

IoT BASED ADVANCE PARKING SYSTEM FOR SMART CITY

Mr. Owais Afzal, Mr. Ram Borkar, Mr. Anurag Jadhav and Ms. Sangita Auti

Mr. Owais Afzal, Dept. of E&TC, Dr. D. Y. Patil School of Engineering, SPPU, Pune, Maharashtra, India.

Mr. Ram Borkar, Dept. of E&TC, Dr. D. Y. Patil School of Engineering, SPPU, Pune, Maharashtra, India.

Mr. Anurag Jadhav, Dept. of E&TC, Dr. D. Y. Patil School of Engineering, SPPU, Pune, Maharashtra, India.

Ms. Sangita Auti, Dept. of E&TC, Dr. D. Y. Patil School of Engineering, SPPU, Pune, Maharashtra, India.

ABSTRACT

Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location. It's inevitable for the people to update with the growing technology. And generally people are facing problems on parking vehicles in parking slots in a city. In this study we design a Smart Parking System (SPS) which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area. And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere.

Keywords:- Internet of Things (IOT), Smart Parking System (SPS), Arduino, VB software

1. INTRODUCTION

The Internet of Things is a recent communication paradigm that envisions a near future, in which that objects of everyday life will be equipped with microcontrollers, transducer for digital communication and suitable protocol that will make them able to communicate with one another and with the user, becoming an integral part of the internet. The IoT concept aims at making the Internet even more immersive and pervasive. Furthermore, by enabling easy access and interaction with a wide variety of devices such as, for instance, home applications, surveillance cameras, monitoring. Internet of things was first introduced in 1999 at and first used by Kevin Ashton. As evolving this latest burning technology, it promises to connect all our surrounding things to a network and communicating with each other with less human involvement. Still internet of things is in beginning stage and there is no common architecture exists till today. [1] In the development of traffic management system, an intelligent parking system was created to reduce the cost of hiring people for optimal use of the resources for car owners. Currently, the common method of finding the parking space is manual where the driver usually finds a space in the street through searching for it manually. This process takes time and efforts and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. This study aimed to provide information about for the driver and to make a reservation minutes earlier using a supported device such as smart phone or tablet PCs.[2] The implementation of smart city is now becoming possible with the emergence of internet of things (IoT), which radically evolves the current network into a network of interconnected objects, such as sensors, parking meters energy measuring devices and actuators.[3] Finding parking space, traffic congestion and air pollution are the major problem which every city commuter has to face. One study reveals that 30% of the congested traffic in the city is contributed by cars that are searching for parking spots. If the drivers can be informed in advance about the availability of parking spaces at and around their intended destination, the traffic congestion can be efficiently controlled.

2. LITERATURE REVIEW

2.1 Review on IoT

Yogesh Tayade and M.D. Patil [1] described the system which can be used to find parking availability space, determine traffic and pollution updates. The smart parking solution proposed a system to emphasize pervasiveness, energy efficiency and security for IoT by bundling and integrating IoT technologies and services. There is lot of researches and implementations are currently being going on in all the respective areas. Thus there is no guideline or a boundary exists to define the definition of internet of things. So depending on the context, application the internet of things has different definitions. Shortly it is defined as the things present in the physical world or in an environment are attached with sensors or with any embedded systems and made connected to network via wired or wireless connections

2.2 Review on Smart City

Andrea Zanella et. al.[2] described the solutions available for the implementation of Urban IoTs. The discussed technologies are close to being standardized and industry players are already active in production of devices that take advantage of this technology to enable the application of interest. The enabling Technologies furthermore, have reached a level of maturity that allows for the practical realization of IoT solution and services, starting from field trials that will hopefully help clear the uncertainty that still prevents a massive adaption of IoT paradigm. A concrete proof of concept implementation, deployed in collaboration with city of Padova, Italy has also been described as a relevant example of application of the IoT paradigm of smart cities.

2.3 Review on Advanced Parking System in IoT Environment

Thanh Nam Pham et. al.[3] proposed a parking system that improves performance by reducing the number of users that fail to find a parking space and minimize the cost of moving to the parking space. Their proposed architecture and system has been successfully simulated and implemented in a real situation. The result shows that the algorithm significantly reduces the average waiting time of users for parking. The simulation the system achieve the optimal when most of the vehicles successfully found a free parking space. The average waiting time of each car park for service become minimal and total time of each vehicle in each car park is reduced.

3. PROPOSED SYSTEM

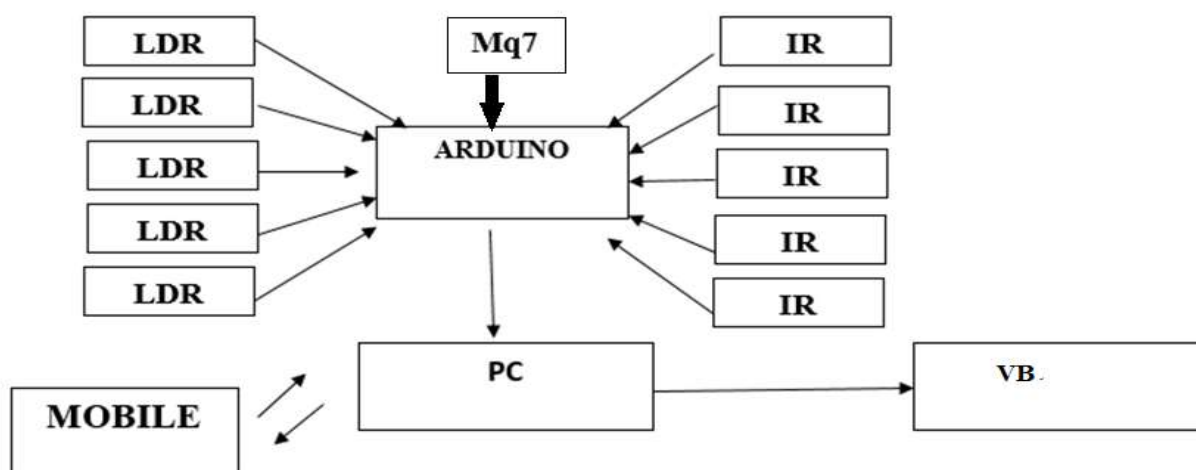


Fig 1. Proposed System

4. WORKING PROCEDURE

4.1 System overview-

Analog to digital conversion of variation of signal produced by sensors i.e. Infra-red sensor (IR) and Light Dependent Resistor (LDR).MQ7 Sensor for measuring the Carbon monoxide level in atmosphere.SPI protocol for Ethernet shield.Providing DHCP (Dynamic Host Control Protocol) IP.VB.net to Design the Graphic user Interface (GUI) to show the map.TCP/IP Protocol. Internet IP address with map for the parking space.

- **Data Acquisition :**

LDR sensors are placed on the parking space to detect presence of car in the parking. IR sensors are placed on the Road to measure the traffic density. And the MQ7 collects the information about the Carbon monoxide level in atmosphere.

- **Data Processing :**

Voltage variations are in analog form. This analog data is converted into digital equivalent of the analog voltage. This task is performed by the ADC which is inbuilt in our controller Atmega328

4.2 Initial Phase: In this phase, all the information regarding the project and the research papers that are related to the project have been studied and the data sheets of hardware were used to choose the particular components as per the projects requirement.

Implementation Phase: In this phase of the project, the practical implementation of the project is done by following the conventional PCB making process and building the hardware of the project. After implementation of hardware, the software development of the project is done and the simulation is performed and after successful simulation the program is dumped into the controller and then the project is finally tested to ensure correct operation

4.3 How the project will work:

First, our algorithm will adopt a mechanism to search car parks at the least cost. Second, we will adopt a mechanism for forwarding the vehicles to another car park if the current car park is full. We propose a network of car parks such that each park is a node in a network. Each node will obtain the information from the neighboring node, thus ensuring smooth movement of vehicles at low cost and increasing the probability of finding a free parking space. To make our system achieve better performance compared with other parking systems. We will evaluate the performance of our system through simulation and implementation. The results of the simulation must be close to mathematical models and achieve better performance than the other systems. The proposed system will reduce the number of vehicles failing to find a parking space and minimize the costs of moving to the car park. The cost defined here is the time that the user must wait for the service, thus helping users save time and money and reducing environmental pollution.

4.4 Hardware

(1)Arduino: Arduino is an open-source electronics platform based on easy-to-use hardware and software. [Arduino boards](#) are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the [Arduino programming language](#) (based on [Wiring](#)), and [the Arduino Software \(IDE\)](#), based on [Processing](#).

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of [accessible knowledge](#) that can be of great help to novices and experts alike.

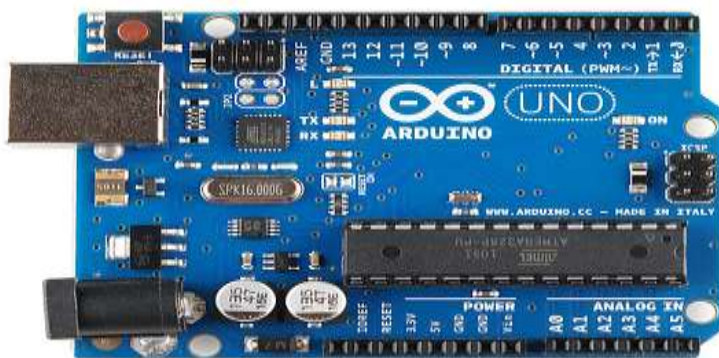


Fig 2. Arduino Uno R

(2) Sensors:

MQ7 Sensor:

This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-7 can detect CO-gas concentrations anywhere from 20 to 2000ppm.

The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC. This sensor has a high sensitivity and fast response time. Structure and configuration, basic measuring circuit Structure and configuration of MQ-7 gas sensor is shown as below (Configuration A or B), sensor composed by micro AL₂O₃ ceramic tube, Tin Dioxide (SnO₂) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-7 have 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

LDR Sensor:

A photo resistor or light dependent resistor is a component that is sensitive to light. When light falls upon it then the resistance changes. Values of the resistance of the LDR may change over many orders of magnitude the value of the resistance falling as the level of light increases.

resistance : 400ohm to 400Kohm

normal resistance variation: 1Kohm to 10Kohm (in the robots which i used for line following for identifying black and white strips)

sensitivity: about 3msec (Sensitivity is defined as the time taken for output to change when input changes, i got this reading by verifying with ADC interfaced with parallel port, sensitivity of LDR's is in milliseconds. This is the best sensitivity obtained to me).

Voltage ratings: I used it on 3V, 5V and 12V

IR Sensor:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED ([Light Emitting Diode](#)) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

4.5 SOFTWARE DESIGNING

Arduino Software (IDE): The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Writing Sketches Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port.

Visual Basic: VB.Net is a simple, modern, object-oriented computer programming language developed by Microsoft to combine the power of .NET Framework and the common language runtime with the productivity benefits that are the hallmark of Visual Basic. This tutorial will teach you basic VB.Net programming and will also take you through various advanced concepts related to VB.Net programming language.

Visual Studio 2015-Visual Basic is engineered for productively building type-safe and object-oriented applications. Visual Basic enables developers to target Windows, Web, and mobile devices. As with all languages targeting the Microsoft .NET Framework, programs written in Visual Basic benefit from security and language interoperability.

5. FLOWCHART

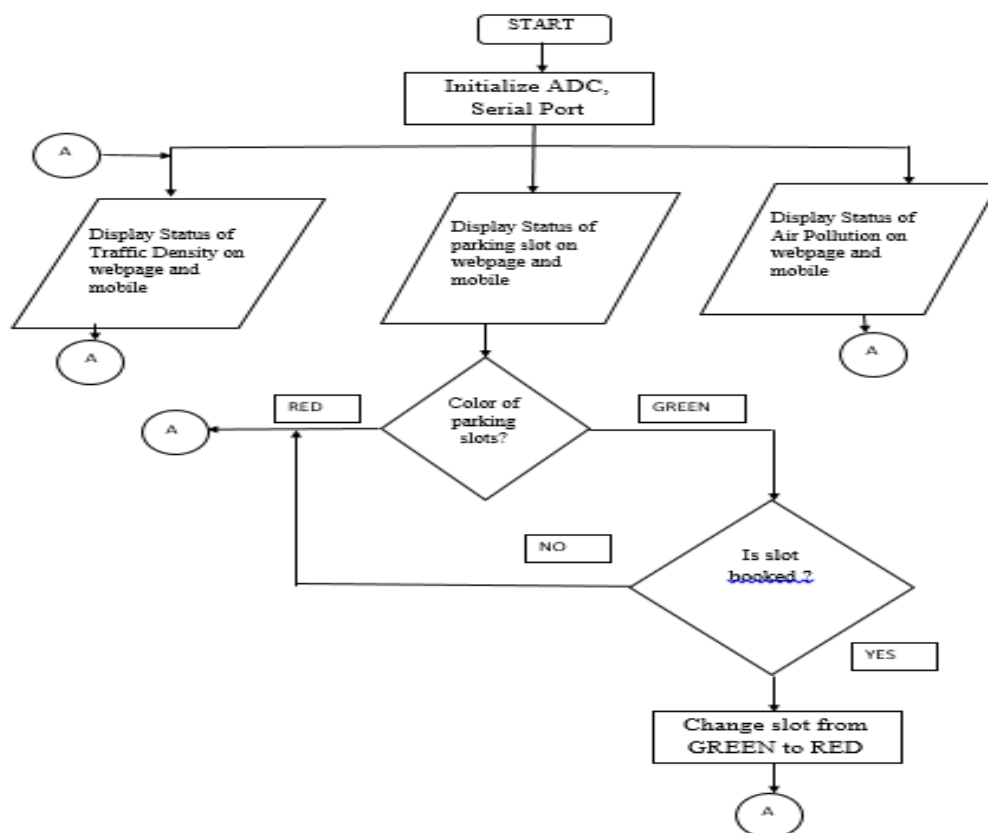


Fig 3: Flowchart

6. CONCLUSION

This designed automatic smart parking system which is simple, economic and provides effective solution to reduce carbon footprints in the atmosphere. It is well managed to access and map the status of parking slots from any remote location through web browser. Thus it reduces the risk of finding the parking slots in any parking area and also it eliminates unnecessary travelling of vehicles across the filled parking slots in a city. So it reduces time and it is cost effective also.

7. ACKNOELEDGMENT

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