

MECHATRONIC BUS STATION

¹Renju G R, ²Christin Markose

¹P G Scholar, ²Professor

¹Applied Electronics and Instrumentation Engineering,

¹ Rajadhani Institute of Engineering and Technology, Kollam, India

Abstract: Bus lane manual opening and even in the case of toll booth opening is time consuming and may leads for heavy traffic conditions sometimes. There is no major method which can be used as a solution for this. Here an idea is implemented named the Mechatronic bus station. In this system, the lanes of a bus station can be automatically driven using the image processing technology. Digital image processing takes a major part of the project to detect the vehicle number and open the corresponding lane automatically. Bus stations with multi lanes can be established with it. It is also presented a flowchart of the whole process algorithm starting from the recognition of the vehicle and ending with its departure from the bus stop. The patent of the Russian Federation confirms the scientific novelty of technical solutions. The material presented in this article is useful to specialists in the field of traffic management on public passenger transport routes.

IndexTerms - mechatronics, image processing, matlab, arduino keywords@ieee.org or visit http://www.ieee.org/organizations/pubs/ani_prod/keywrd98.txt

I. INTRODUCTION

The problems of ensuring unhindered movement of route vehicles at a bus stop, as well as the safety of passengers while waiting for a bus and landing in it are relevant. A developing country like India is facing heavy traffic now a days and also jay walking in public stations is also a major problem facing in cities which leads to the time consumption of vehicles. Public bus station is equipped with manual drive system to open different lanes. It takes time and it's a lengthy procedure which is not having any advantage. Here a different approach is explained and implemented which may leads to reduce of traffic blocks in the bus stations and to reduce the human effort.

II. LITERATURE REVIEW

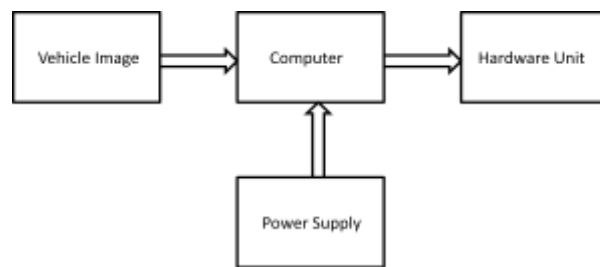
The abundant and enormous amount of number of vehicles which is rolling over the roads are increasing every day. Now days the existing traffic systems are not able to handle the situation mostly at the day time. Unauthorized and uncategorized movement of buses in the stops are a major parts for causing the traffic block and even for the deaths of the passengers. The existing system is not able to handle the problem effectively. Digital image processing is an advanced technology which is involving a lot of researches and algorithm methods to transfer most of the complex works to be done automatically by the systems. The most advancement in the digital image processing is that it can be implemented just with a software changes and the existing security cameras can be used for the purpose. Number plate recognition is also an emerging trend in the digital image processing and it is also very helpful for security purposes, to find the stolen cars. The number plate recognition is done by a series of processes ie from capturing the data followed by edge detection and grey scale and to binary conversion ^[1].

Microcontrollers are specially designed integrated circuits which can be used for any purpose by the user by applying a series of coding techniques and programs like C++, Java etc. The mentioned system can be implemented with the help of and Arduino micro controller development board. Arduino is a credit card sized development board which is designed with AVR micro controller. The combined working of Hardware in the loop simulation and AVR microcontroller gives the actual result of real time monitoring of the system ^[2]. The aforesaid idea is presented as a miniature version with Arduino development board combined with MATLAB. The system consists of two parts. Hardware part and software part. Hardware in the loop simulation is carried out here for the real time analysis of the system. Hardware in the loop simulation is also a latest trend in the simulations where the miniature version of the actual products is used to plot and analyze the response of the system. ^[2]

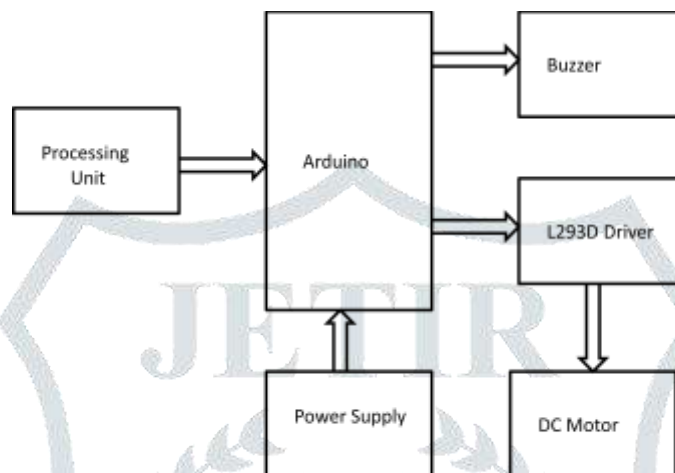
Database management system gives more choices which can be useful for the vehicle identification. Each vehicle is given different numbers, so there is a database created for the purpose. With the help of Real time operating systems, the aforementioned principles can be run smoothly and faster. The processed and identified vehicle number is fed to the system to check with the data base to find the actual owner and details. With the actual use of real time operating systems, it is able to carry the system to a whole new another level with industrial level processes.

III. METHODOLOGY

The following is the functional block diagram of the system. Since the system is consisting of two different parts, its separately shown here. Block includes a software part and a hardware part. Software is for the image processing and hardware is to drive the system for lane opening.



Functional Block diagram of the Image Processing Unit



Functional Block diagram of the Control Unit

The System mainly consists of two different modules. One is the hardware module and the second one is the software part. Hardware part is used for the driving of the lane circuit and software part is used for the image processing section.

3.1 Block Diagram Description of the image processing unit.

Vehicle image: Since the prototype is the miniature version of the system, image segmentation and scanning is done with a jpeg file instead of capturing real time image with the help of camera. So the vehicle image will be in jpeg format.



Figure 3.1

3.2 Block Diagram Description of the image processing unit.

The Matlab software is referred to the computer here. That is image processing is done with the help of Matlab. Matlab is the matrix laboratory software. Here purely programming is the key to the process neither using any of the tools.



Figure 3.2

3.3 Flow chart representation of the image processing section.

The software works here as the processing center of the image with the help of the Matlab software. Matlab as the name suggests, the matrix laboratory. That is it is easy to do matrix i.e. two dimensional operations with the Matlab. The software is used to process the image. It is done with the application of series of further calculations and steps. At first the image is converted into grey scale from RGB. That is because it is difficult to process RGB files but grayscale is comparatively easy and also RGB extraction is not required for the number plate recognition. Then the image dilation is done followed by horizontal and vertical edge processing. Then it is passed through a low pass filter for the noise cancellation purpose. Then the image is segmented for the Region of Interest (ROI) extraction. Then check for the characters preloaded with the database, then the stored in a file. The sequence is added together to form the vehicle number and the number is then also checked with the pre stored values. If the number is already listed then the instruction related to the number is passed to the arduino that is the hardware unit. Here hardware in the loop simulation is used to interact with hardware in real time with Matlab. The hardware is accessed through the USB and serial port communication is used to interact with the hardware.

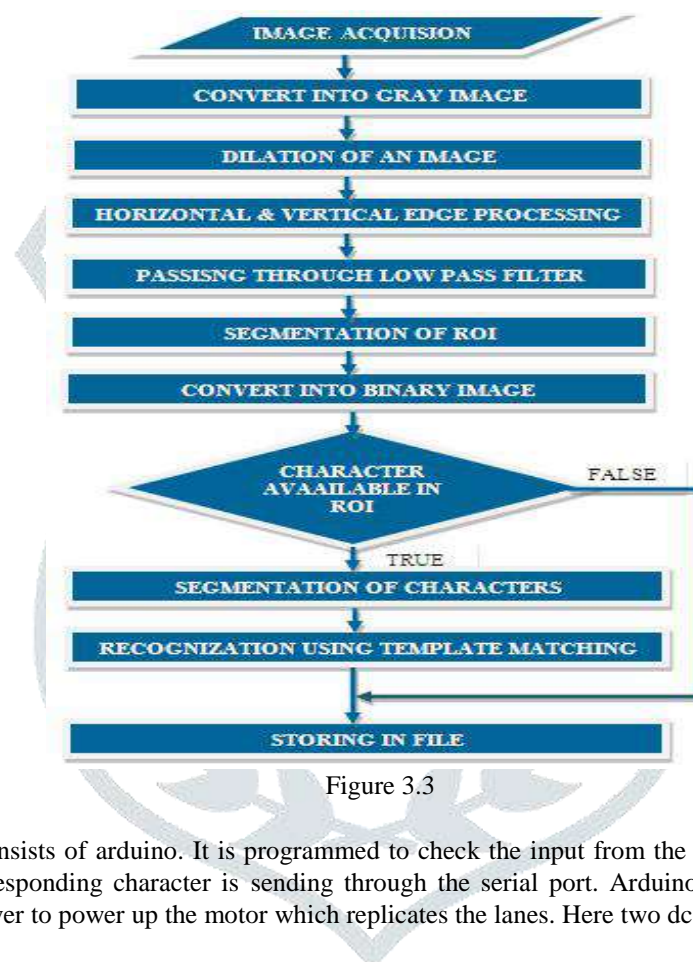


Figure 3.3

The hardware mainly consists of arduino. It is programmed to check the input from the serial port. So Matlab detects and decodes a number plate, corresponding character is sending through the serial port. Arduino receives the character and gives instruction to the dc motor driver to power up the motor which replicates the lanes. Here two dc motors are used.

IV. RESULT AND DISCUSSION

The image extraction results shown below to give the results obtained during the test runs of the prototype. Separate images of two different images and number plates are extracted and corresponding files are saved in notepad. The further it is fed to the microcontroller as well as check the pre-loaded values in the database and the result is given whether which lane must be opened.



Figure 4.1 Image Extraction1



Figure 4.2 Image Extraction 2

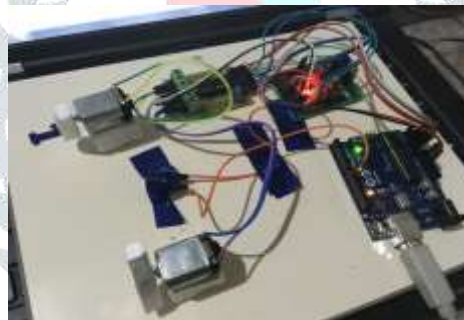


Figure 4.3 Hardware Unit

V. CONCLUSION

The problem of ensuring the safety of passengers waiting for public passenger transport is considered. In order to solve the parking problems, equip a bus stop with the necessary equipment for admission to the bus stop pavilion only for vehicles servicing the route on which it is installed. The system is helpful to avoid unwanted life loss in bus stands.

REFERENCES

- [1] Bovik, A.C.1995. Digital Image Processing Course Notes, Austin: Dept. of Electrical Engineering. U. of Texas.
- [2] Kalmykov, B.Y.And Kalmykova, O.M.2017 .Automated bus stop.RU Patent 2614159.
- [3] Industry-Specific Standard 218.1.002-2003 Bus stops on highways, General technical requirements, Available: http://www.znaytovar.ru/gost/2/OST_21810022003_Avtobus_nye_ost.html.
- [4] Chertkova, Y.A.And. Kalmykova, O.M.Problems of ensuring road safety along city streets with dense buildings and high traffic. In the collection: *Perspectives of science*.