An Intelligent Parking Guidance and Information System with ARM9 Microcontroller

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Abstract-   This paper introduces an intelligent parking guidance and information system with ARM9 microcontroller. The parking problem in big cities, especially the mega-cities, has become one of the key causes of the city traffic congestion. The Parking Guidance and Information System (PGIS) is considered to be an effective way to improve parking situation. In general parking systems are designed by using different sensors like IR or ultrasonic sensors. By using these sensors they identify whether parking slot is free or it already contains car. But actually these sensors are not used for detecting particularly car they can detect any object. .By using image processing technique it identifies car only or if any object other than car is at parking slot it don't considered that slot is booked.
In this paper we also introduce an important feature like fetching the above said status of the parking slot on the web or Internet and status can updated for particular time. In this way the car parking system is more easier and flexible for the person to view and book the slot from anywhere. It is done by using Image Processing, Embedded Linux, ARM9,GSM.

Keywords –Image Processing, Embedded Linux, ARM9, GSM.

I. INTRODUCTION

The main objective is to design an intelligent parking guidance and information system with ARM9 microcontroller which can run on an embedded system. To design this parking guidance system we are using ARM9 micro controller, webcam and GSM module.

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In this paper, we also introduce an important feature like fetching the above said status of the parking slot on the web or Internet and status can update particular time. In this way the car parking system is more easier and flexible to their person view and book the slot from any where.is done by means of using Image Processing, Embedded Linux, ARM9, GSM.

II. PROPOSED SYSTEM

The main objective is to design a parking guidance and information system is using S3C2440 which is a 32-bit micro controller has feature of image/video processing by using various features and classification algorithms have been proposed for detecting only car at particular parking slot. By using image processing technique it identifies car only or if any object other than car is at parking slot it don't considered that slot is booked.

To design this car parking system we are using ARM9 micro controller, webcam and GSM module. The webcam finds the free slots for parking. It can capture slots at a time and display it on Touch screen LCD. If any car is present in the slot it will display red color box on LCD. If the slot is free it will display empty slot number on the

LCD. If any person wants to book the slot, send slot number through SMS. The controller receives the slot number information through GSM. After receiving the information the controller keeps the slot free for minutes time, display black color box on LCD and also sends message as slot booked to that particular person.

2.1 . Block Diagram–
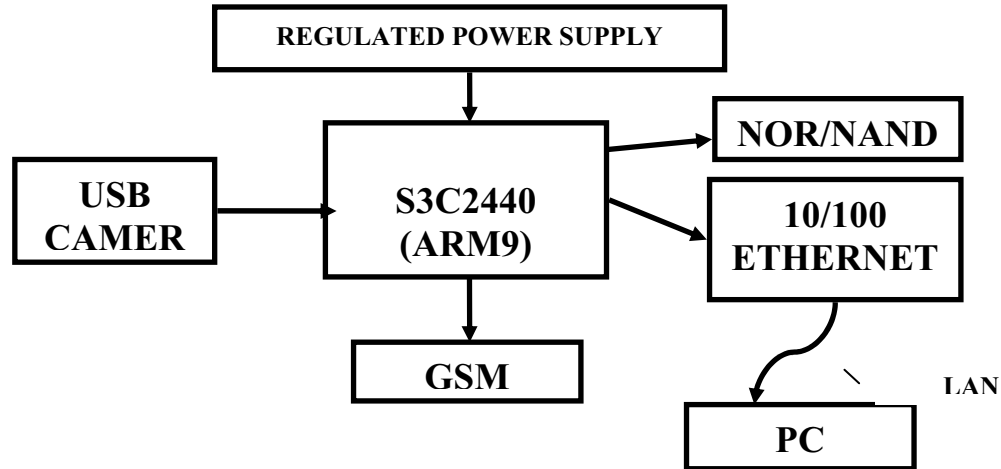
In this paper we also introduce an important feature like fetching the above said status of the parking slot on the web or Internet and status can updated for particular time.In this way the car parking system is more easier and flexible to their person view and book the slot from any where.

2.2. Flow Chart –

The working of the project can be explained in the following steps:
1) Initially Power supply is switched ON in the ARM9 boars & as well as GSM .
2) In this project two stages are there :
   a). Car Detection:
   b). If Empty Slot:

Car Detection

3). Retrive the image from the camera.
4). Then detect cars in that image.
5). After that detect the position of cars.
6). Store generalized eigen values in XML file.
7) If the position found then drawn the rectangular on oppropriate slot.
8). If not found then go to car positon.
9) .Send the image to web server through ftp.

If empty Slot:

10). The position is found,read GSM modem will buffer.
11). If the message is found then get the message data & Phone Number.
12). If the message is not found then data will go to the GSM modem.
13). Based upon the data block the slot,if the slot is empty.
14). Acknoledge the slot number to the phone number.

Car Detection:

```
                        ┌─────────┐
                        │  Start  │
                        └────┬────┘
                             │
                             ▼
              ┌──────────────────────────────┐
              │  Retrive image from Camera    │
              └──────────────┬───────────────┘
                             │
                             ▼
      ┌──────► ┌──────────────────────────────┐
      │        │  Detact cars in that image    │
      │        └──────────────┬───────────────┘
      │                       │
      │                       ▼
      │        ┌──────────────────────────────┐
  NO  │        │  Detact the position of car   │
      │        └──────────────┬───────────────┘
      │                       │
      │                       ▼
      │                  ╱─────────╲
      │                 ╱    If     ╲
      └────────────────◄   found?    ►
                        ╲           ╱
                         ╲─────────╱
                             │ YES
                             ▼
              ┌──────────────────────────────┐
              │ Drawn rectangular on          │
              │ oppropriate slot              │
              └──────────────┬───────────────┘
                             │
                             ▼
              ┌──────────────────────────────┐
              │ Send the image to Web server  │
              │ through                       │
              └──────────────┬───────────────┘
                             │
                             ▼
                        ┌─────────┐
                        │  Stop   │
                        └─────────┘
```
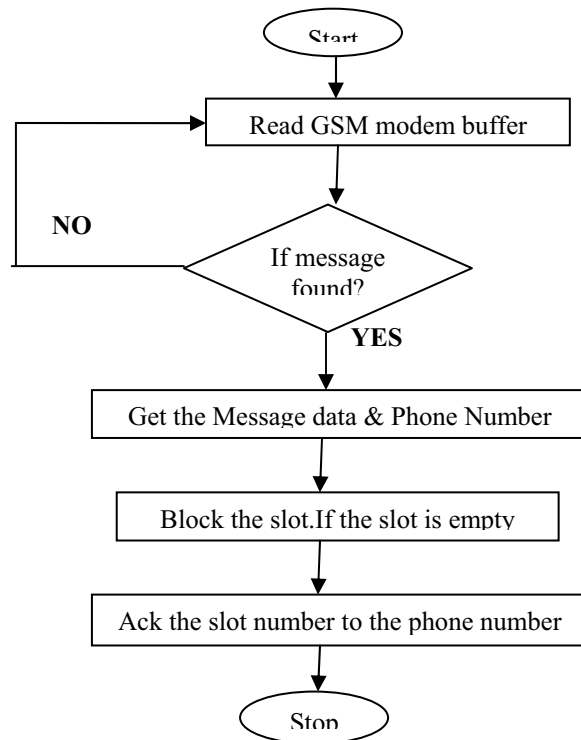
If Empty Slot:

```
                        ┌─────────┐
                        │  Start  │
                        └────┬────┘
                             │
                             ▼
      ┌──────► ┌──────────────────────────────┐
      │        │   Read GSM modem buffer       │
      │        └──────────────┬───────────────┘
      │                       │
      │                       ▼
  NO  │                  ╱─────────╲
      │                 ╱ If message ╲
      └────────────────◄   found?     ►
                        ╲            ╱
                         ╲──────────╱
                             │ YES
                             ▼
              ┌──────────────────────────────┐
              │ Get the Message data &         │
              │ Phone Number                  │
              └──────────────┬───────────────┘
                             │
                             ▼
              ┌──────────────────────────────┐
              │ Block the slot.If the slot     │
              │ is empty                      │
              └──────────────┬───────────────┘
                             │
                             ▼
              ┌──────────────────────────────┐
              │ Ack the slot number to the    │
              │ phone number                  │
              └──────────────┬───────────────┘
                             │
                             ▼
                        ┌─────────┐
                        │  Stop   │
                        └─────────┘
```
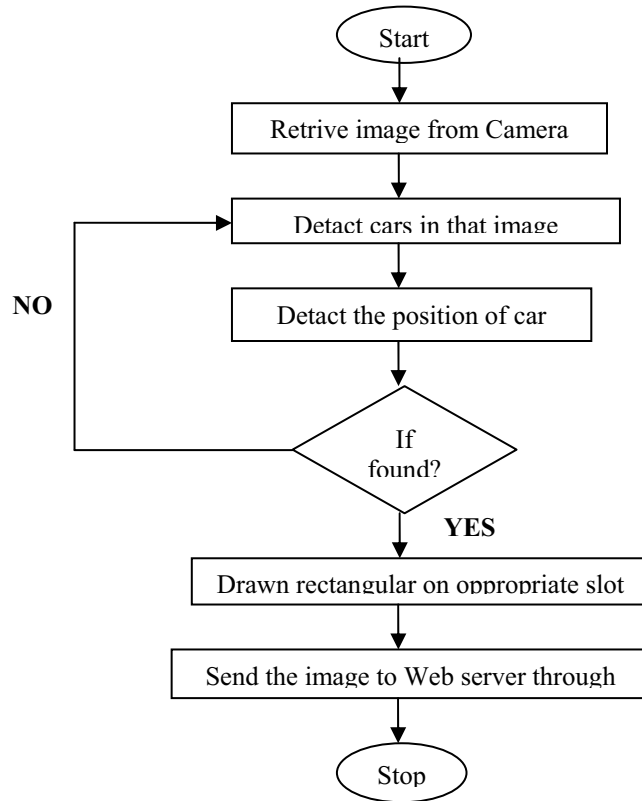
III. HARDWARE AND SOFTWARE PLATFORM

The d e v e l o p m e n t   b o a r d with Samsung S3C2440A microprocessor is selected as the hardware platform. CPU frequency is up to 203MHz in the board. Start-up codes, OS kernel and users' application programs are together stored in a NAND FLASH whose capacity is 64MB. Application programs run in 64MB SDRAM, which can also be used as the room of various data and the stack.   A CMOS camera capturing videos is connected to a USB interface in the board. After the captured video is processed by the detection module, they are transmitted to a local host or the remote monitoring center on Internet from a 10Mbps' Ethernet interface.

The embedded Linux2.6.12 is a kind of miniature operating system, which is designed for the demand of the embedded OS.It has some advantages, such as small code amount, fast running speed, strong stability and so on. And this OS cuts out the normal Linux and becomes much smaller in size. It can even be solidified in a memory chip with a few KB or MB. The kernel of Linux2.6.12 can be customized by development engineers in terms of the actual demand. So it is regarded as the ideal software platform to   develop embedded application programs.

In summary, the development platform includes the target board with the S3C24100A microprocessor and the embedded Linux2.6.12. The embedded OS provides powerful support for the development of application software.

3.1 GSM Module

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

The message sending module is SIM300, it is a Tri-band GSM/GPRS that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300 provides GPRS multi-slot class 10/ class 8 (optional) capability and supports the GPRS coding schemes. The SIM300 provides RF antenna interface with two alternatives: antenna connector and antenna pad. The antenna connector is MM9329-2700. And customer's antenna can be soldered to the antenna pad. The SIM300 is designed with power saving technique, the current consumption to as low as 2.5mA in SLEEP mode. The SIM300 is integrated with the TCP/IP protocol, Extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for data transfer applications. Both GPS and GSM are interfaced to the control unit using serial communication protocol .

IV. EXPERIMENT AND RESULT
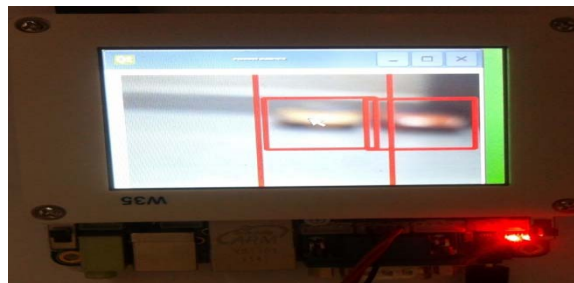
- Connect all the modules as per the requirements.
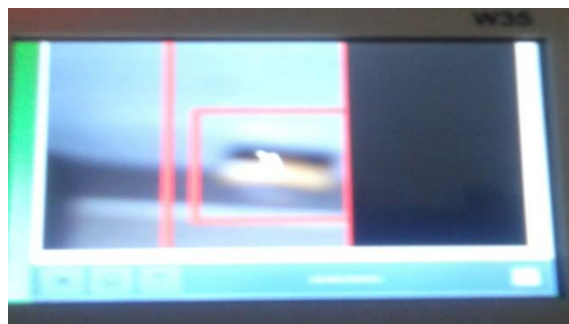
- Insert the SIM in the GSM Module.

- Initially Power supply is switched ON to the ARM9,GSM.

- Using web cam retrive the car images and ARM9 will be detect the car images.
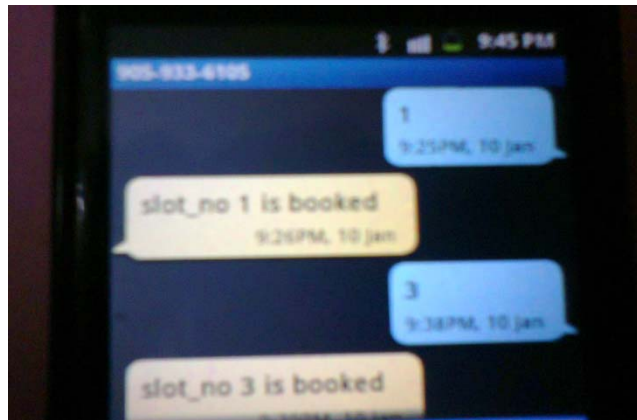

- If there is empty slot,then send the message to gsm modem.

- Read the GSM modem buffer ,if message is found get the message data and phone number.based upon the data the slot will be blocked.

- .Acknoledge the slot number to the phone number.

- Send the image to the web server through ftp.

V.CONCLUSION

The project "**A PARKING GUIDANCE AND INFORMATION SYSTEM BASED ON ARM9"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

Secondly, using highly advanced ARM9 board and with the help of growing technology the project has been successfully implemented.

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