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A MINOR PROJECT PROPOSAL ON

"Advanced Traffic Management System Using Image Processing"

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ABSTRACT

This project is about a traffic management system which is more advanced than the existing ones. Traffic management is quite a heavy topic nowadays, as the number vehicles as peaking day by day. Similarly, road accident is also caused due to inefficient traffic control. Here, the present traffic signal are based on the static feed of time without considering the actual available traffic. This leads to a situation where vehicles wait unnecessarily in one of the lanes while the traffic flow is not up to the consideration amount in the other lane. So, taking these points into the consideration, it rather a necessity that we put out efforts in finding a perfect solution to these problems. To solve this issue we propose a system that uses Arduino/Raspberry Pi which works on the basis of image processing. A camera module will take the picture of live vehicles, which would be sent to Arduino/Raspberry Pi, and this would be processed using image processing algorithms to determine the current traffic density. According to the traffic density, the traffic lights will be controlled, that helps to maintain a healthy flow of traffic in all lanes.

Key Words:

Arduino/Raspberry Pi, Camera Module, Image Processing

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CHAPTER 1: INTRODUCTION

1.1 Background

Fast transportation systems and rapid transit systems are nerves of economic developments for any nation. Mismanagement and traffic congestion results in long waiting times, loss of fuel and money. It is therefore utmost necessary to have a fast, economical and efficient traffic control system for national development. The monitoring and control of city traffic is becoming a major problem in our country. This system is going to be the greatest boon in this present era of transportation.

1.2 Problem Statement

With increasing urban population and hence the number of vehicles, need of controlling streets, highways and roads is major issue so we are proposing a system for advanced traffic control.

1.3 Objectives

- To improve efficiency of existing automatic traffic signalling system.
- To optimise the fuel consumption and time delay for public.

1.4 Features

- Compact size.
- Easy and fast installation.
- Easy maintenance.
- Low cost with high performance.

1.5 Scope

Globally, the traffic management is a big issue. For developing countries including Nepal, where population density is extreme in major cities like Kathmandu, and the number of vehicles is a lot, it a big challenge to provide an efficient flow of traffic. For these scenarios, the proposed system might become a best alternative, as road aren't going to be expanded and population isn't going to decrease.

1.6 System Requirement

1.6.1 Software Requirement

The software tool used for our product is:

- Python IDE

1.6.2 Hardware Requirement

- Arduino/Raspberry Pi
- Camera Module (OV7670)
- LED’s (as Traffic Signals)
  Power Supply

CHAPTER 2: LITERATURE REVIEW

Vidhya & Banu (2014) designed a project to develop a density based dynamic traffic signal system. The project consisted processing of image captured in the traffic signal and then it was converted to grayscale image and after that to calculate the number of vehicles counts were drawn to have its threshold. Calculation of number of vehicles gave the density which was further used for allocating green time to the traffic on the approach lane by using the Raspberry pi as a microcontroller.

Karthick et al (2012) proposed a system to analyse the live video camera recordings to handle the traffic automatically by allotting green time to the traffic by calculating the number of vehicles which gives the traffic density which acted as a input for the algorithm which was in place for allocating optimal time for the vehicles to pass the intersection.

Khiang Tan et al (1996) developed a graphical simulation windows software for the design and implementation of an automatic traffic lights controller by making use of fuzzy logic technology and also compared the designed software results with conventional lights controller in which the designed one was found to be superior in terms of performance and cost.

Rekha & Karthika (2013) presented a combination of inductive loop sensors and fuzzy logic technology in which inductive loop sensors were responsible for real-time traffic data and fuzzy logic technology was responsible for the allotment of green time to the traffic to clear off the intersection efficiently. This method was proved to be very effective in handling the traffic.

Rashid Hussain et al (2013) proposed the concept of Wireless sensor network technology have the real-time traffic data at an intersection and then to allocate the timings to the traffic to clear off the intersection. This method was proceed to be efficient as it didn't required any built in system in vehicles for its working.

Shilpa et al (2009) worked on a new technique "Intelligent traffic light controller" which was made by making use of GSM services as it included providing the information regarding traffic flow to users by sending SMSs in addition to the sensors provided on the intersection to allocate the timings to clear off the intersection.

CHAPTER 3: METHODOLOGY

The block diagram of advanced traffic management system using image processing is shown below:

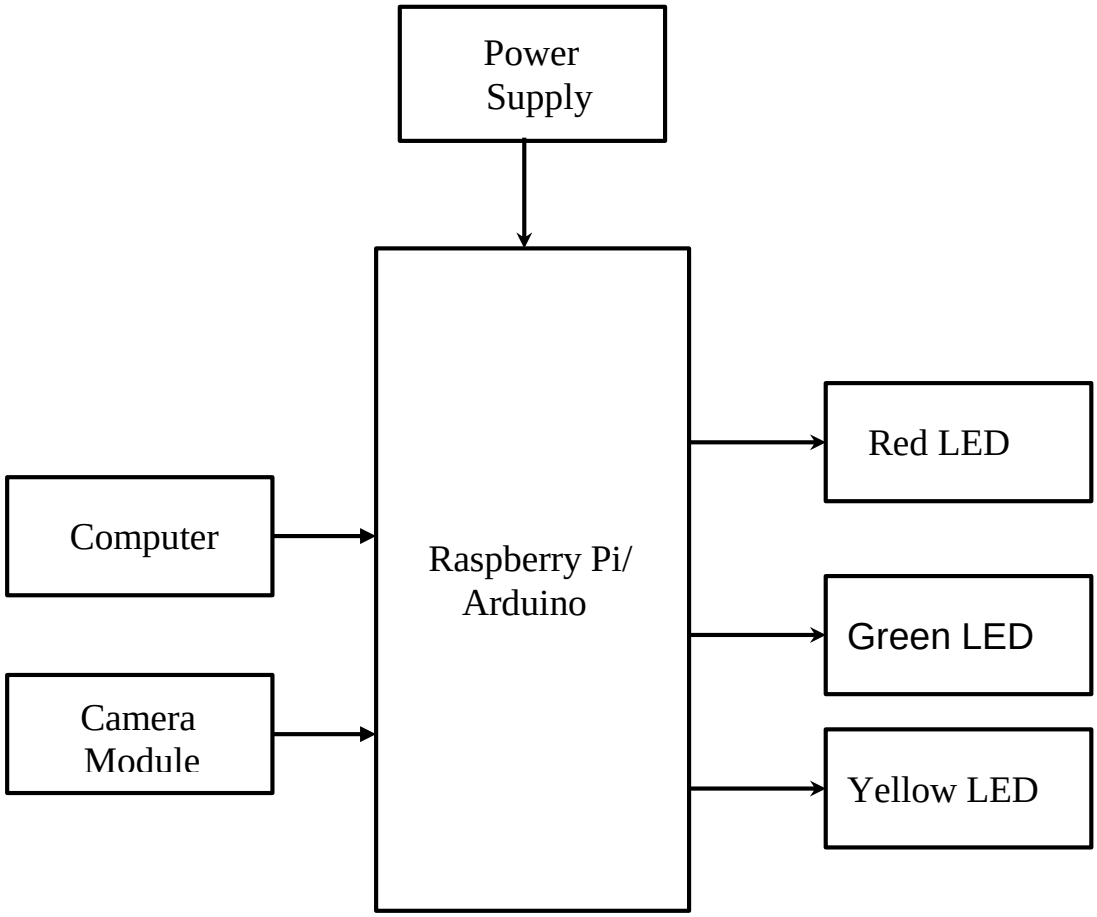

Figure: Block diagram of Proposed Traffic Control System

Computer, here is used to load the program for Raspberry Pi/ Arduino. First of all, Camera Module captures the images of road with vehicle. The image is sent to the Raspberry Pi/ Arduino, which needs to be processed. Now, the image processing algorithm is used to determine the traffic density in each road. Based on the traffic density, the traffic lights are controlled.

1. Raspberry Pi:

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It has the ability to interact with the outside world, and has been used in real time applications. This board is the central module of the whole embedded image capturing and processing system as given in figure. Its main parts include: main processing chip, memory, power supply HDMI Out, Ethernet port, USB ports and abundant global interfaces. It operates at a frequency of 700MHZ. To access WIFI in Raspberry Pi the WIFI Module must be connected into its USB. As it runs Linux, it is capable of creating WIFI networks. The Raspberry Pi 2 is based on the Broadcom BCM2836 system on a chip (So C), which includes and ARMCortexV7 900MHZ processor Video Core IV GPU, and was originally shipped with 256 megabytes of RAM. As of 8 June 2015, about five to six million Raspberry Pi's have been sold. The Raspberry Pi 2 was released in February 2015.

Figure: Raspberry Pi 2 Module

2. Camera Module:

The OV7670 CAMERACHIPTM is a low voltage CMOS image sensor that provides the full functionality of a single-chip VGA camera and image processor in a small footprint package. The OV7670 provides full-frame, sub-sampled or windowed 8-bit images in a wide range of formats, controlled through the Serial Camera Control Bus (SCCB) interface. This product has an image array capable of operating at up to 30 frames per second (fps) in VGA with complete user control over image quality, formatting and output data transfer. All required image processing functions, including exposure control, gamma, white balance, color

saturation, hue control and more, are also programmable through the SCCB interface.

Figure: Camera Module (OV7670)

3. Power Supply:

The Arduino/ Raspberry Pi needs 5V power supply. So, an external power supply of 5V is needed to power it.

4. Computer:

Here PC is needed to program Arduino/ Raspberry Pi. For image processing, OpenCV-Python library will be used.

Chapter 4: EPILOGUE

4.1 Expected Output

On bringing this system into implementation we expect to minimize the traffic problems such as delayed traffic, road accidents, increasing the efficiency of traffic. People won't have to wait long in order to reach their destinations. This work is definitely going to serve as a boon to human. On the other hand, it will definitely decrease the burden of the traffic police in managing the traffic. In near future, if this is implemented, then the overall productivity of the nation is going to increase.

4.2 Budget Analysis:

S.N	COMPONENTS	PRICE (NRs)
1	Raspberry Pi	4,500
2	Camera (OV7670)	1,000
3	Arduino UNO	800
4	Power Supply (5V)	900
5	Miscellaneous	500
	Total	7,700

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4.3 Work Schedule

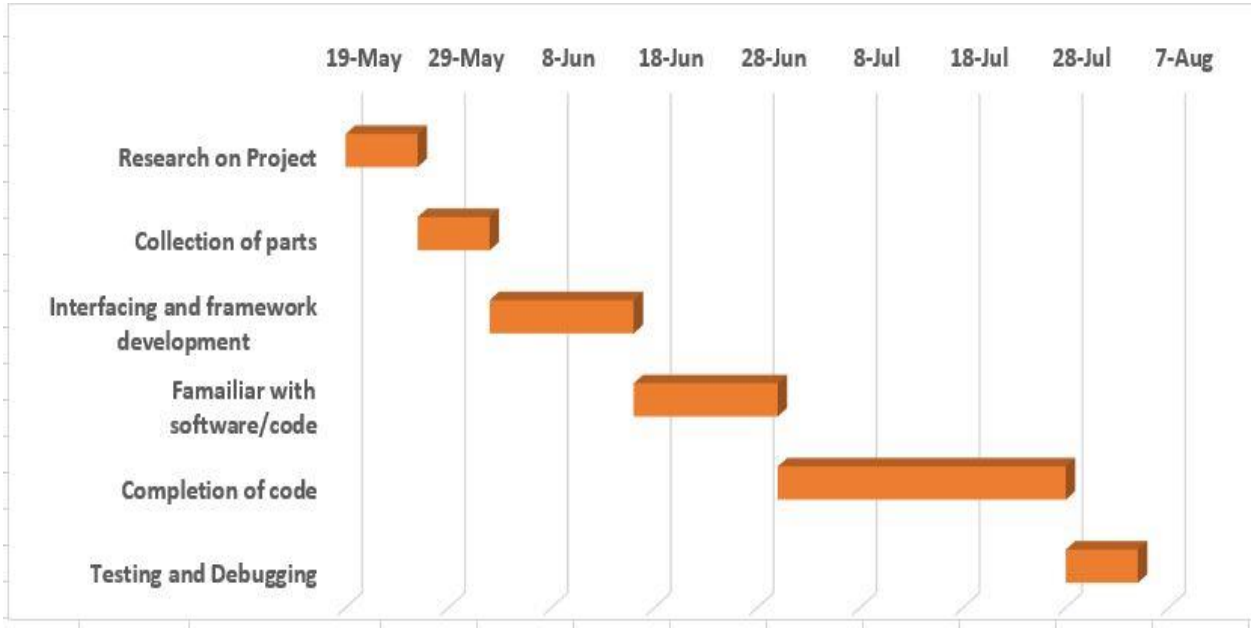

Figure: Gantt chart

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