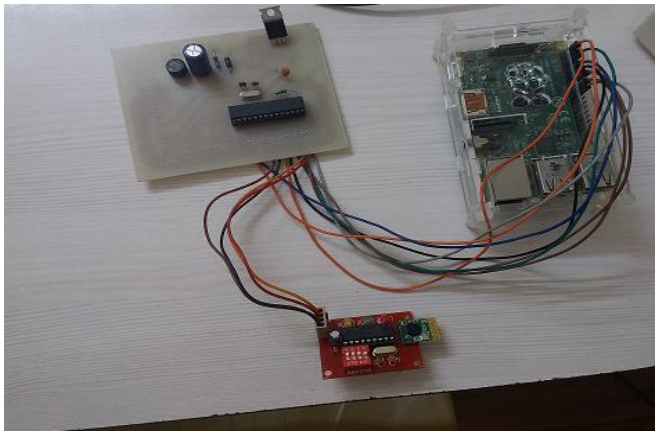
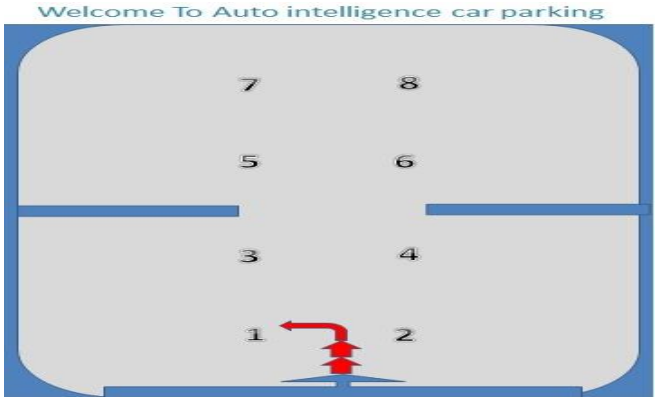


Fig 7 Hardware interfacing of Receiver side

The sensor will detect the vehicle and it sends the information to the microcontroller which will transmit it wirelessly using CC2500 and this will be received and displayed using Raspberry pi and the shortest path is calculated by raspberry pi and it will also give the audio commands to the user about the vacancy of the vacant parking lot. The GUI display is as shown



VI. CONCLUSION

This paper introduces a Intelligent parking and management system using wireless sensor network based on IR sensor nodes The customer can readily determine space availability prior to entering the garage and/or parking level.

• The Driver can plan for their transit to public transportation with such smart parking systems employed at Park

• The parking operator can use this system data to predict future parking patterns and trends..

• The parking operator can reduce the staffing requirements for traffic control within the facility

. • The system significantly reduces traffic and the resulting vehicle emissions and noise pollution as well by decreasing the time required for customers to locate open spaces

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