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INTELLIGENT PARKING SLOT IDENTIFICATION SYSTEM IN COMMERCIAL COMPLEX USING IoT

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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. Index Terms- Internet of Things (IOT), Smart Parking System (SPS), Raspberry pi, pi-camera, Raspbian OS

Keywords - .Raspberry pi,USB Camera,DC Motor,RFID Module,IR Sensor,Linux OS

I. Introduction

In recent research in metropolitan cities along with increase in population there is high vehicle density on roads. Hence this leads to annoying issue for the drivers to park their vehicles as it is very difficult to find a parking slot. The drivers usually waste time and effort and end up parking their vehicles finding a space on streets through luck. In worst case, people fail to find any parking space especially during peak hours and festive seasons.

Most of the time when users go to malls and commercial complex, they experience that there is a limited space for parking spots especially on prime hours. Hence, there is a desperate need of a robust parking system that will enable us to reserve the parking spots. For that it is necessary to build a centralized system to gather all the information on parking spots of malls, commercial complexes, and multilevel car parking systems. According to the International Organization of Motor Vehicle Manufacturers (OICA), the number of cars produced in 2014 alone stands at 60 million. With the explosive growth in automobiles, on-street parking will soon disappear, given the constraints on road space. Hence there is a desperate need of multilevel car parking and which should be smart also.

The common problem that every person come across in their complex system to find the available parking slot for their vehicle. In the development of traffic management systems, an intelligent parking system was created to reduce the cost of hiring people and for optimal use of resources. The most common method used is to find the parking space manually where the driver usually finds a free space in the particular area.

II. Existing System

The existing system has facility which is irrespective of anyone registration required. The user needs only to type a specific formatted message into the message box and send it to a provided number. Then server gives the feedback to user about the parking space details with respective address provided by the user.

III. Proposed System

The proposed system wirelessly transfers data. It restricts user entry, as only users with registered numbers can enter the parking slot. It allows pre-booking. The system allows users to give individual parking preferences. The system checks if any parking slot is free and finds best available parking slot according to user's preference.

The RFID card is made to store information like the car's registration number, car owner's name. An online database is maintained containing car's registration number, owner details (name, phone, parking preference, username and password for website, available balance), time of entry and exit. The user is allowed to choose a parking slot based on his preference of least walking distance from the elevator, nearest parking slot (least

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driving distance), or security (total coverage/partial coverage of the slot by CCTV cameras).

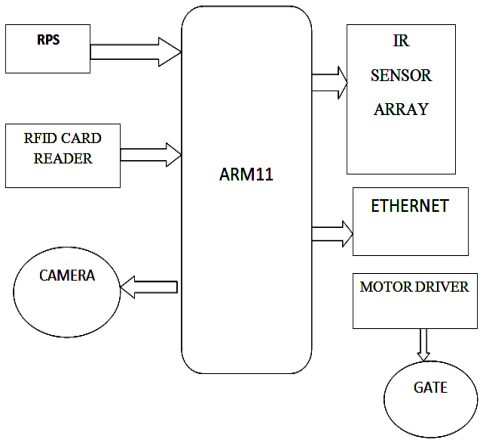

Fig.1: Proposed block diagram

A. Raspberry Pi

Raspberry pi B is a portable, powerful and minicomputer. Programmable PC that runs in open-source Robot operating system. The board consists of Video Core IV graphics processing unit (GPU), ARMv7-compatible quad-core one, 512 MB of RAM. It has a Micro SD to boot media and for persistent storage. One powerful feature of the Raspberry Pi is the row of GPIO -General Purpose Input/output pins along the edge of the board (refer Fig.1.1). These pins are a physical interface between the Pi and the outside world. At the simplest level, these are called as switches. Seventeen of the 26 pins are GPIO pins; the others are power or ground pins.

B.USB Camera

The type of camera used here is an USB camera which has recording function built-in and can thus record directly to any standard storage media, such as SD cards, NAS (network-attached storage) or a PC/server. The camera feeds or streams its image in real time to a computer or a mobile using network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via Wi-Fi. When sent to a receiver side, the video stream is saved in cloud.

C. DC Motor

The DC motor is connected to a set of four wheels and is responsible for the movement of robot. A DC motor is a class of electrical machine that converts direct current electrical power into mechanical power. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings.

D. RFID MODULE

Radio frequency identification is a powerful emerging technology that enables companies to achieve total business visibility. By knowing the identity, location and conditions of assets, tools, inventory, people and more, companies can optimize business processes and reduce operational costs. Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves.

E. IR SENSOR

IR 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.

Then all you have to do is to pick-up the reflected IR light. For detecting the reflected IR light, we are going to use a very original technique: we are going to use another IR-LED, to detect the IR light that was emitted from another led of the exact same type. This is an electrical property of Light Emitting Diodes (LEDs) which is the fact that a led produce a voltage difference across its leads when it is subjected to light. As if it was a photo-cell, but with much lower output current. In other words, the voltage generated by the leds can't be - in any way - used to generate electrical power from light, It can barely be detected. that's why as you will notice in the schematic, we are going to use a Op-Amp (operational Amplifier) to accurately detect very small voltage changes.

F. LINUX Operating system

Linux or GNU/Linux is a free and open source programming working framework for PCs. The working framework is a gathering of the fundamental guidelines that tell the electronic parts of the PC what to do and how to function. Free and open source programming (FOSS) implies that everybody has the flexibility to utilize it, perceive how it works, and changes it.

G. QT EMBEDDED FRAME WORK

Qt is a cross-stage application system that is generally utilized for creating application programming with a graphical UI (GUI) (in which cases Qt is delegated a widget toolbox), and furthermore utilized for creating non-GUI projects such as command-line devices and consoles for servers. Qt utilizes standard C++ however makes broad utilization of an uncommon code generator (called the Meta Object Compiler, or moc) together with a few macros to advance the dialect.

IV. Working Principle

In this project, we are giving the complete description on the proposed system architecture. Here we are using Raspberry Pi board as our platform. It has an

ARM-11 SOC with integrated peripherals like USB, Ethernet and serial etc. On this board we are installing Linux operating system with necessary drivers for all peripheral devices and user level software stack which includes a light weight GUI based on XServer, V4L2 API for interacting with video devices like cameras, TCP/IP stack to communicate with network devices and some standard system libraries for system level general IO operations. The Raspberry Pi board equipped with the above software stack is connected to the outside network and a camera is connected to the Raspberry Pi through USB bus.

The architecture of the web server has the following layers.

- In the lower level the web server has the physical hosting interfaces used for storing and maintaining the data related to the server.
- Above the Physical hosting interface the server has HTTP server software and other web server components for bypass the direct interaction with the physical interaction with the lower levels.
- The final layer has the tools and services for interacting with the video streams which includes the Image codec and storing interfaces, connection managers and session control interfaces etc.

After connecting all the devices power up the device. When the device starts booting from flash, it first load the linux to the device and initialize all the drivers and the core kernel. After initialization of the kernel it first check weather all the devices are working properly or not. After that it loads the file system and start the startup scripts for running necessary processes and daemons. Finally it starts the main application.

When our application starts running it first check all the devices and resources which it needs are available or not. After that it check the connection with the devices and gives control to the user. The board continuously reads data from the camera and at the same time it reads the data from the sensors. The scheduler is monitoring the process dedicated for camera reading and sensor reading. The camera read image and sensor values with scheduler information will send to the web server. There the user in front of the web server will monitor the priorities and the sensor and camera data. Whenever the user wants to change the priorities of the processes then using the web interface he can change the priorities. Whenever change is occurred then the web server sends the modified signals to board. Whenever the board got the modification, it will send the scheduler to change the priorities

ADVANTAGES:

1. Low support cost,
2. Easy to Implement
3. Low Power Consumption
4. Controlling is done using Web Technologies

APPLICATIONS:

1. Airports
2. Shopping Malls
3. Colleges
4. Industries

V. Future Scope

- The cost of ARM11 is more that's why in future we can implement this system using ARM CORTEX A8, Beagle bone etc as well as updated processors with high frequencies will work fine.
- As the storage space is also less in future we can also record these live streaming data by connecting external memory storage.
- We can complete our project using wireless technology.
- In future we can provide more security to data by using encryption, decryption techniques.

VI. Conclusion

A successful implementation of this project would result in less traffic and chaos in crowded parking spaces like malls and business buildings where many people share a parking area. The automated parking fee system would allow people to travel without cash. It provides drivers with Also, as it would reduce the waiting time, long queues, tension, stress and increase the efficiency of the parking system. As the Smart Car Parking System Requires minimal manpower, there are minimum chances for human errors, increased security in addition to a swift and friendly car parking experience for drivers.

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