ISSN 2395-695X (Print)
ISSN 2395-695X (Online)
International Journal of Advanced Research in Biology Engineering Science and Technology (IJARBEST)
Vol. 2, Issue 2, February 2016

AUTOMATIC TRAFFIC CLEARANCE FOR AMBULANCE USING DOPPLER EFFECT

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***ABSTRACT*- The road accidents are increased to uncertain level especially in urban areas. The road accidents which are mostly fatal is to be avoided.The objective of this work is to establish a smooth flow of traffic for the ambulance to reach the accident spots and hospitals faster and thus minimizing the delay caused by traffic congestion. Here we introduced the Doppler Effect concept to overcome this issue.Using Doppler Effect, the siren sound from the Ambulance is detected and the respective signal is allowed to clear with green signal. Along with that, a camera is used to detect the arrival of the ambulance towards a traffic signal, by fixing the camera 300 meter before the signal itself.The respective outputs from both units are given to the microcontroller. If both the cases are detected TRUE, then the micro controller turns ON the respective signals to green and all the other signals are turned to red, thus clearing the traffic for ambulance.**

Index Terms: **Micro controller (ARDUINO), Doppler Receiver, LCD Display, Camera, Database, Traffic light signals.**

I. INTRODUCTION

Traffic congestions in urban areas and traffic emergencies stands as the major issues of the society. The major reason that causes delay for ambulance to reach its destination is the Traffic congestion. One of the most important reason for delay is the time wasted in waiting for traffic signals to get cleared, especially when their intersections are highly congested.Thus we propose a new fully automated design for controlling the signal to reach the hospital in time.Using Doppler Effect, the siren sound from the Ambulance is detected and the respective signal is allowed to clear with green signal.Along with that, a camera is used to detect the arrival of the ambulance towards a traffic signal, by fixing the camera 300 meter before the signal itself.The respective outputs from both units are given to the microcontroller. If both the cases are detected TRUE, then the micro controller turns ON the respective signals to green and all the other signals are turned to red, thus clearing the traffic for ambulance.

II. METHODOLOGY USED

The automatic traffic light system is that, in which the ambulance which want to pass by when the signal is red, a Doppler receiver which is attached to the traffic light will recognize the siren sound of ambulance and gives the notification to the microcontroller which in turn makes the camera to take snapshots.

When the image comparison result is positive the microcontroller will shift the red light to green. Also the image of the ambulance will be captured by the camera which is recognized from 300m distance from the signal. When it is green signalled for the ambulance the other three sides of the signals are halted.

When the Doppler receiver receives the maximum siren sound traffic signal will be greened and when it recognizes the minimum sound of the siren, then the traffic signal continues the normal

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operation. Here the purpose of using particularly the Doppler receiver is because, it produces accurate results and it is cost effective, simple to construct and easier to install

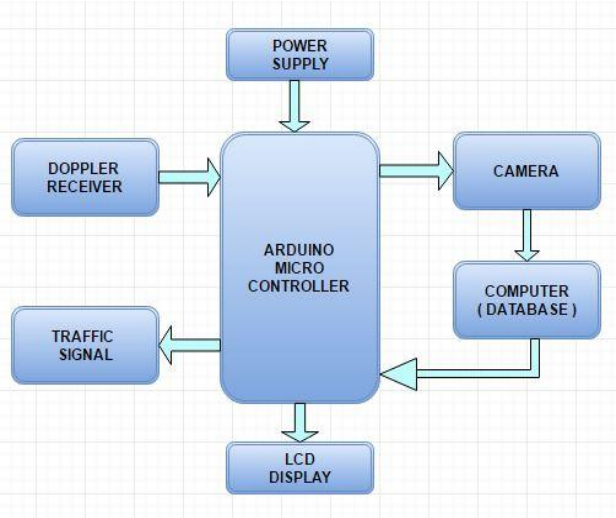

Fig.1. block diagram

The above figure represents the block diagram for traffic clearance for ambulance using Doppler Effect.

III. DOPPLER RECEIVER

The siren sound of the ambulance will be received by the Doppler receiver and sent to the microcontroller. The Doppler receiver is designed based on the characteristics of siren sound. The siren sound has high frequency and it lasts for some more time than the normal noises which can be identified based on the signal received by the receiver. The name Doppler receiver denotes that the sound received by this receiver has high frequency because of the Doppler Effect on sound produced by a receiver in motion.

The frequency patterns of such sound are continuously analyzed by the receiver. This analysis helps the receiver to differentiate siren sound from other noises. Doppler receiver will help the microcontroller to shift the red to green based on the siren sound. When it recognizes the maximum siren sound the microcontroller allows the camera to take snapshots simultaneously. When it recognizes the minimum sound the normal operation is continued.

IV. CONTROL SYSTEM

The control system used here is ARDUINO UNO. This microcontroller continuously gets the input from the Doppler receiver. When a positive signal is obtained from the receiver, it triggers the camera to take continuous snapshots. The microcontroller then gets the input from the computer based on the image comparison results and accordingly controls the traffic light system. Thus the entire working process is controlled by the microcontroller.

V. CAMERA

The main purpose of the camera is to capture the image of the ambulance, which will be placed at 300m distance away from the traffic signal. So the captured image will be processed and controlled by the controller. Here we are using camera for capturing the image and by using mat lab the image processing is applied on the captured image.

VI. DATABASE

A particularly predefined ambulance symbol will be present in the database for image processing in a computer. The camera captures snapshots and the image is given to the computer. Then the computer will process the image and compares it with the predefined database present within it. Then the alert to halt the other sides of the traffic signal in order to provide the green light to the respective signal is provided by the microcontroller.

VII. POWER SUPPLY DESIGN

This 5-15V regulated power supply has a variable DC voltage ranging from 5V to 15V. Current supply up to 400mA can be obtained from the power supply. A potentiometer can used to vary the output voltage. The power supply is designed for the input line power of 240V AC. Then the varistor ratings are changed to obtain 150VAC and the transformer ratio to 110V/12V, if 110VAC input is used. Fuse is used for a protection in case if there is any short-circuit. To clamp the exceeding voltage from the line to a reasonable level, the varistor V1 is parallel connected with the line voltage input. Thus the transformer and other circuits are protected.

Once the voltage level surge to a high level beyond the ability of the varistor to absorb it, either fuse F1will burn or varistor will alone burn or sometimes both will burn. If this circuit fails after a period of operation, check whether the fuse and the

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varistor are still in good condition and if not replace them. Diodes are used to rectify the 12V AC Voltage to DC voltage. Electrolytic capacitor is used to reduce the ripple of the DC voltage as a smoothing capacitor. The DC voltage is fed to the input of 7805 regulator where the output DC voltage is obtained. Obviously, changing the value of will change the output also. Capacitor is used to filter out high frequency component from the power supply.

VIII. LIGHT SYSTEM

The working of the light system is to provide the green light to the respective side of the traffic signal. Until a control signal is received from the microcontroller, the light system works similar to traffic lights. The control signal will be provided by the microcontroller only when the siren sound and image comparison matches. When they are recognized by the microcontroller, then the light for particular direction will shift from red to green. This process is known as pathway clearance, so that ambulance will reach the hospital in time without delay.

IX. PROCESS FLOW

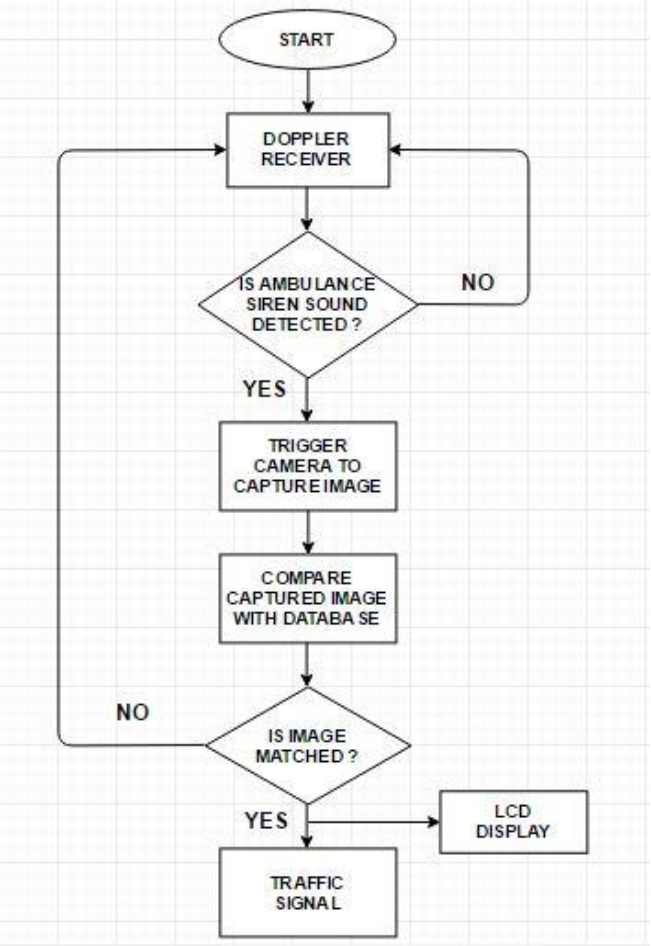

Fig.2. Flow diagram

The Doppler receiver continuously checks for the siren sound of ambulance and gives signal to the microcontroller accordingly. When such sound is detected, a particular signal is given to the microcontroller. Then the microcontroller in turn triggers the camera to take multiple snapshots. The images that are captured by the camera are compared with the predefined database in the computer. If the captured image fails to match with the predefined image, the microcontroller again checks with the receiver input. If the captured image matches with the predefined image in the database a particular signal is given to the microcontroller accordingly. Thus the microcontroller gets two TRUE inputs from both Doppler receiver and Image comparison module. Thus the microcontroller controls the Traffic signal to clear the particular direction by changing the signal from red to green.

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X. RESULT

The hardware connection of our work is shown in the below figure (Fig.3)

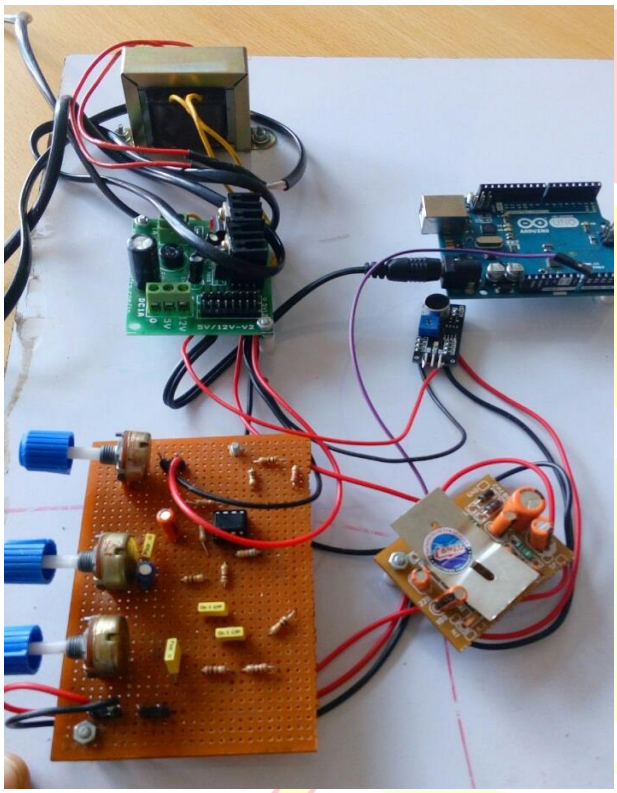

Fig.3. hardware connections

The Doppler receiver which detects and amplifies the siren sound is shown below (Fig.4)

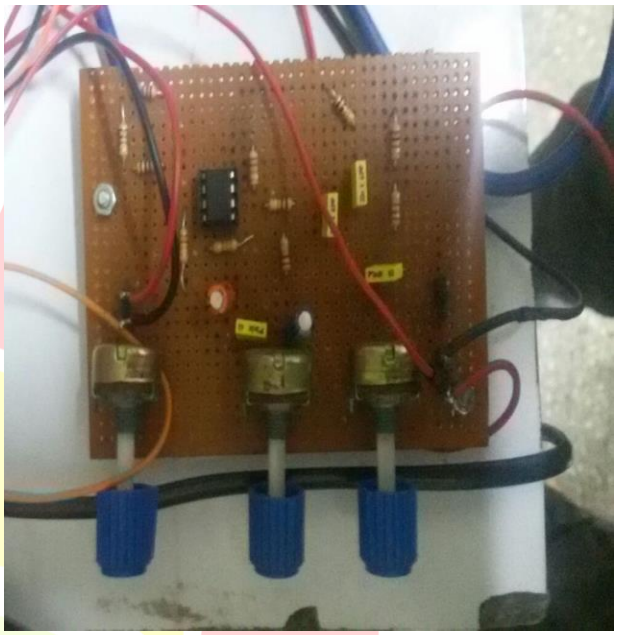

Fig.4.doppler receiver

The hardware output of our work is shown below(Fig.5)

Fig.5. hardware output

XI. CONCLUSION

In this system we have described a new approach for automatic traffic clearance for ambulance using Doppler Effect. The ambulance is detected with the help of Doppler receiver and by capturing and comparing the image of the ambulance and accordingly the traffic lights is controlled. Thus traffic clearance for ambulance using Doppler Effect which when implemented in countries with larger

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population like INDIA can produce better results since this technique is more accurate with no loss of time.

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