

Traffic Light Control Using Accelerometer Sensor on ARM Platform

Swapnali Shirke

Dept.Electronics and Telecommunication
SKNCOE,MS India.

P G Chilaveri

Dept.Electronics and Telecommunication
SKNCOE,MS India.

Abstract

In this paper , "Traffic control System" is based on the traffic rules . For that traffic police gestures are important. There are two method for gesture recognition,first is vision based and other is sensor based.In this paper sensor based method is used for gesture recognition on ARM platform.For that thresholding method is used as detecting algorithm. SD card is used to store the voice data and transmited using XBEE module.

1. Introduction

When traffic is very heavy, an automatic traffic light system is not efficient to control traffic, causing traffic jam. In this case, it is necessary to switch off the traffic light and let traffic police guide traffic by gestures. In the case of bad weather or obstruction by other vehicles, however, sometimes it is difficult for all drivers to recognize the gestures. It would be useful if the traffic light can follow the traffic police gestures.

Two methods are considered suitable for gesture recognition. The first one is to use vision sensors like cameras to acquire images, which are analyzed to recognize the gestures. The second one is to place inertial sensor on the traffic police hand and extract the motion characters. The most advantage of the vision method is that it can recognize gestures without adding any extra hindrance to the police. However, it suffers from poor illumination, e.g. at night or in fog weather.

Due to the advantages of low cost and small size, MEMS accelerometers have been used widely in gesture recognition. By fixing two 3-axis accelerometers on wrist of both hands, so the arm movement and hand position, when the arm is steady, can be extracted. By recognizing traffic

police gestures and synchronizing the traffic lights with them, it is envisage that this application will give help to vehicle drivers.

2.Literature Review

There are no of systems for regulating the traffic given as following:

The author Zhang Yuye et.al. [11] System use AT89C51 and CAN BUS controller which leads to complicated design and cost of the system more because of CAN BUS controller. Also power requirement will be more in case of AT89C51.

The author Manoj Kanta Mainali et.al.[7] proposed a genetic algorithm approach to estimate the traffic volume in road sections without the traffic information of road sections. This method can estimate the unknown traffic volume using only the known traffic volumes.

The author Cai Bai-gen et.al.[3] design a vehicle detection system based on magneto-resistive sensor is composed by wireless traffic information collection nodes which are set on two sides of road to detect vehicle signal. The magneto-resistive sensor is costly and maintenance cost of the system will be more if the system fails. This system is lack of emergence measures.

The author S.L.Toral et.al.[13] design will provide good result for vehicle detection where ARM-based video processor not only deals with the video processing algorithms but again the cost of system design will be more because camera will be required to capture video .

The author Shilpa S.Chavan et.al.[12] design of traffic light controller handles major problem of conventional traffic signal. At certain junction, sometimes even if there is no traffic but people have to wait because the traffic light remains red for the preset time and road users waits until the light turn to green. They try to solve this problem effectively by using Microcontroller(89c51),GSM but system will leads to complications.

The author Ahmed S. Salamaet.al.[8] provide integrated intelligent traffic light system using photoelectric sensors distributed on long range before and after traffic light on roads. Emergency cases such as , the passing president car and ambulance that require immediate opening of traffic signal. The system has the ability to open a complete path for such emergency cases until reaching the target but this system does not operate

wells when more than one emergence Vehicles come on the signal from two sides.

The author Dinesh Rotake, Swapnil Karmore. al.[2] provides ITSC system. When more than one emergency car came then most of the system fails. The ITSC system consist of AVR-32 microcontroller with inbuilt 8-channel ADC to receive IR-input from IR-transmitter which is embedded in the emergence vehicle. The 8-IR sensors are used to detect the emergence vehicle and open the divider gate to pass emergence car and then immediately closed the gate.

3. TLC System

For TLC system implementation, the traffic police hand gestures are important. So that require suitable hand gesture recognition technique. There are no of "Hand Gesture Recognition techniques" present, from that only two techniques are consider first is vision based and second sensor based. In vision based system for traffic control then it require camera, time consuming technique and have some disadvantages. So that to design real time traffic control system, here used sensor based technique. In this system, accelerometer sensor is used for hand gesture recognition. Block diagram of proposed system is given in fig.no.1

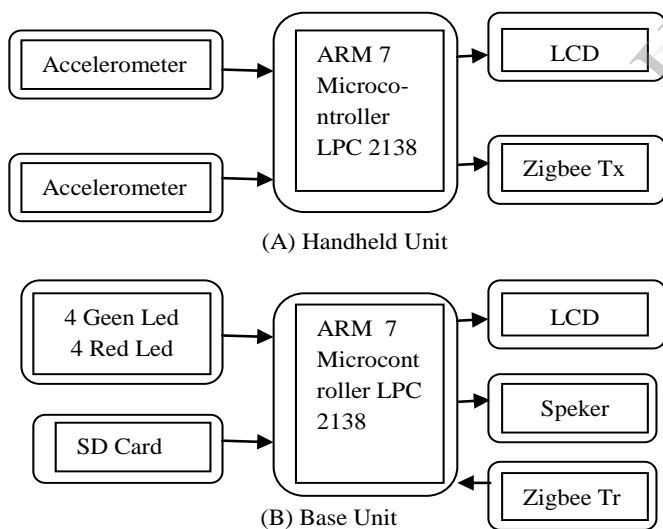


Figure 1. Block Diagram of TLC System

Here utilize a sensor on handheld unit which integrated a tri-axes accelerometer chip as a handheld input device in this interaction system. When the human performs a gesture, the sensor will collect the data flow output by accelerometer chip, and send it to PC via wireless protocol. Here consider this raw data stream fetched from sensor as an "input pattern".

According to the daily experience, the patterns generated by the movement of hand when human performing the same gestures satisfy certain statistical rules to some extent, based on it we propose the "standard pattern". The "standard pattern" is a class of pre-defined patterns, each one corresponding to a special "input semantics". When user performed a gesture, the sensor will send the "input pattern" to interaction system, then system will find out the most approximate "standard pattern", this also can be regarded as a procedure of recognition, and finally the interaction system get an input semantic according to the recognition result.

The three axis accelerometer are basically used to identify the movements across the three axis i.e. x-axis, y-axis, z-axis. Accelerometer is an electronic device which is interfaced using I2C protocol and provides the reading after every 1msec. According to the requirement of the application, the microcontroller will take the reading from the accelerometer within a fixed interval of time and do the necessary operation according to the requirement of the application

The system is being provided with pre captured hand gestures in its database. Once the hand unit gesture, give the commands by the use of accelerometers and the system compares that with the hand gestures stored in the database by the use of SD CARD. Once matched, the system respond in the manner it is being programmed.

4. Results

Here two unit are present, first is base unit and another is handheld unit. At the start of system, initializing of all component. There are two mode of the system first is auto mode second is manual mode. The results are categorized based on objective and mode of the system. 1) To recognize real time hand gesture using accelerometer sensor. 2) To control hardware according to hand gesture. First system in auto mode, so that at base unit traffic light signal are glowing automatically according to the programmed them. If there is need to control the traffic by traffic police gesture, then system change the mode ie it switch to manual mode by pressing manual mode button. Then system is controlled by hand gesture of traffic police. One example is given below.

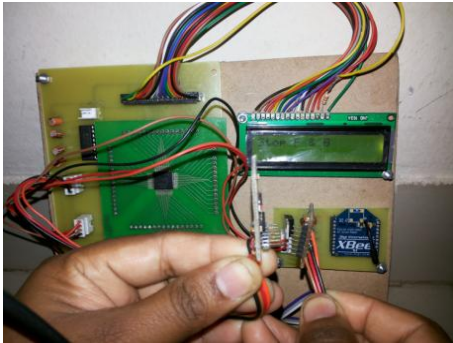


Figure 1. Front And Behind Stop Position At Handheld Unit

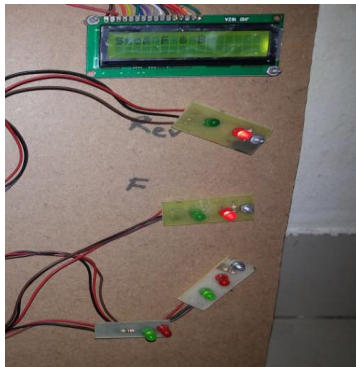


Figure 2. Front And Behind Stop Position At Base Unit.

5. Conclusion

The TLC system is implemented using accelerometer sensor-based hand gesture recognition technique. This is user friendly system, where the complex human-computer interface is required. The system is more accurate than vision based system as illumination problems is solved.

6. References

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