

Smart Parking System

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Abstract: In the era of modern world, where world's population is crossing around 8 billion, people's needs are constantly increasing. Shopping malls, Movie theatres are acquiring huge spaces and people going facing problems about parking there vehicles resulting in long traffic jams on main roads and frustration faced by the car drivers. Therefore, to overcome these problems smart parking systems are coming in hot. Using IOT, solutions are made to overcome the problems. Paper gives the brief idea about how smart parking systems are important and various inventions made in this field.

Introduction:

In the recent growth in economy and due to the availability of low price cars in market, an every average middle class individual can afford a car, which is good thing, but the consequences of this are heavy traffic jams, pollution, less availability of roads and place to drive the car.

One of the important concern, which is to be taken in accounting, is that problem of parking those vehicles. Though, if there is space for parking the vehicle but so much time is wasted in finding that exact parking slot resulting in more fuel consumption and not at all environment friendly. If somehow we figure out that the parking lot itself can give the exact vacant position of parking slot then it will be helpful not only for the drivers but also for the society. Therefore, many inventions are made to find solution.

From these many solution one is, "The Development and Simulation of smart parking system". The architecture consist of combination of software and hardware components mainly IOT based sensors such as proximity sensors, magnetic field sensors, LED displays and wireless communication devices. Using the IOT sensors and software strategic a novel system is defined which also consists of a mobile app, which navigate the route through the parking.

The system have drawbacks as high cost due to so many sensors used and implementation of the system is quite difficult task. In country like India where approximately 210 million vehicles on the road and variety of parking

structures are available, it will become difficult to implement such system.

Literature Survey:

One of the first experimental prototype of automatic parking system was developed on an electric car Ligier at INRIA (i.e. French Institute for Research in Computer Science an Automation) in the mid-1990s.

Year	Briefing
1990	The automatic parallel parking algorithm localizes a sufficient parking place along the roadside, attains a convenient start location for the car in front of the parking place, and performs a parallel parking manoeuvre. Automatic pulling out involves localizing an available space for the car motion within the parking place, placing the car at an appropriate spot at the rear of the parking place, and performing a Manoeuvre to pull out of the parking place into the traffic lane.
1992	Volkswagen proposed an automatic parking technology using four-wheel steering in its IRVW (Integrated Research Volkswagen) Future concept car, allowing it to move sideward for parallel parking. However, no commercial version of this technology was ever offered.
2015	Bosch plans to release a fully automated parking system. This driverless system allows the driver to get out of the car and activate an autonomous parking from a smartphone. The system will calculate a parking manoeuvre and monitor the surroundings.
2017	A group in Tunghai university, Taiwan, develops smart parking guidance system. System navigates driver to parking through voice navigation.

Proposed System:

Proposed system consist of IR (infrared) sensors using LM358N, esp8266 nodeMCU as wireless communication and raspberry pi3 as computation device and LCD displays. IR sensors are deployed at the every parking

place. Those sensors will sense the parking space and this data will send to esp8266. The data will now transmitted to raspberry pi3, which is connected to internet with the hard wire, will display the actual data. Whenever particular parking is vacant then on LCD it will be marked as green and occupied parking by red. This will reduce the time and traffic outside the mall. Most efficient thing is we do not need to modify anything just need to deploy the sensors at existing parking and forming a network for transmission of the data.

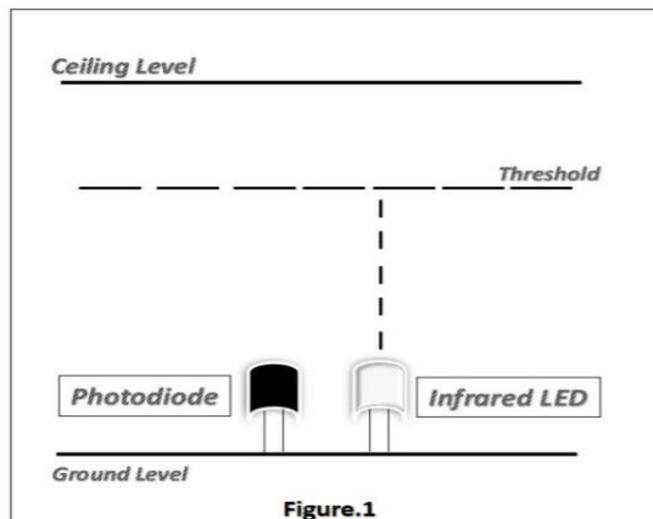
IR sensor:

We have made a self-need IR sensor. Sensor consist of an infrared LED as a transmitter and a photodiode as a receiver. IC LM358N is use to provide amplification for infrared LED and photodiode. IC LM358N is a double operational amplifier, which can also be used, for generating mathematical value of the signal. A 10KΩ multi turn preset is used to adjust the intensity of transmitter.

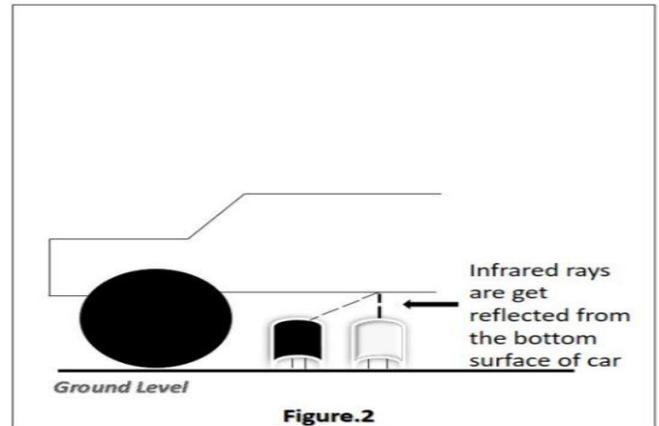
Working of the system:

1. Initial stage is sensing the place :-

IR sensor is a combination of infrared LED and a photo diode. Infrared light emits infrared rays in vertical direction as shown in figure.1,



Once the car come above the sensor, infrared rays will be reflected and will be catch by photodiode that will act as a receiver in sensor, (refer figure.2). LM358N will be use to amplify the voltage of transmitter and receiver.



2. Collection of data from sensors:-

Data from the sensors will be collected by esp8266. It is a nodeMCU.

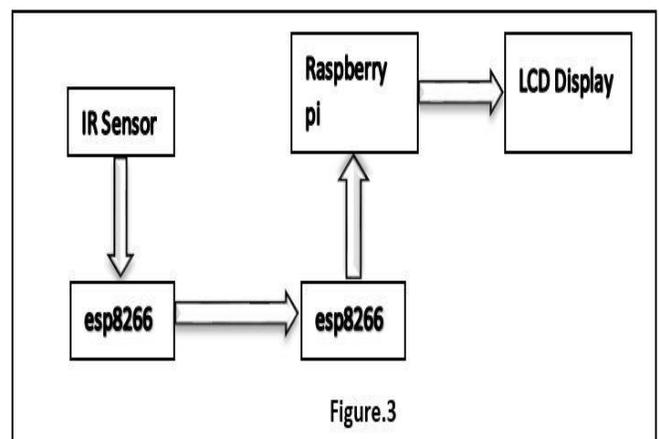
3. Transmission of Data:-

Data gathered by nodeMCU will be transmitted to computational device. In our case, Raspberry pi3. Total data transmission will carried out in wireless manner. It will be a client-server model.

4. Computation of data:-

- a. Raspberry pi is a tiny computer about the size of a credit card; the board features a processor, RAM and typical hardware ports, which can be seen on most of computers. That means a raspberry pi can be treated as mobile computer.
- b. Readings received from sensors will treat as an input for Raspberry pi, which will process it in the terms of vacant place or occupied.

System Architecture



Technical issues:

Overall system performance is depend upon the accurate reading of the sensor, speed of data transmission, valid data, time delay between consecutive reading. A network must be established between sensors and esp8266. One important issue also must be taken into consideration is that whenever data is transmitted over the Wi-Fi between two esp8266, that data either to be transmit in encrypted format else the whole network must be in stealth mode.

Battery life of sensors and sensor positioning are the issues to be tackled. As there will be large number of sensors, wiring them for energy is very tough task. As a result, these sensors must be battery powered with power management algorithm.

In bright sunlight, photodiode starts to malfunction, as when sunlight falls on photodiode it treats the sunlight as reflected infrared rays, reason is that sunlight contains some amount of infrared rays.

GUI to be provide is also a difficult task as each parking have different geographical structure and many parking place may have multi-floor structure, which can raise an issue.

Future Work:

Now we are close to develop proposed system. In future, we are about to develop a mobile application for proposed system, which will provide following features:

- I. User interface of the application will be very user friendly, which will make it easy to use.
- II. Using this mobile application one can check out various parking stations by only sitting inside home.
- III. For each separate parking station there will be sortation by name (depends on parking station owner).
- IV. This will again reduce the complications and time consumption as individual will be aware of actual parking station state.

Conclusion

For Indian cities to remain relevant, they need to become smarter and more connected. As number of vehicles in India have crossed 21 Billion count smart solutions are need to be implemented.

Proposed system is one forward step towards the smart city. As it will be fully automated so no human interference will needed.

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