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Adaptive Traffic Control For Ambulance

S.Vigneshwaran[1], T.Akash[2], P.Hariharan[3],M.Karthikeyan[4],J.Rahul[5]

Assistant Professor, Department of Instrumentation & Control Engineering,
Saranathan College of Engineering, Trichy [1]

UG Final Year Student, Department of Instrumentation & Control Engineering,
Saranathan College of Engineering, Trichy [2-5]

Abstract: Vehicular traffic is endlessly increasing everywhere in the world and can cause terrible traffic congestion at intersections. Most of the traffic lights today feature a fixed green light sequence, therefore the green light sequence is determined without taking the presence of the emergency vehicles into account. Therefore, emergency vehicles such as ambulances, police cars, fire engines, etc. stuck in a traffic jam and delayed in reaching their destination can lead to loss of property and valuable lives. This paper presents an approach to schedule emergency vehicles in traffic. The main objective of this system is that to control the traffic, allowing an ambulance to arrive at a particular location without it having to stop anywhere until the destination is reached. This system includes RF technology and LabVIEW software.

Keywords: Four way Traffic Control Arduino, RF433 MHz Module, myRIO, LabVIEW.

I. INTRODUCTION

According to the project, when the ambulance is at emergency comes to in any junction the traffic signals stops the signals and give a green signal for the ambulance. The road accidents in modern urban areas are increased to an uncertain level. The loss of human life due to the accident is to be avoided. Traffic congestion and tidal flows are major facts that causing delay to the ambulance. To bar loss of human life due to Accidents to we introduce a scheme called Adaptive Traffic clearance for the ambulance using an RF technology. The main theme behind this scheme is to supply a smooth flow for the emergency vehicles like the ambulance to succeed in the hospitals accurately and thus minimizing the delay caused by the traffic congestion. The idea behind this scheme is to implement Traffic clearance for the ambulance using an RF technology which could control mechanically the traffic lights within the trail of the ambulance.

II. LITERATURE SURVEY

[1] A new traffic control scheme can be generated to construct the urban roads traffic control closed-loop self-tuning system. So the system control strategy can be adjusted real-timely according to the system output, and the open-loop control will be upgraded to the closed-loop control in the traffic control. [2] Traffic control is the most common operation strategy deployed in major cities and influences the performance of network most directly to tackle gridlock. Traffic signal control systems and algorithms have a long history. With the deployment of detectors (including traditional infrastructure based detectors and GPS, mobile devices or onboard units equipped on probe vehicles) on arterial roads, more and more traffic signal.[3] The adaptive control system combines these desired states and the current prevailing traffic conditions collected by the sensing system to produce real time traffic control schemes. These traffic control schemes are implemented in the field to guide the real world traffic flow to evolve towards the desired states.[4] A third methodology is to detect vehicles using the recognition of in-use Bluetooth devices and to derive an average travel time between two Bluetooth detectors. For the first two approaches, several traffic state reconstruction methods exist. the traffic situation can be reconstructed out of travel time measurements. To this end, Bluetooth detectors are placed along a road. A vehicle with in-use Bluetooth device(s) passes a first sensor and afterwards a second sensor downstream.[5] The proposed system creates a android app that connects both the ambulance and the traffic signal station using cloud network. This system makes uses RFID(radio frequency identification) technology to implement the Intelligent traffic signal control. The basic idea behind the proposed system is, if the Ambulance halts on the way due to a traffic signal, RFID installed at the traffic signal tracks the RFID tagged ambulance and sends the data to the cloud.[6] This RFID technique deals with a multi-vehicle, multi-lane, multi road junction area. It provides an efficient time management scheme, in which a dynamic time schedule is worked out in real time for the passage of each traffic column. the present intelligent traffic lights are sensor based with a certain algorithm that controls the switching operation of the system.[7] The traffic give way to such emergency vehicles, on hearing the vehicle's siren. However, this is not sufficient in situations where the traffic cannot give path to emergency vehicles at the traffic signals, which is the major reason for delay. Almost all the traffic signals today are automated, when an emergency vehicle passes by an

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intersection without green signal is a danger to traffic which is approaching the signal from other roads for which the signal is green. Thus to avoid major accidents the emergency vehicle has to wait until the entire traffic signal cycle to complete and gets an official green signal. This is an important reason for the delay in response time of emergency vehicle.

III. SOFTWARE

LabVIEW

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. The graphical language is named "G (not to be confused with G-code). Originally released Apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control and industrial automation on a variety of platforms including Microsoft Windows, various versions of UNIX, Linux and OS X. The latest versions of LabVIEW are LabVIEW 2019. For this work LabVIEW 2019 version is used as it has found to be most stable version of all.

LabVIEW ties the creation of user interfaces (called front panels) into development cycle. LabVIEW programs subroutines are Virtual Instruments (VIS). Each VI has two components: a block diagrams and a connector panel. The last is used to represent the VI in the block diagrams of other, called VIS. The front panel is built using controls and indicators. Controls are inputs—they allow a user to supply information to the VI. Indicators are outputs –they indicate, or display, the results based on the inputs given to the VI. The back panel, which is a block diagram, contains the graphical source code. All of the objects placed on the front panel will appear on the back panel as terminals. The back panel also contains structures and functions which perform operations on controls and supply data to indicators. The structures and functions are found on the Function palette and can be placed on the back panel. Collectively controls, indicators, structures and functions will be referred to as nodes. Nodes are connected to one another using wires –e.g. two controls and indicators can be wired to the addition function so that the indicator displays the sum of the two controls. Thus, a virtual instrument can either be run as a programme, with the front panel serving as user interface, or, when dropped as a node onto the block diagram, the front panel defines the inputs and outputs for the node to the connector pane. This implies each VI can be easily tested before being embedded as a subroutine into a larger program. The graphical approach also allows non-programmers to build programs by dragging and dropping virtual representation of lab equipment with which they are already familiar. The LabVIEW programming environment, with the included examples and documentation, makes it simple to create a small application. This is a benefit on one side, but there is also a certain danger of under estimating the expertise needed for high-quality G programming. For complex algorithms or large-scale code, it is important that the programmer possess an extensive knowledge of the special LabVIEW syntax and the topology of its memory management. The most advanced LabVIEW development system offer the possibility of building stand-alone applications. Furthermore, it is possible to create distributed applications, which communicate by a client/server are therefore easier to implement due to the inherently parallel nature of G.

IV. HARDWARE

A. myRIO

myRIO Student Embedded Device—The myRIO1900 is a tool you can use to teach and implement multiple design concepts with one reconfigurable I/O (RIO) device. Featuring I/O on both sides of the device in the form of MXP and MSP connectors, it includes 10 analog inputs, six analog outputs, 40 digital I/O lines, Wi-Fi, LEDs, a push button, an onboard accelerometer, a Xilinx FPGA, and a dual-core ARM Cortex A9 processor.

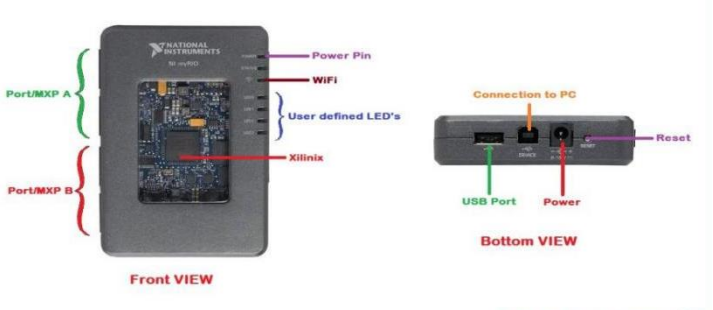

Fig.1: myRIO

Fig.1 shows the myRIO, the word "RIO" stands for Reconfigurable Input Output. NI-myRIO is one of the best products of National Instruments which can able to do the process of Image Processing programs, Hardware interfacing

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programs such as motors, gears and levers etc. NI-myRIO has Xilinx which is thereby a combination of Dual Core ARM Cortex A-9 Processor and FPGA embedded on it. It has Integrated WIFI, Analog I/O ports and Digital I/O ports and many others as described in the following figure.

B. Arduino

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

Fig. 2: Arduino

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Ground and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

C. RF Transmitter & Receiver

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 433 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna. The transmission occurs at the rate of 1Kbps – 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder.

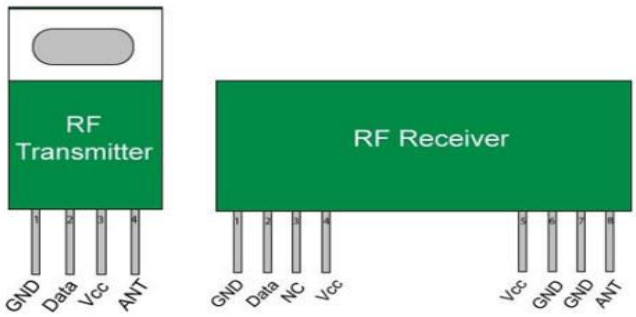

Fig. 3: RF Transmitter & Receiver

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V. BLOCK DIAGRAM

The traffic light control system consists of two main blocks they are the Transmitter Block and the Receiver Block.

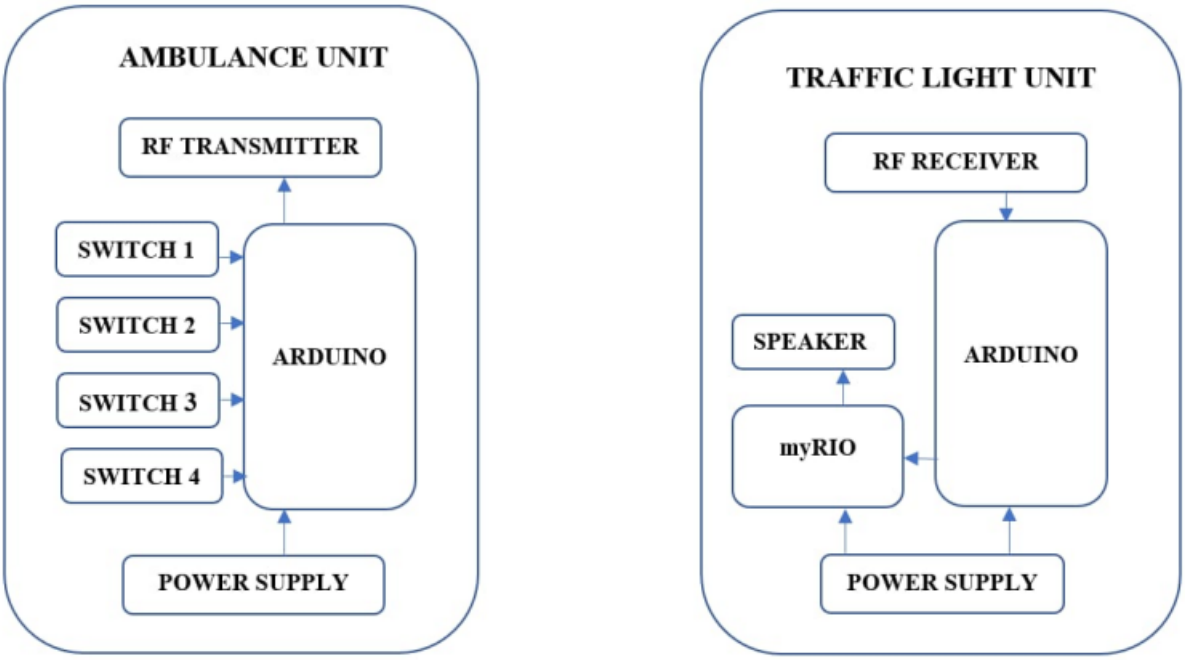

Fig. 4: Block Diagram

A.***Transmitter Block:***

This block is used to transmit the signals given at the input terminals, a microcontroller(Arduino Uno) is used to interface and manipulate the input signals, the input controls used in the Transmitter block are Switch 1, Switch 2, Switch 3, and Switch 4 which performs various logic operations when executed. The Arduino is given a power supply of +5 Volts DC Supply.

B.***Receiver Block:***

This block is used to receive the datas transmitted from the transmitter and Receiver module uses the transmitted signal and decrypts the sent signal, based on the received signal the microcontroller(Arduino Uno) executes the logic proportional to it. The other parts of the receiver block are Arduino, myRIO, Loudspeaker and a Traffic Light Indicator. The Arduino and myRIO are supplied with +5 Volts of DC Supply.

VI. WORKING

As the Block Diagram shows the system has two separate blocks the first one is input block which is fixed in every ambulance and it has four distinct switches interfaced with Arduino and RF Transmitter for the transmission of emergency signal. The second block is output block which is placed at every traffic signal junction. It has RF Receiver which receives the transmitted signal from the input block and the receiver signal is fed to the another Arduino which in turn interfaced with myRIO Hardware which controls the traffic lights. Four switches in the input block corresponds to each directions, that is Switch 1 is North, Switch 2 is East, Switch 3 is West and Switch 4 is South.

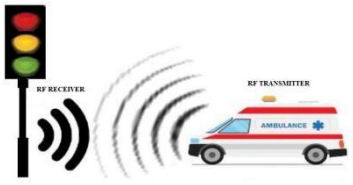

Fig. 5: Communication between Traffic Signal and Ambulance

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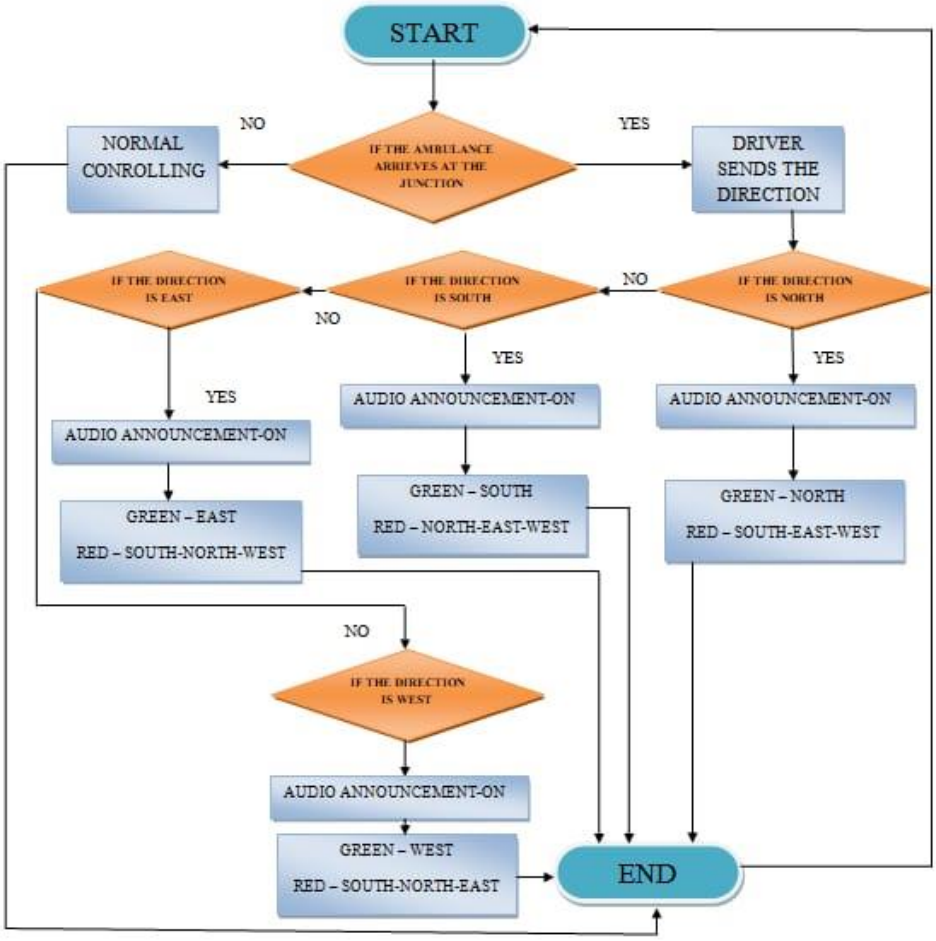

Fig. 6: Working Flow Chart

A.Case:1- If no switch is pressed at the input block

Normal Traffic Signal Cycle continues until signal is received from the input block.

B.Case:2- If switch 1 is pressed at the input block

Then the direction is North and following changes are automatically made through LabVIEW Programming.
First Audio announcement is given aloud, Second the Green Signal at the North Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

C.Case:3- If switch 2 is pressed at the input block

Then the direction is East and following changes are automatically made through LabVIEW Programming
First Audio announcement is given aloud, Second the Green Signal at the East Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

D.Case:4- If switch 3 is pressed at the input block

Then the direction is West and following changes are automatically made through LabVIEW Programming
First Audio announcement is given aloud, Second the Green Signal at the West Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

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E.Case:5- If switch 4 is pressed at the input block

Then the direction is South and following changes are automatically made through LabVIEW Programming
First Audio announcement is given aloud, Second the Green Signal at the South Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

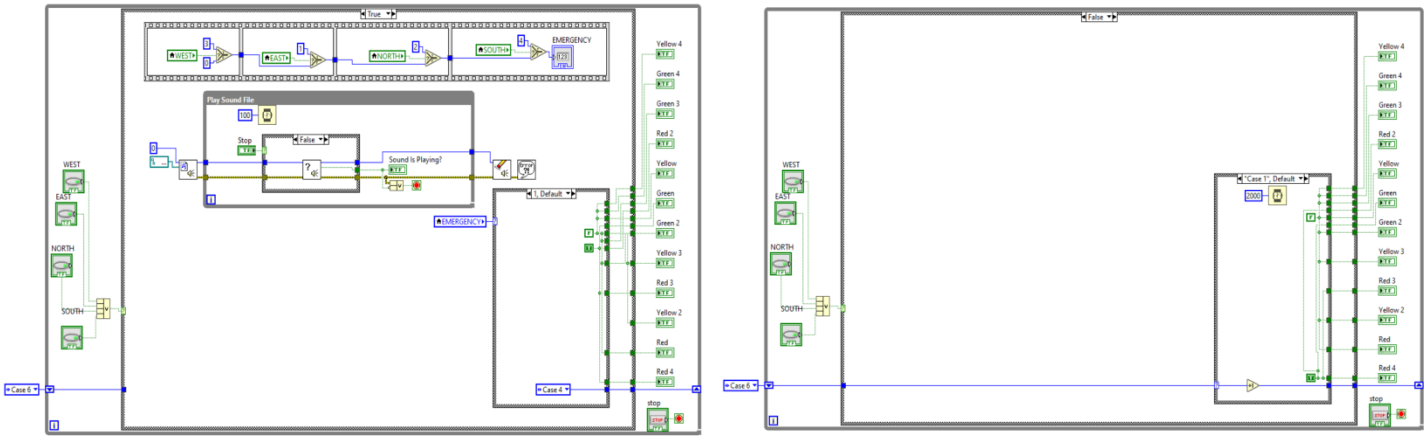

Fig. 7:Block Diagram of LabVIEW Program

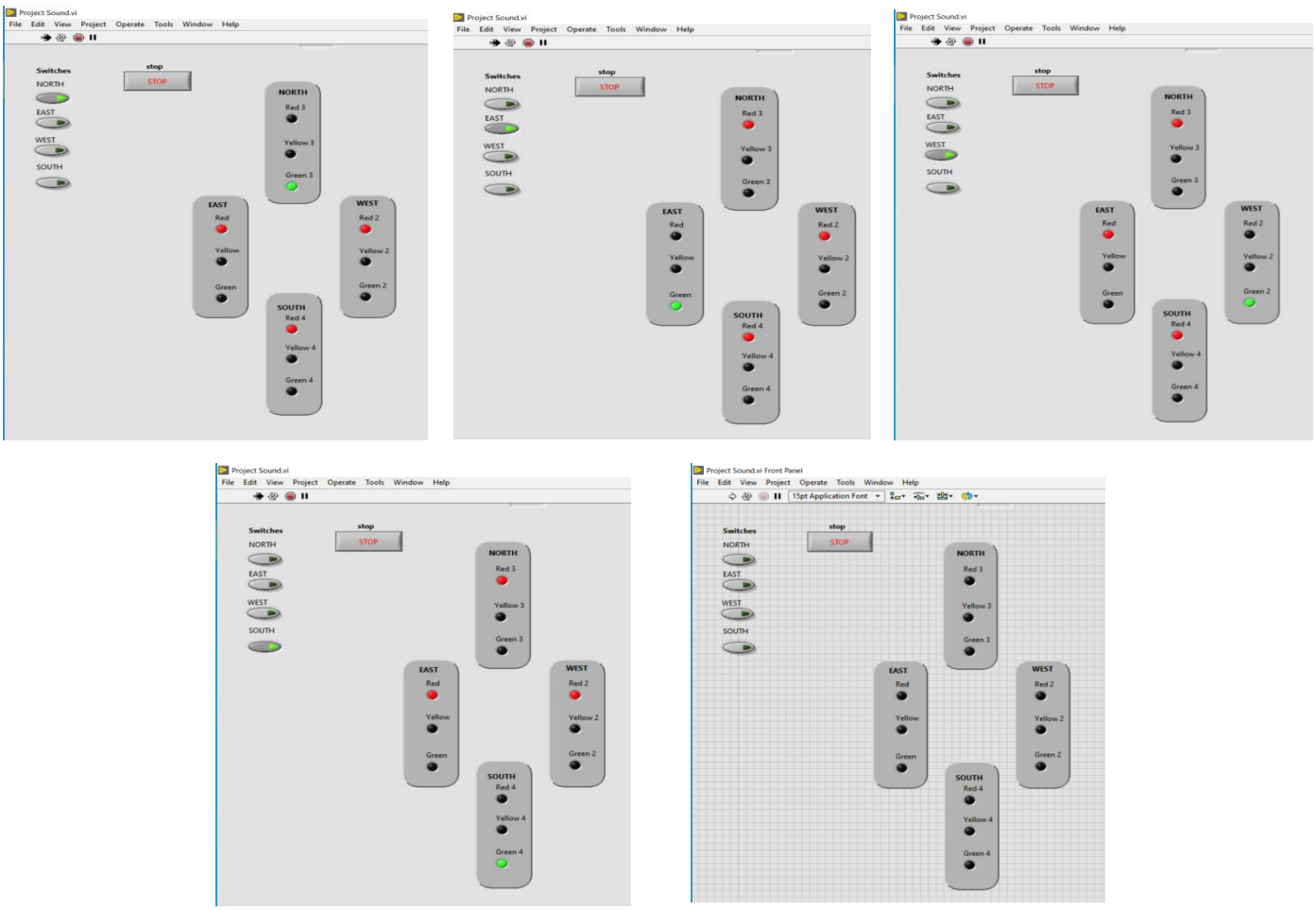

Fig.8:Front Panel of LabVIEW Program for Different Cases at run time

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VII. CONCLUSION

All developed nations have well-developed transportation system with efficient traffic controlled on road, rail, air, and transportation of goods industrial products, man power and machinery are the key factors which influencing the economic development of any country. Mismanagement and traffic jam lead to long waiting times, loss of fuel and money. It is therefore, utmost necessary to possess a quick, economical and efficient control system for National development. The monitoring and control of city traffic is becoming a serious problem in many countries. With the ever-increasing number of vehicles in the road, the traffic monitoring authority on find new methods of overcoming. This system will certainly help to traffic police to offer the way to the ambulance when there's heavy traffic on the road. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicles get clear way to reach their destination in less time, and without any human interruption.

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