M2M BASED COMMUNICATION FOR SMART PARKING SYSTEM

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ABSTRACT

In this paper, we have a tendency to explore the conception of the good parking system and their classes. The classifications of various existing systems are explained. The parking system handles varied technologies, and therefore the classes of these techniques square measure given. The functions of the nodes in wireless detector networks square measure classified. The storage of parking spaces creates a challenging problem. In this research, we implement a parking a simulation system to study operator's problems. An SPS not only tracks the number and locations of available parking spaces in a parking slot but also utilizes Machine-to-Machine communications (M2M) to provide drivers useful information.

Keyword: ***Categories of Smart parking system; Functions of nodes; Parking system technologies; Smart parking system.***

1. INTRODUCTION

With revolution in IT Industry in development countries, the shopping malls and other bazaars have increased a lot. The mainly problem in such industries is that providing adequate parking for their customers. Even in case of corporate companies, as the no of employees are increased to certain extent, providing parking to entire company has become troublesome. The parking lot of each and every person needs to be tracked, to maintain such complex systems. Even though parking systems are keeping track of vehicles hours, they have monitor how many more vehicles can be parked in particular floor which helps to fill the parking slots in a good way. To overcome this problem, A signal is sent which indicates the status of the particular slot (available/non-available) by using the sensor systems at each parking slots. The RFID is best suitable to address the above problem, where in the car parking system can be completely automated. Whenever a car arrives to park, the driver swipes the tag which helps in opening the gate and a counter is used to increment and display the available slots in that particular parking area. At exit, the counter will be decremented automatically once the vehicle exits the parking system. Using RFID reduces the time to process the receipts manually at the parking lot.

II.RELATED WORKS

The parking system is now implemented in our everyday activities. There square measure varied sorts of help concerned in parking systems. The driver has got to rummage around for a parking make time for automobile parking space. In order to scale back the hassle of the motive force, the parking systems provide guidance to the driver for parking the car. Based on this idea varied parking systems square measure developed. The information transmissions are made by mobile and web services in some systems then various sensors and technologies are used for implementing parking system. The parking application extends to reservation for parking, automatic payment for parking and identification of car and vehicle license plate recognitions using camera. The devices of parking system perform varied functionalities supported the technology of the parking system. Some of the functionalities square measure observance, collection of data, and transmission of data.

III.SMART PARKING SYSTEM

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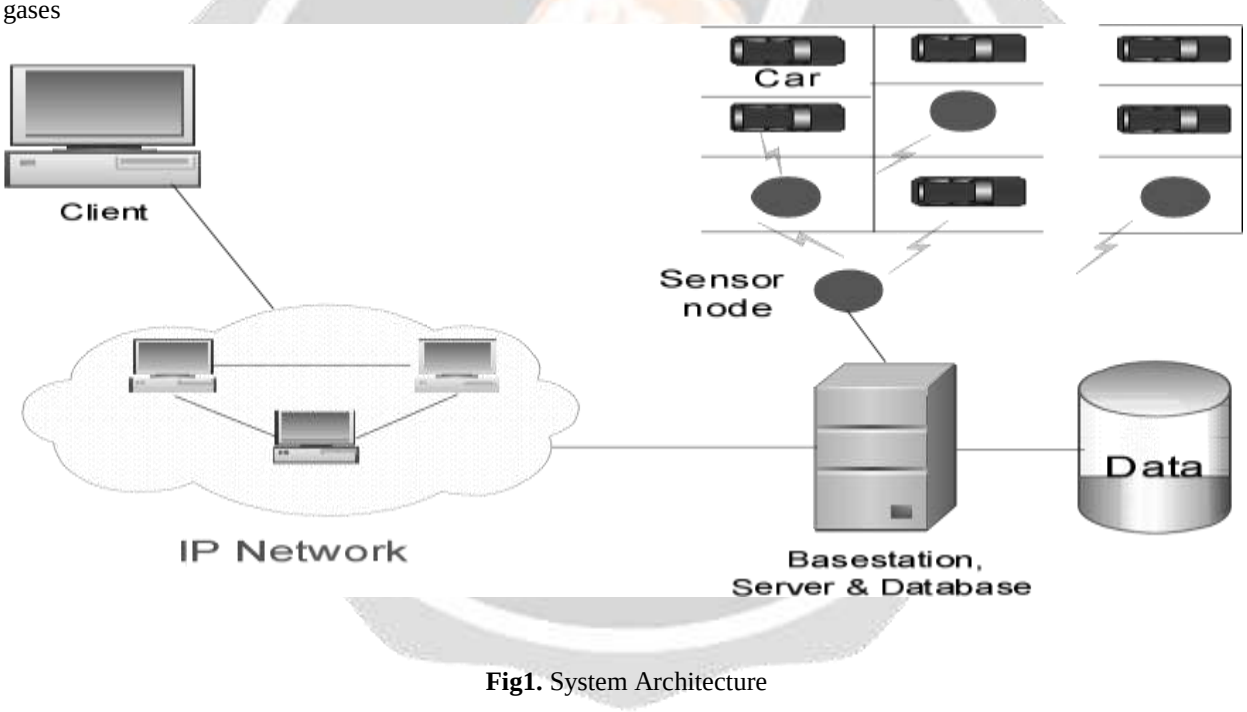

Fig1. System Architecture

IV.METODOLOGY

Design specifications of the project will be arrived based on the reviewed literature and study carried out. Design and Modelling of the project will be carried out using the ARDUINO tool based on the literature review and the study carried out. Performance estimation of the project will be analyzed based on the modelled design. Implementation of the project will be carried out using C and coding for embedded platform. Functionalities test will be carried out based on the design specifications, implementations specifications.

V.OBJECTIVES

Existing system is based on the Arduino and with this type of system, In present system the major problem in bigger corporate industries, shopping malls and many other industries is, knowing the available parking slot and a person to keep track of it. Which have been done manually this is waste of time.

To overcome the above problem we are implementing our project that is M2M BASED SMART PARKING SYSTEM .In our project we are using RFID module, microcontroller, sensor and displays for smart parking facility which saves the time. In this it won't require any person to keep track of parking slot and all are done automatically. The major problem in bigger corporate industries, shopping malls and many other industries is, knowing the available parking slot and a person to keep track of it. To overcome this problem a sensor node can be implemented at each parking slot and sending a signal whenever the particular slot is available/not available. In the manual process of parking, we have to wait for a parking slot and receipt. It is too time consuming process, so that we are using Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders.

To allot the parking slot for vehicles automatically in corporate industries, shopping malls and many other industries. To control the delay for parking vehicles. To understand the project and its implementation issues on embedded platform. To Design and model project and its associated subsystems in ARDUINO. To implement project on suitable embedded platforms and estimate its performance.

VI.SYSTEM COMPONENTS

Micro-controller, LCD Display, Power Supply unit, RFID reader, Infrared Sensors, Motor Driver, DC Motor, Operating System: Windows 7, Tool: Arduino IDE, Compiler: Arduino is a microcontroller board and is built on ATmega328. The board mainly consists of

1. 16 MHZ quartz crystal
2. 14 digital input and output pins out of which 6 pins are configured and used as PWM outputs.
3. A power jacks
4. A USB assembly
5. An ICSP header and a reset button
6. 6 Analog input pins

To start with the Arduino, we need to power it with a AC to DC adapter or a battery. The Arduino board can be connected to the personal computer via USB cable. We can work and program the Arduino without worrying too much about erroneous conditions as we can replace the chip just for a few bucks to start programming from the beginning.

The Arduino is also called as Genuino Uno where in the word "UNO" is an Italian word which signifies "ONE". This board was selected to spot the release of Arduino software (Integrated development environment) version 1.0. The earlier version 1.0 of the UNO is considered as the reference for the further release versions of Arduino which is remarkably shows the legacy of the same. It is the primary key version for many series of Arduino boards and as well as for the orientation model of Arduino platform

Table 1: Specifications of the components:

Microcontroller	**ATmega328P**
Operating Voltage	5V
Input Voltage (recommended)	7-12V

Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 Ma
DC Current for 3.3V Pin	50 Ma
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

VII.CONTEXT DIAGRAM

In this project we have proven the concept of Arduino Based car parking system. As we have a tendency to see within the nowadays everything goes automatic we've designed a system which can mechanically sense the entry and exit of cars with the assistance of microcontroller through the gate and then display the number of cars in the parking lot on LCD display. We have deployed a microcontroller Arduino which is used to sense the movement of cars and depending upon whether there is a availability of space to enter, it either opens the gate or not. There is also RFID module to provide security as users who have authority can swipe the RFID cards and get entry otherwise not. The Project Automatic Car Parking System using Arduino Microcontroller is an interesting project which uses Arduino as it is a brain out of system. The project is designed for car parking. The goal of this project is to automatically park the car for allowing the cars into the parking area. LCD display is provided to display the information about the authentication of user and it displays whether the slot is available or not.

At the entrance of the parking a RFID reader is mounted, which reads a unique ID tag. Then the signal sensed by the RFID module is transmitted to the microcontroller AT89S52 and it checks whether it is authorized user id or not.And opens the gate (Motor operated) only if the card is authenticated and if there is a parking space available. LCD is used for the user reference to wait for the authentication when RF tag is read. Infrared sensors sense the object at that particular slot and send a signal to LCD display. The availability of the parking slot is displayed on the LCD display.This helps the vehicle owner to take the vehicle to that particular slot instead of searching for a slot

available.The use of light is to save the power in parking area. The lights are turned ON/Brightened of Turned OFF/dimmed based on vehicle movement in that particular block. If no vehicle is passing in thatblock, the lights are turned OFF/Dimmed down to save power.

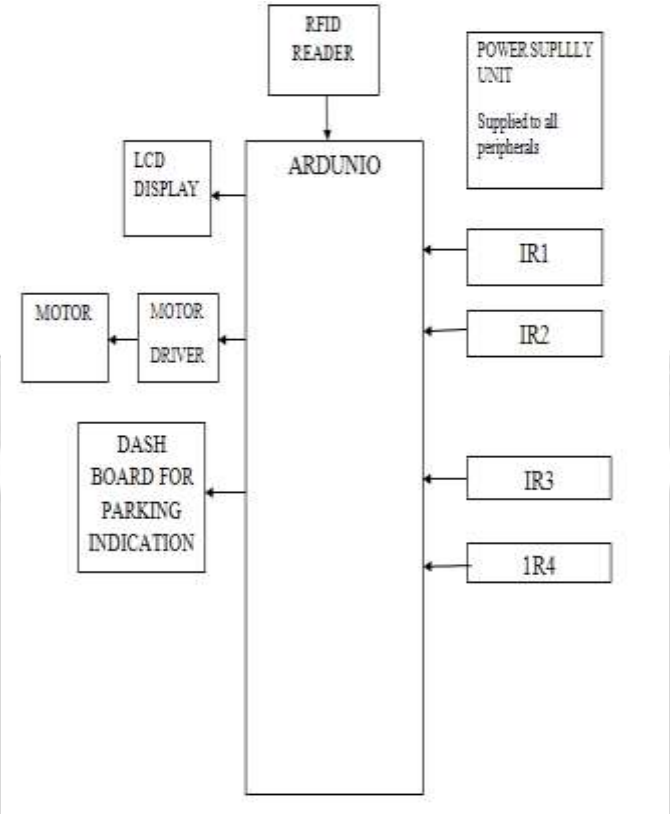

Fig 2: Context Diagram

VIII SOFTWARE & HARDWARE REQUIREMENTS

A RFID card basically consists of an antenna and a small integrated chip which is enclosed and looks like a small electronic device. This chip is capable of storing around 2Kilo bytes of data and not more this limit. These chips look like a tiny tag chip also called as integrated circuit which is integrated and connected with an antenna. Different types of tags are available in market such as hand tags, labeled tags and security tags.

The integrated circuit (IC) present inside the tag provides the memory and other enhanced features to the tag. This chip can be embedded with a unique ID also termed as tag identifier. It is a unique serial number assigned to the tag usually by the manufacturer of the chip. IT also includes a unique. Tracking identifier number which is termed as Electronic product code in short EPC. As the tag contains the memory, this is utilized to store the data in the form of EPC- electronic product code and other valid information which will be subsequently read by the RFID readers.

LCD:

There are many kinds of displays in electronics, one of the commonly used for prototyping is liquid crystal display. In this project, 16x2 LCD module is used, this is a basic module that is used in every basic prototype. LCD modules are alternative for light emitting diode and 7-SEGMENT modules. The reson preferred is, LCD is more accurate and easy for debugging. The cost of LCD is very much inexpensive. LCD don't only print characters but also can

program special characters and user defines custom made characters like smiles etc..which cannot be done using light emitting diode or 7-SEGMENT. Even though if it can be done also, it will be difficult to program the module.

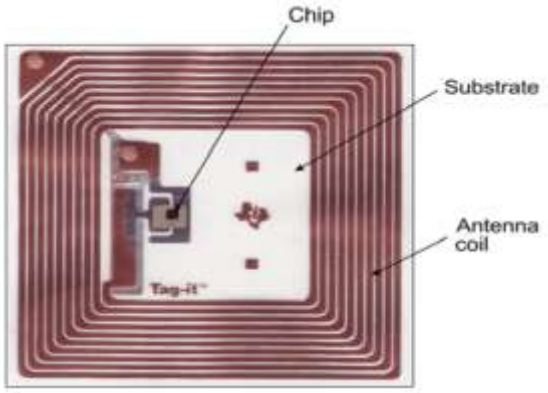

Fig 3: RFID Card

The meaning of 16x2 in LCD is, it is capable of displaying 16 number of rows and 2 number of columns. The amount of space taken to print one character in one address space is 5 row and 7 column pixel. The number of registers in LCD is two: they are command register and data register.
The working of those registers is as follows; the address is send to the command registers, which shows the path of the address for the data to be printed. It performs some of the operations like clearing display with one command, shifting of position (left or right), initializing it to perform tasks, control of the display etc. another register, that is data register is used to store the character that is to be set on particular space on display indicated by address register. There is universal standard for character that is ASCII.

IR SENSOR:

The abbreviation for IR is InfraRed. This is sensor used to sensor the obstacle. This sensor basically has two operating devices inside a module. In which, one emits the radiations which can reflect back if any object is sensed in the surround area. The object is detected from the heat radiated from the object or from the movement of the object. IR sensors detect only heat radiations of the object. These radiations cannot be seen through human eye, it can only be the sensor. These are called as infrared spectrum. The distance that can be sensed by the sensor is very low, as the frequency of it is low. The device that sends the signal is light emitting diode and that receives the signal back is a photo diode. The wave length of the emitting device is low. The receiver actually senses the light emitted by the light emitting diode.

Motor Driver:

The integrated chip used for driving DC motor is L293D, this IC helps DC motor to rotate in both the directions. This IC has 16 number of pins, this allows to connect two DC motors at a time and can be controlled individually. Meaning the one IC controls two DC motors. The king of structure or designed is in the form of H structure. Here voltage flows in both the directions to control two DC motors separately. Here enable pins are used for two different controls, to avoid over lapping. The motor works only when enable pin is triggered. The working of DC motor can be on both sides that are clockwise and anticlockwise. When voltage is applied on one side and grounded on other, it works on clockwise and applying ground on one pin and voltage on other will work on anticlockwise. So, concluding that H structure circuit is apt for driving a DC motor. The size of DC motor driver is small, so most of the robotic applications prefer L293D IC. The pin details is shown in the figures, this explains the pin details of motors connection.

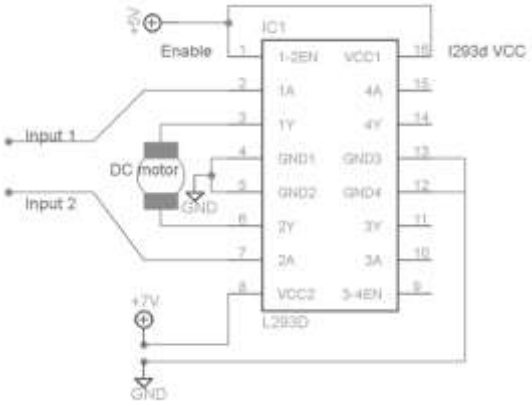

Fig 4: Motor Driver Pin Configuration

The number of inputs in a motor driver is four. As indicated in the figure above pin number 2 and 7 are inputs and outputs for that inputs is pin number 3 and 6. Pin number 1 had to be pulled up in order to trigger that motor. Other two inputs which is not representing in figure 4 is pin number 10 and pin 15. The output pins are pin 11 and pin 14. The enable pin 16 has to be pulled up in order to drive the motor. Making a HIGH and LOW on input pins drives the motor clockwise and LOW and HIGH drives anticlockwise respectively.

IX IMPLEMENTATION

At the entrance of the parking a RFID reader is mounted, which reads a unique ID tag. Then the signal sensed by the RFID module is transmitted to the microcontroller AT89S52 and it checks whether it is authorized user id or not And opens the gate (Motor operated) only if the card is authenticated and if there is a parking space available LCD is used for the user reference to wait for the authentication when RF tag is read. Infrared sensors sense the object at that particular slot and send a signal to LCD display through the controller .The availability of the parking slot is displayed on the LCD display. This helps the vehicle owner to take the vehicle to that particular slot instead of searching for a slot available .The use of light is to save the power in parking area. The lights are turned ON/Brightened of Turned OFF/dimmed based on vehicle movement in that particular block. If no vehicle is passing in that block, the lights are turned OFF/Dimmed down to save power.

ADDING THE LIBRARIES

Adding the libraries liquidcrystal.h, softwareserial.h and string.h libraries to the code so to access the inbuilt functions required to display the data in 16x2 liquid crystal display, serial communication and string operations respectively

```
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
#include <String.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
```

INITIALIZE PINS FOR MODULES

The Pins 6,7,8,9 are configured for IR sensors and the pins 13 and 10 is configured for the dc motor.

```
int IR4 = 9;
int IR3 = 8;
int IR2 = 7;
int IR1 = 6;
int MOTOR1_1 = 13;
int MOTOR1_2 = 10;
```

DECLARATION OF THE MODULES

All the IR sensor pins works in input mode ad dc motor pins are declared to work in output mode.

READING DATA FROM RFID

```
if(Serial.available()) {
  for(i = 0 ; i < 12 ; i++)
  {
    Read_RFID[i] = Serial.read();
    delay(100);
  }
   Read_RFID[i] = '\0';
  lcd.setCursor(0, 0);
  lcd.print(Read_RFID);
  delay(2000);
}
```

The RF Tag is read by the RFID and is stored in an array.

READING IR STATUS

```
ReadIR1 = digitalRead(IR1);
ReadIR2 = digitalRead(IR2);
ReadIR3 = digitalRead(IR3);
ReadIR4 = digitalRead(IR4);
```

The digital read function reads the status of the IR sensor and stores in variable memory. 0 is stored for LOW signal and 1 is stored for HIGH signal.

OUTPUT DISPLAY ON LCD

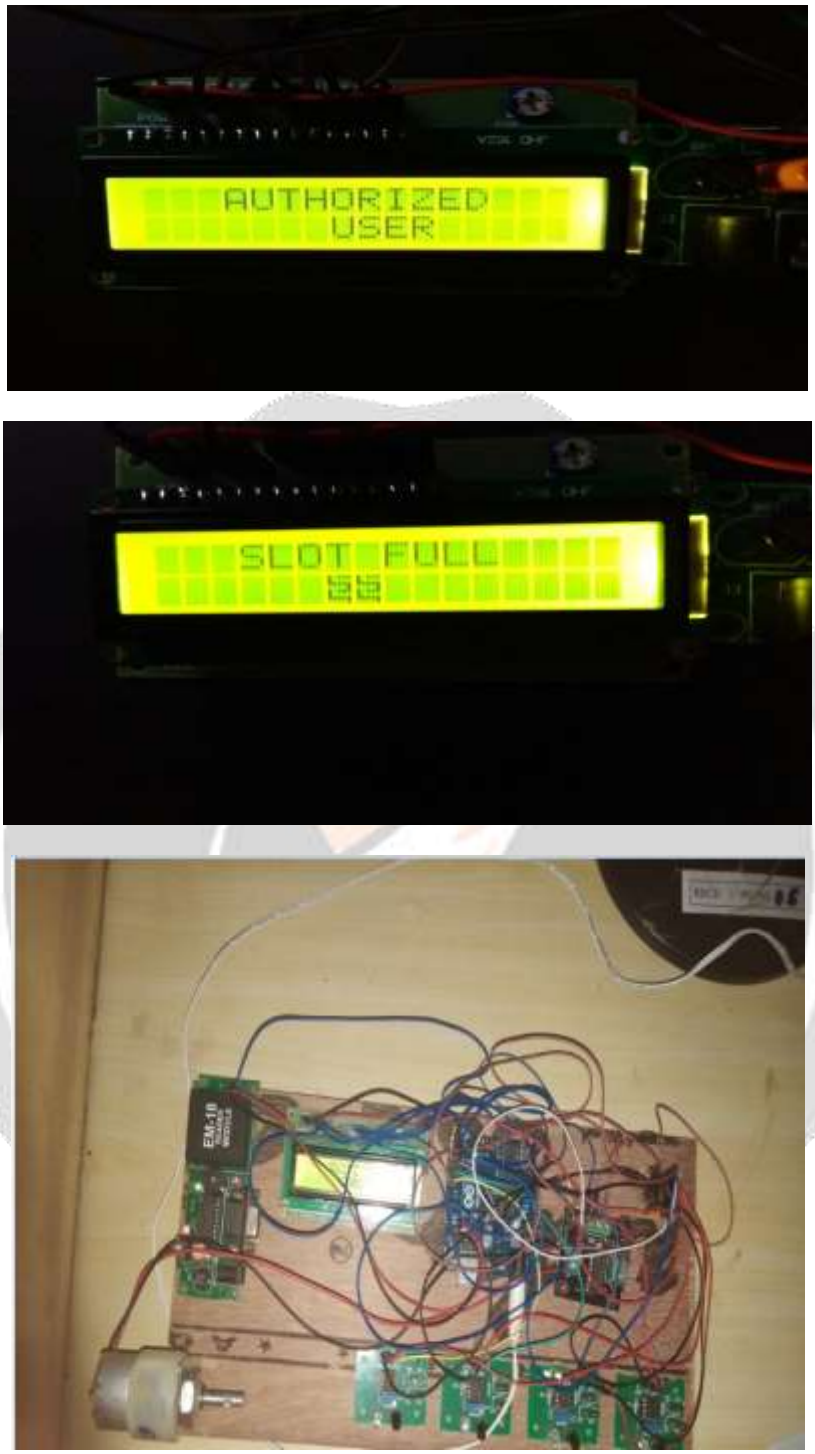

Fig 5: Hardware Implementation

X. CONCLUSION

Using the technologies of parking system, we can implement parking system according to various environments. And we can use types of sensors based on their capacity and efficiency. Based on the functionalities of sensors, they are deployed in the parking systems. As per the proposed system the automatic car parking system was upgraded to

"Displaying the status of the parking area on the LCD at the entrance". To know the status of the parking area the inputs were taken from the IR Sensor in our project to prove the concept

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