Traffic Control System For Two Way Lane Based ON GSM Module

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Abstract— The increase in the number of vehicles has led to Traffic congestion. During the busy hours of a day, the traffic is at its peak and there are various problems related to traffic congestion. One such problem is fuel consumption. An average of 90 minutes is spent daily by a vehicle in congested traffic. People forget to switch off the engines which cause wastage of the non-renewable resources such as petrol, diesel and LPG.For the emergency conditions such as ambulance, fire engines to pass through, and the congestion poses a hindrance. To recover for the lost time spent in congestion people tend to hurry and disperse the congestion, causing accidents. Bangladeshi roads witness one accident every day.To overcome these problems, a system has to be designed which can alert for congestion. "Traffic congestion alert system using GSM" does the needful and thus helps in reducing the traffic congestion.

Index Terms—Traffic jam, Time Waste, Remote Monitoring, Avoid Traffic jam, Time Saving.

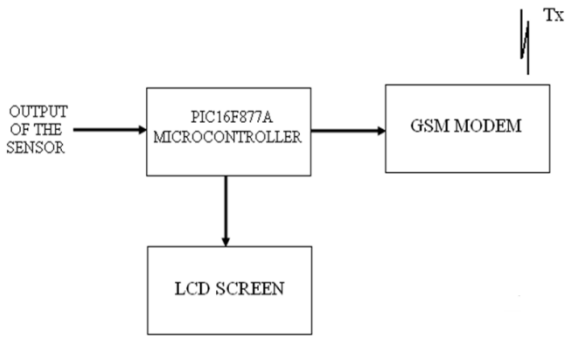
1. Introduction

"Traffic Congestion Alert System Using GSM" project automatically alerts the traffic congestioncondition. It can be implemented in the lanes and junctions which carry heavy traffic. Sensors are placedon roads to monitor the traffic condition. In each junction a transmitter and receiver will be present along with a LCD screen for display of message. When congestion is reported an interrupt is sent to the controller and the corresponding alert, LANE BUSY message is sent to the neighboring junctions. The GSM modem (SIM 300) is used for transmitting and receiving messages on GSM network. The alert message is received on the surrounding junctions using GSM modem (SIM 300). This message will be displayed on the respective LCD screen. Thus the rider is alerted for the congestion condition beforehand. This facilitates the rider in taking an alternate congestion free route, avoiding being stuck in the traffic jam (congestion). After the particular lane clears, the LANE CLEAR message is also displayed. This helps in diverting the traffic and hence reducing congestion.

2.Description

Transmitter and Receive

(a) Fig. 2.1 transmitter bock diagram



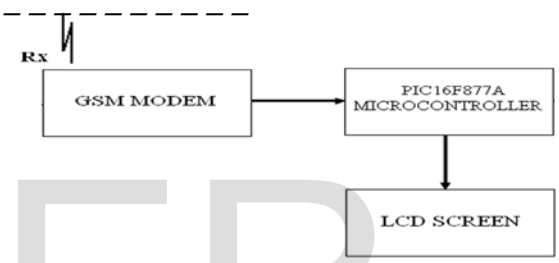


Fig. 2.2 receiver block diagram

The Block Diagram includes transmitter and receiver as shown in Figure (2.1) and Figure (2.2), which gives an overall description of the project. Using GSM system the data is transferred from the transmitter to the receiver. This data will be displayed on both the LCD screens placed at transmitting and receiving side.

Sensors are kept on lanes for traffic monitoring. The output of these sensors is given to the PIC16F877A microcontroller. The controller processes these outputs received and the corresponding busy lane is displayed BUSY on the LCD screen connected to the microcontroller. The BUSY message is wirelessly transmitted to the receiving end using the GSM modem. It is processed in the PIC microcontroller.

3. HARDWARE DESCRIPTION

The hardware includes power supply, sensors, PIC microcontroller, LCD screen, MAX232, RS232 and GSM modem.

3.1Power Supply

Figure 3.1 shows ac to dc converter which is used for powering the microcontroller section and relay driving sensor section. These two transformers are used to step down the 230V ac main supply to 12V ac supply. Current handling capacity of the transformer is 500mA.

3.2 Sensor

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. Figure 3.2 show the sensor

3.3 LCD Screen

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector as shown in Figure 3.3.

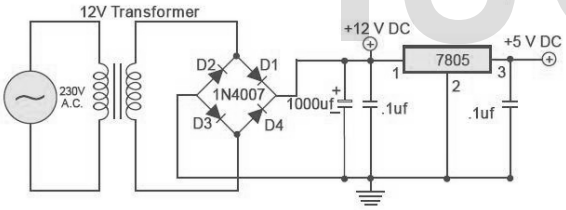


Fig. 3.1 power supply circuit

Fig. 3.2 IR sensor (RX & TX)

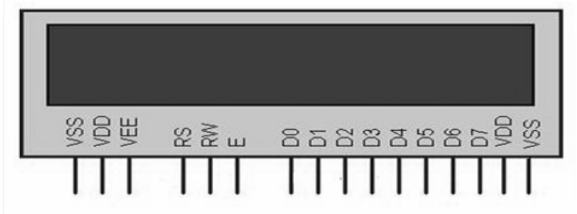


Fig. 3.3 LCD Screen Schematic Diagram

3.4 PIC16F877A Microcontroller

The 16F877A is a low-power; high performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The following are the main features of this micro-controller as shown in Figure 3.4

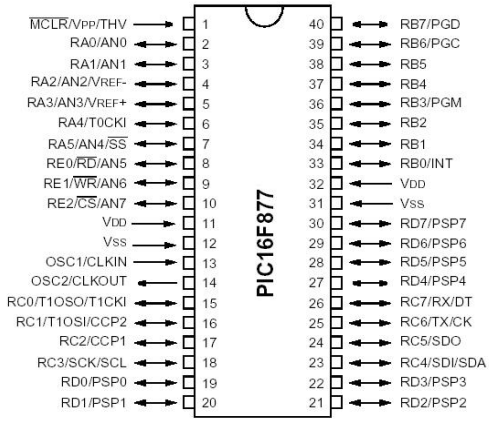


Fig. 3.4 PIC16F877A pin diagram

3.5 RS232

To allow the data compatibility among data communication equipment made by various manufactures, and interfacing standard called RS232, as shown in Figure 3.4, was set by the Electronics Industries Association (EIA) in 1960. RS232 is the widely used serial I/O interfacing standard. In RS232, 1 is represented by -3 to -25 V, while a 0 bit is +3 to +25 V,

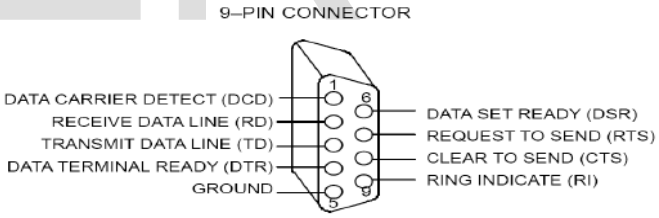


Fig. 3.5RS232

3.6 MAX232

MAX232 IC chips are commonly referred to as line drivers. One advantage of MAX232 chip is that it uses +5V power source which is same as the source voltage of PIC16F877a. This does not require dual power supply. The MAX232 has two line drivers for transferring and receiving data.

3.7 GSM MODEM

Figure 3.6 shows SIM300 block diagram.

GSM modem can be interfaced to RS-232 through D-type 9 pin connector. Serial port baud rate is adjustable from 1200 to 115200 bps (9600 default). The antenna can be either SMA antenna connector and wire antenna.

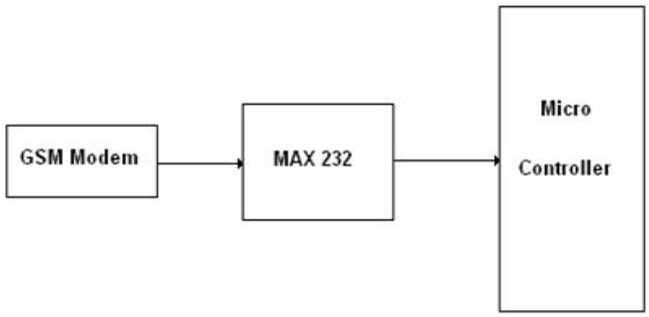


Fig. 3.6 GSM modem block diagram

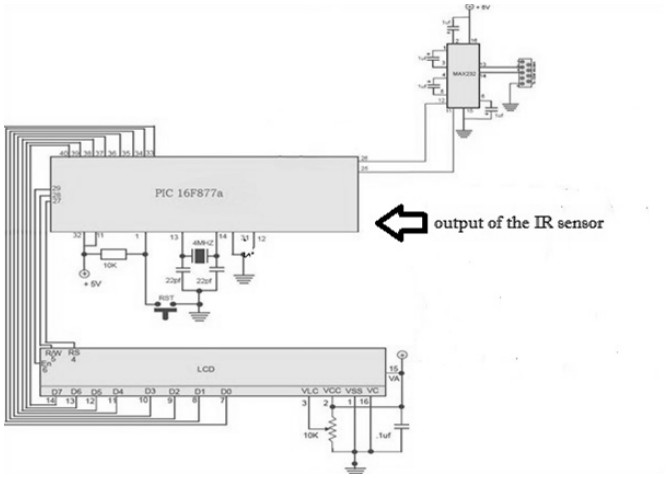


Fig. 5.1 transmitter circuit diagram

4. Software Description

The software includes GSM system and SMS. The PIC is programmed using the simple high level language tool C to control the sensor outputs and the subroutines.

5. Steps Involved In the Program

Step 1: Start of the Program

Step 2: Setting up of Modem, Hardware and software with the initial value.

Step 3: Store the desired destination SIM number in the PIC microcontroller at the Transmitting side.

Step 4: If the entiresensors become jammed. This interrupts the controller.

Step 5: Once the request occurs from any of the sensor from any of the lanes, step 6 is performed.

Step 6: The sub routine of the particular interrupt is executed and the message showing corresponding "LANE JAM" will be sent to the receiver and also displayed on the LCD screen placed at transmitting end.
Else control will go to step 4.

Step 7: Once the congestion is cleared which had previously occurred, the sensor is released, then the step 9 is performed.

Step 8: The sub routine of the particular interrupt is executed and the message showing corresponding "LANE CLEAR" will be sent to the receiver and also displayed on the LCD screen placed at transmitting end.
Else control will go to step 6.

Step 9: Control goes to step 4 which loops infinitely

6. Implementation

The IR sensors are placed on the lanes for monitoring traffic. A transmitter and receiver circuit along with LCD screen is placed at every junction. The SIM (Subscribers Identity Module) is inserted into the GSM modem and the whole setup is powered ON. The GSM modem initializes by registering itself to the GSM network. All the hardware and software components are initialized by setting initial value. The threshold time for sensor is set. The SIM numbers of the neighboring GSM modems are stored in the transmitting PIC microcontroller.

When a vehicle passes on the road, the sensor starts sensing the vehicle i.e. when the vehicle jammed the road then the sensor is close and it closes the circuit. If this condition prevails for more than the threshold time, an interrupt signal from that sensor is sent to the PIC16F877A microcontroller. The microcontroller detects and services the interrupt. In the ISR (Interrupt Service Routine) the display messages are stored. The PIC microcontroller sends the "LANE JAM" message to the GSM modem. This message will also be displayed at the transmitting LCD display. The GSM modem transmits this message in the form of SMS (Short Message Service) from the SIM present in the transmitting GSM modem to all the receiving GSM modem located at the surrounding junctions. This is accomplished using the existing GSM network.

The "LANE JAM" message is received at the GSM modem located in every neighboring junction. This message is decoded in the PIC microcontroller and displayed on the LCD screen connected to it. The "LANE JAM" message is displayed

on every neighbouring junction. This enables the rider to divert his route to an alternate and avoid getting into the traffic jam.

After the switch is released, the "LANE CLEAR" message is sent from the transmitter junction in the same manner as described above. The "LANE CLEAR" message is displayed on the LCD screen at receiving junctions.
The microcontroller keeps polling the sensors to check for interrupt signals. This process is done for 24 hours, 365 days round the clock.

7. Advantages

The existing system does not alert the traffic congestion. As there will be no alert more vehicles coming into the lane will increase the complexity of congestion. The congestion will require manual inspection. The "Traffic Congestion Alert System Using GSM" alerts for the congestion condition beforehand and avoids further deterioration of traffic. This system can be deployed on the already existing GSM network. This does not require a separate network setup. With the courtesy of GSM, global coverage is available. The congestion status of a remote lane can be monitored.

Messages are transferred wirelessly. This reduces the expense of cable laying, wires and their wear and tear. The transfer of messages is through SMS (Short Message Service), thus the service charges are comparatively less. The maintenance cost of GSM is less.

The air and noise pollution can be reduced. Hence health and environmental hazards are also minimized. The non-renewable energy sources such as petrol, diesel, LPG will be consumed less.

Way can be made for the emergency vehicles such as ambulance and fire engine once they are on road, seeing the LCD display. Thus congestion can be reduced during peak hours helping the riders to reach the destination on time.

8. FUTURE SCOPE

"Traffic Congestion Alert System Using GSM" can be further improved by creating a website that gives the status of each lane. This way an online portal of the application can be created. With the aid of GSM network the traffic status of any remote lane can be monitored and viewed on the website from any location.

9. Conclusion

The traditional methods for controlling the traffic jam do not prevent the vehicle from getting into the jam. But "Traffic Congestion Alert System Using GSM" gives the status of forthcoming lanes and alerts the rider by displaying the busy message if any of the lanes is found congested. Hence the vehicle can be prevented from getting caught up in traffic jam. By diverting the traffic away from the congested lane the congestion can be cleared much faster.

10. Reference

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