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Smart Parking System Using IOT and WSN

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Abstract

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 for car-park owners. Currently, the common method of finding a parking space is manual where the driver usually finds a space inthe street through luck and experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in capacity with high vehicle density. The alternative is to find a pre-defined car park with high capacity.

The base paper implements a system prototype with wireless access in an open-source physical computing platform based on Arduino with RFID technology using a smart phone that provides the communication and user interface for both the control system and the vehicles to verify the feasibility of finding free parking space using internet and cloud technology.

INTRODUCTION

An embedded system is a special purpose computer system that is designed to perform very small sets of designated activities. Embedded systems date back as early as the late 1960s where they used to control electromechanical telephone switches. The first recognizable embedded system was the Apollo Guidance Computer developed by Charles Draper and his team. Later they found their way into the military, medical sciences and the aerospace and automobile industries.

Today they are widely used to serve various purposes like:

- Network equipment such as firewall, router, switch, and so on.
- Consumer equipment such as MP3 players, cell phones, PDAs, digital cameras, camcorders, home entertainment systems and so on.
- Household appliances such as microwaves, washing machines, televisions and so on.
- Mission-critical systems such as satellites and flight control.

The key factors that differentiate an embedded system from a desktop computer:

- They are cost sensitive.
- Most embedded systems have real time constraints.
- There are multitudes of CPU architectures such as ARM, MIPS, PowerPC that are used in embedded systems. Application-specific processors are employed in embedded systems.
- Embedded Systems have and require very few resources in terms of ROM or other I/O devices as compared to a desktop computer.

In the existing system the Lab monitoring system is design and controlled by using RF technology which can monitor and control the system inside the lab only in places where network availability is more. They are bit more costly because cost of components is increased. Not so easy to implement as you have to

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take great care of noise, Because of antennas it is bulkier.

The proposed method is used to overcome the drawbacks present in existing method. Here we are using ARM Intelligent Monitoring Center which uses Samsung's processor as its main controller. The environmental conditions present inside the lab can be monitored using sensors like temperature, gas and LDR. All the sensors are connected to sensor board.

From the sensor board we are sending monitored values to control room (ARM board) through RS232 serial cable. The serial cable is connected to one of UART port of ARM board. Whenever a person is entered inside the lab, the person's image can be captured by camera and send it to controller.

The controller transmits the data to remote PC through Ethernet by using FTP. FTP is a protocol through which users can upload files from their systems to server. Once data is placed at server we can view the data at remote PC (with internet) on web page with unique IP address. We can view continuous streaming of video as well as senor's data.

If we want to control the devices based on sensor's information we can control through web page from remote location using HTTP protocol. HTTP protocol continuously requests the server for control (turn on or turn off) the devices. In this way we can monitor and control the devices through remote PC.

PROJECT DESCRIPTION

Aim-The main aim of this project is todesign a smart parking system with efficient devices including raspberrypi, Arduino microcontrollers, Zigbee modules and relay boards.

Implementation-This project is implemented ARM11 Raspberry pi and Arduino developed boards interfaced with IR Sensors, ZIGBEE.

Existing System-The base paper uses RFID Technology to identify free space. In this system every driver has to carry their RFID tag which will be read at entrance and exit. In case driver forgets his card, his car will not be able to enter the parking lots. If such a car is allowed to park then other users who are looking for free space online will get wrong information about the free space.

Proposed System-We are proposing to use IR sensors at every parking space to find its status (FREE / OCCUPIED). In such a system there is no need for user to carry any card and hence no misleading information to other drivers.

Hardware Description

ARM11, Arduino, IR Sensor, ZIGBEE

Software Description

OS: Embedded Linux, **Language:** C/ C++, **IDE:** Qt Creator.

Block Diagram

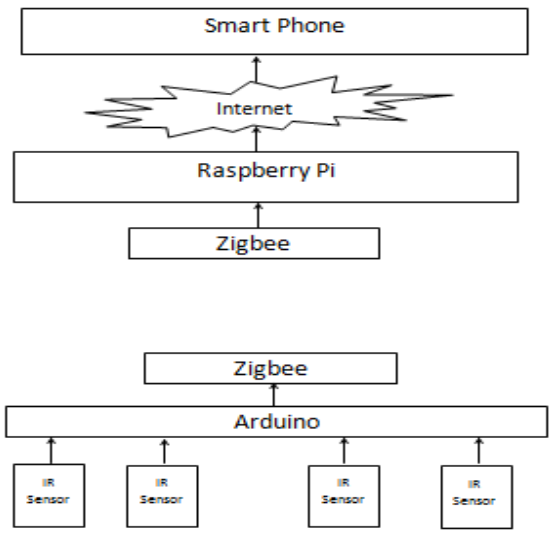

Fig 1: Block diagram of smart parking system using IOT and WSN

PRINCIPLE OF OPERATION

In this project, we are giving the complete description on the proposed system architecture. Here we are using

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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.

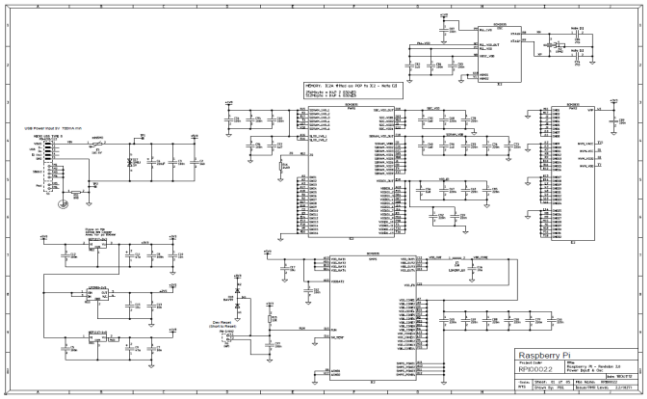
Above the Physical hosting interface the server has HTTP server software and other web server components for bypass the direct interaction with the physical interaction with the lower levels.

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.

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 checks the connection with the devices and gives control to the user.

Circuit Diagram and its overall operation:



The Interface for the user has the following things.

- A label for displaying the image which is coming from the image.
- Text-boxes for showing the sensor values.

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.

RESULTS

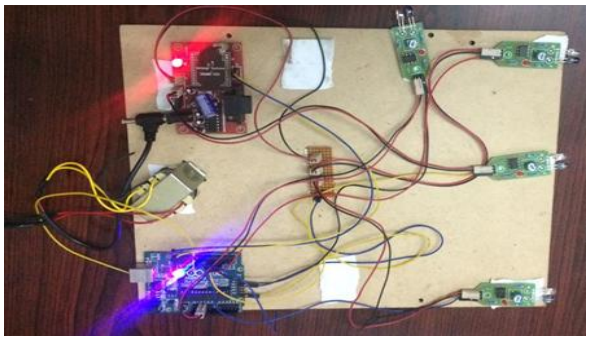


Fig 2: Hardware Circuit of the proposed system

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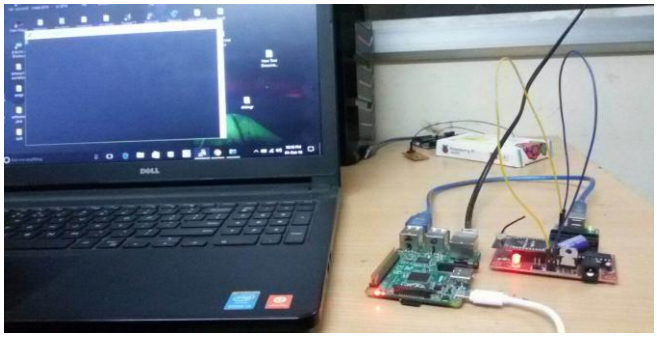

Fig 3: output can be seen on laptop

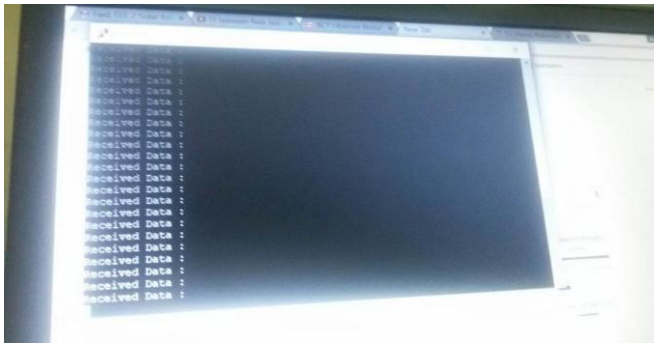

Fig 4: Showing Received Data

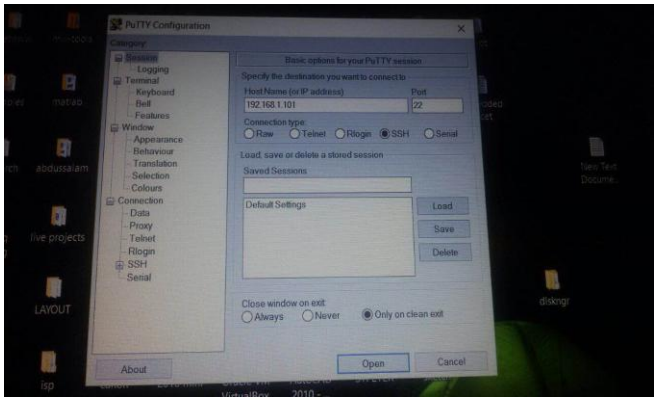

Fig 5: IP ADDRESS USED

Applications:

- Remote device control, automated control of home appliances, Surveillance

Advantages:

- As ARM11 CPU is used, future modification is done easily according to our need.
- It can be modified & can be applied to other automation applications also.

CONCLUSION

The paper onSmart Parking System using IoT and WSN has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used and tested.Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.Secondly, using highly advanced ARM11 Processor board and with the help of growing technology the project has been successfully implemented.

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.

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