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IOT BASED SMART TOLL BOOTH SYSTEM USING RASPBERRY PI

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ABSTRACT

The highway toll system has already been developed and widely used in many developed countries. But most of them use Radio Frequency ID. In developing countries RFID for each car does not exist. And using RFID is still a costly solution. Some of the developing countries use image processing technique to detect license plate for auto toll system. But the problem is not solved yet due to high price of host device (e.g. computer) to run. Implementation of image processed toll systems are only limited in some places. Keeping these problems in mind we have developed this project where raspberry pi will be used as host. This minicomputer has the ability of image processing and control a complete toll system. A camera will be used to take picture of the vehicle's name plate to sort the toll charge according to vehicles category. Along with multiple automatic tolls taking booth there will be a manual booth with operator also who will handle those vehicles which experience issues with any of the automatic toll taking booth.

Keywords—Rasberry Pi;

I INTRODUCTION

In developing countries likes Bangladesh the amount of vehicle is increasing rapidly. According to 3rd-ESTForum Bangladesh Country Paper, annual growth of vehicle is more than 10% and most of them are motor vehicle. So the manual toll system has become a real concern in Bangladesh. Being one of the leading developing countries, Bangladesh is not able to implement automated toll system due to its vast vehicle amount and high cost of implementation on a large scale[1]. At present Bangladesh government has taken steps to digitalize all the vehicles license plate number. So, countries with digitalized license plate numbers can use this project to implement at a negligible cost for automated toll system[2]. There are several countries like china has developed RFID based toll system. There are some researches on developing image processing based toll system like Vehicle Number Recognition System For Automatic Toll Tax Collection by Shoaib Rehman but it's based on computer dependent image processing system. In this system raspberry pi based image processing system depending automated toll system has been proposed. Raspberry Pi will take picture through Wi-fi

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camera and process the image of license plate[3]. It will connect with database and subtract the toll from user account. When the toll is received the barrier will be moved automatically and after the car has passed the barrier will be placed again automatically[4].

II BLOCK DIAGRAM

2.1 Diagram

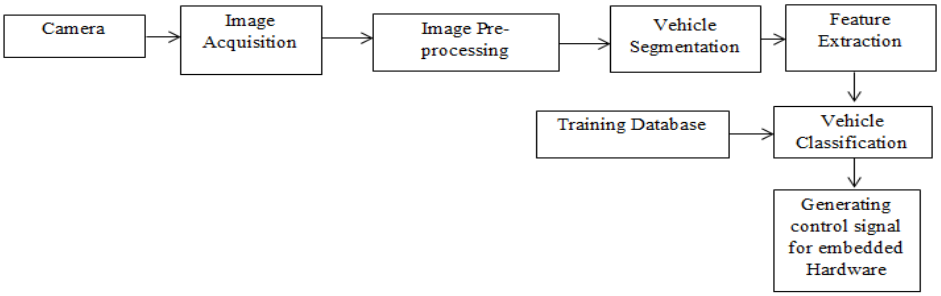

Fig 1. Image Processing Part[3]

2.2 Hardware Description

Raspberry Pi Model B has 512Mb RAM, 2 USB ports and an Ethernet port. It has a Broadcom BCM2835system on a chip which includes an ARM1176JZF-S 700MHz processor, Video Core IV GPU, and an SD card. It has a fast 3D core accessed using the supplied OpenGL ES2.0 and Open VG libraries. The chip specifically provides HDMI and there is no VGA support .The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl[5].

Heart of this project is raspberry pi minicomputer. To interface with NRF24l01 raspberry pi has SPI. MISO, MOSI, SCK & SS pins of NRF transceiver is connected with MISO MOSI, SCK & SS pins of raspberry pi. U art is used to communicate with thermal printer. Rx of raspberry pi is connected with Tx of thermal printer. The tx of thermal printer is not needed. Wifi dongle is connected through USB port. Other parts like seven segment display, stepper motor are controlled through GPIO pins. In manual entry section keyboard and mouse is connected in USB port of raspberry pi. As display 24' tv is used which is connected through a AV cable. The complete system is running on Linux ARC platform. Two shift register (74HC595) is used to control seven

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segment displays. The shift register holds what can be thought of as eight memory locations, each of which can be a 1 or a 0.To set each of these values on or off, we feed in the data using the 'Data' and 'Clock' pins of the chip. The clock pin needs to receive eight pulses, at the time of each pulse, if the data pin is high, then a 1 gets push into the shift register, otherwise a 0.When all eight pulses have been received, then enabling the 'Latch' pin copies those eight values to the latch register. This is necessary; otherwise the wrong LEDs would flicker as the data was being loaded into the shift register. The chip also has an OE (output enable) pin, this is used to enable or disable the outputs all at once. The ULN2003 is a high voltage, high current darlington array containing seven open collector darlington pairs with common emitters. Each channel rated at 500 mA and can withstand peak currents of 600mA. Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout. 4 GPIO of raspberry pi is needed to drive the stepper motor.

III CONCLUSIONS

Raspberry pi based image processing is an new and advance technology which can open an era of computer vision. Other gestures and different types processing systems can be implemented in raspberry pi which will dramatically reduce the price of the system. But still there are some drawbacks like it has very limited memory which makes it difficult to store data and process database into it [6]. If these obstacles are overcome then it will become a great standalone embedded platform for different solution.

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