Designing Of Overload Monitoring System In Public Transportation Based On Microcontrollerin Ethiopia

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Abstract- There has been an issue of overload passenger monitoring despite having stationed police at different locations for manual checkups. This has led to many injuries and death due to passengers being overloaded. This project aims at developing a system for monitoring and reporting excess passengers in public transport. It is based on global system for mobile communication (GSM) modem. This paper includes GSM modem, liquid crystal display (LCD) and buzzer alarm as output from microcontroller and passive infrared ray (PIR) sensor as input. If the number of passengers become above the required, the microcontroller send data's to the GSM modem. GSM modem transmit the information to a database and then to the respective authority such as traffic police. The central database stores all information for the systemsuchas different traffic police stations with respective contact numbers, user name and message sent by the system. This helps to control excessive passenger, hence reduces the number of deaths and severe injuries.

Key words: GSM modem, Microcontroller, PIR sensor, data base, buzzer and LCD

I Introduction

Overload passenger in public transport is a serious problem in many countries across the world because it incurs huge costs in terms of life, property and maintenance of buses. Many countries have established a system to reinforce overload limit regulation (rule) and some are attempting to address theissue and implement strict controlling mechanisms. The struggle for the problem since the last decades particularly after the introduction of public transport buses received more attention. And yet these are playing major roles in the transportation satisfying the transport demand generated by the growing economy and ever increasing population both in developed and developing countries. The problem of overloading is generally under control in many developed countries while it is still a challenge too many developing and under developed nations. [3] Now a day, with the increasing number of people in cities of Ethiopia, the problem of poor transportation services has grown to an alarming extent. Due to no availability of bus information, the buses are overloaded for most of the times, which often results in some kinds of fault occurrence in buses and peoples get late further. The GSM/PIR based monitoring and controlling passenger system is a system that makes use of PIR infrared radiation motion analyzer which counts passengers who get in and out of the public buses. GSM is used as communication link between different modules. These modules include bus station module, in bus module and bus stop module. Bus station module contains GSM modem interfaced to the microcontroller and receives bus information from in bus module. The bus starts to transmit the number of peoples to the bus station and bus stop terminal while crossing the road.

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Bus stop module after receiving buses data through GSM engine displays it on LCD installed at each bus stop. GSM based overload monitoring system will provide effective real time vehicle monitoring, mapping and reporting this information value and adds by improving the level of service provided. The system has an on-board module which resides in the vehicle to be tracked and a base station that monitors data from the various vehicles. This system uses ARDUINO Uno microcontroller. The inbuilt analog to digital converter (ADC) receives analogue data from sensors and converts it to digital data and passes it to the microcontroller. The sensors continuously send data from the distant site. This system is interfaced with a GSM modem. This system senses the conditions continuously and a message is sent to bus station. Using this system, the operator can monitor the signals from anywhere. The GSM modem is connected to microcontroller using RS232 interface. Whenever ashort message service (SMS) is sent to the GSM modem, the GSM modem receives the data and sends to microcontroller. After receiving the signal from the microcontroller it processes the data and sends the read data to GSM modem. The GSM modem sends theupdated data to bus station. [4]

II transport system in Ethiopia

Ethiopia had registered an accelerated economic growth particularly since the last 10 years. The Ethiopian Transport Authority (ETA) had also played a vital role where remarkable achievement is made towards improving and expanding public transport system of the country. Nevertheless transporting agricultural surplus, industrial goods and commodities towards market and development center is increasing from time to time.[9] To manage with this demand public transport buses are becoming one of the nation's priorities despite their huge investment cost. Yet due to overload transportation, many of the transport buses are suffering from early damage before their intended service lives. Now a day it is becoming a pain in the neck for the ETA. Based on the data collected from the ETA, there is still an overloading passenger in the transport buses. [9] The current transportation system is very tedious and manual. This increases labor cost for traffic police, due

to the system is poor for security and safety for passengers. The core objective of the literatures review is to have an insight regarding previous works and improving the previous method using this new technology in order to avoid accident, extra labor spent and overloading.

III design methodology

a) Bus station module

Bus station module is installed at bus terminals where the bus will depart. It is equipped with microcontroller, GSM module, administrator computer (supercomputer) and database server. The GSM module is used to receive public vehicles information at the time of overloading.

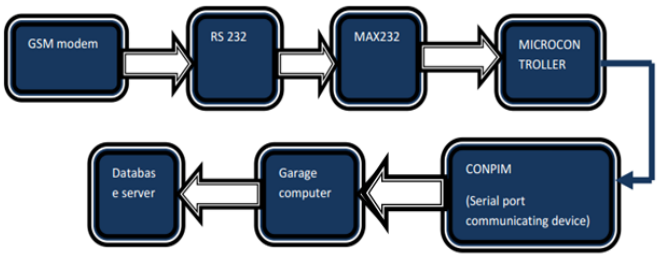

Figure 1: *bus station module*

b) In bus module

In bus module will be the base module for the entire process which consists of microcontroller interfaced with PIR sensor counter pair, 20x4 LCD display, GSM modem and buzzer alarm with indicating lamp. LCD is used to display the number of passengers and number of extra passengers. GSM modem sends the bus information to bus terminals like bus stop and bus station. Two pairs of PIR sensors (PIR 1&PIR 2, PIR 3 &PIR 4) are connected to the controller to count the number of passengers in and out.

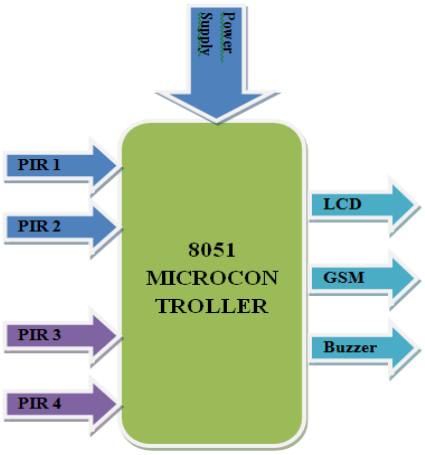

Figure 2: *in bus module*

c) Bus stop module

Bus stop module is installed at every bus stop edge which consists of GSM modem, microcontroller and LCD display. This module is used to know the status of bus before it passes to the bus station. The information in this module is received from in bus module. If there is overloading in the bus the message is transmitted to the bus stop module then the traffic police give penalty for the bus driver.

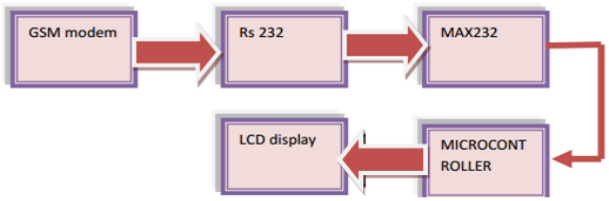

Figure1: *bus stop module*

GSM modem interface module is used to convert RS 232 logic into TTL logic. The Output from GSM Unit is 3.5V(for 1) and 0v(for 0).This can be interfaced with RS232 ,Which Produces +10v for 1 and -10v for 0.This can be converted in to +5v(for 1) and 0v(for 0) by MAX 232 and interfaced with Micro Controller. The MAX232 is used as GSM Interface.

d) GSM network interface with the threemodules

The execution of the system starts from the bus station module. Initially the bus station module has bus detail information like bus number, bus starting and destination place. When this module receive information i.e. bus number, number of extra passengers and driver user name from the in bus module, it understands the information due to all bus information details are present in the station database. Whenever the bus crosses bus stop module, data is transmitted and received between in bus module and bus stop module through GSM unit. Then this information is displayed on LCD, in the traffic police office. As a result the traffic police take measurement for this situation.

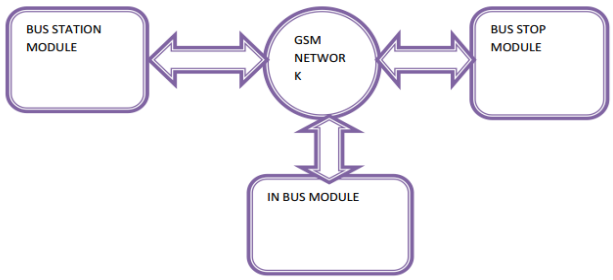

Figure 4: *GSM network with three modules*

IV software design

The software used in this project developed in ARDUINO micro controller. The following procedures are used for constructing flow charts as it clarifies for the working principles of the whole system (gathering bus information and communicating with GSM modules).

1. PIR sensor senses motion and sends the data to the microcontrollers.
2. The given program loaded to the microcontroller counts the number of passengers inside the bus.

3. Then, microcontroller studies the given data and stores it to serial EEPROM.
4. After processing and filtering data is sent to the GSM Modem.
5. GSM modem sends the data in the form of SMS to selected device.
6. Then, the data is processed and number of passengers are tracked and displayed on the screen.

There are two flow charts avelaible dedicated for the arduino micro controller bus data processing and information communication with GSM modem.

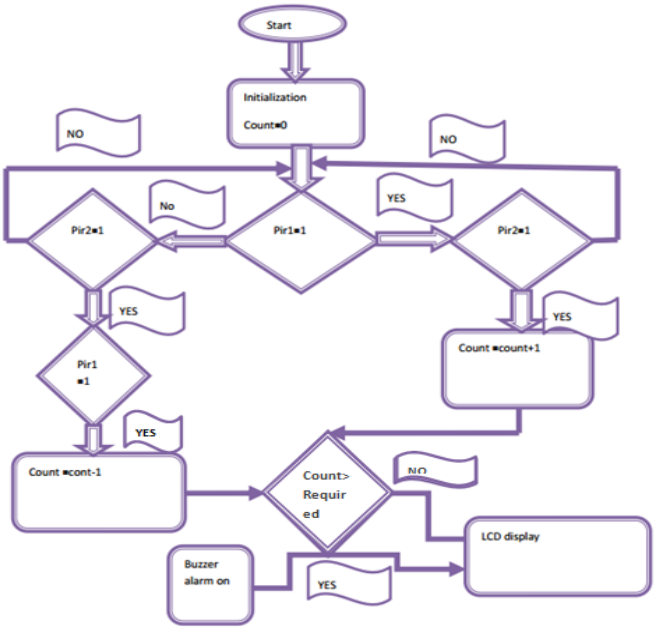

Figure 5: *flow chart dedicated to arduino micro controller data processing*

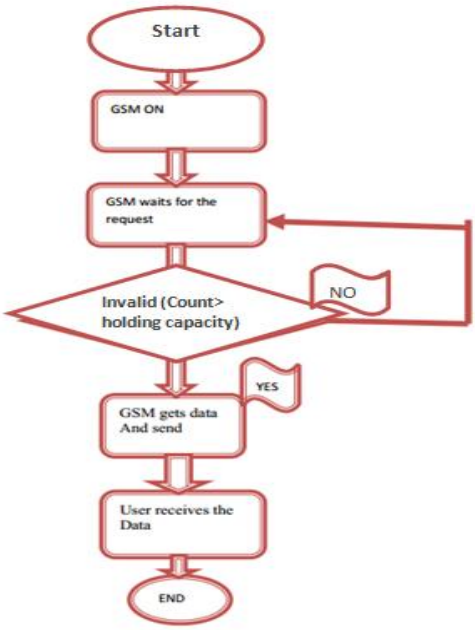

Figure 6: *flow chart dedicated for data communication*

V Results

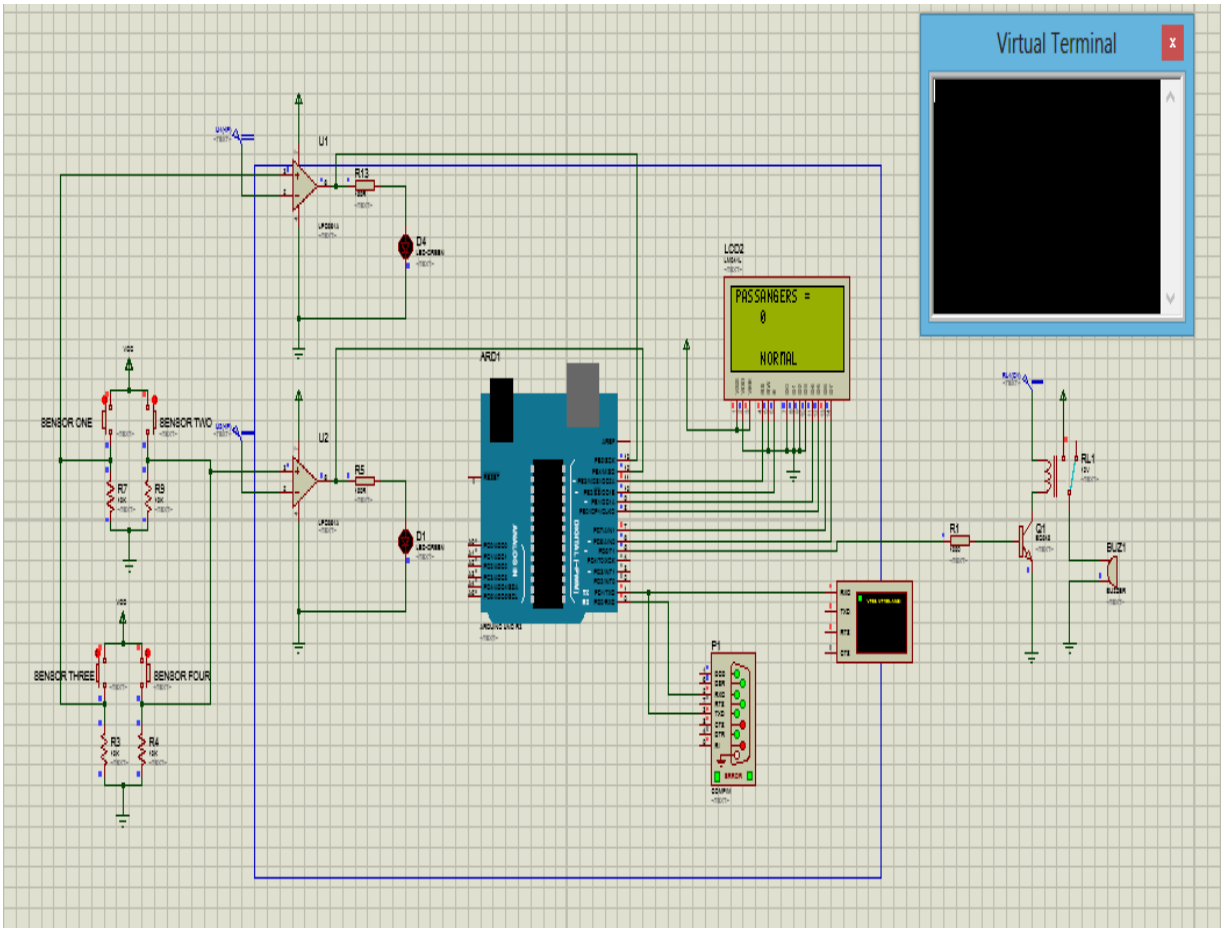

Figure 7: *Overall circuit diagram of the system*

As shown in the figure 7 above, the circuit has four logic inputs for two doors in terms of PIR sensor, because of the PIR sensor is not present in PROTEUS software manual switch instead is used. These sensors are PIR1, PIR2, PIR3 and PIR4 in which they are given to the microcontroller in two ways. In the first case, when PIR1 senses before PIR2 for the first door or PIR 3 senses before PIR4 for the second door, this indicates the person is entering tothe bus and so counter increase by 1 and the green color LED start to light. In the second case, when PIR2 senses before PIR1 for the first door or PIR4 senses before PIR3 for the second door, this indicates the person is exiting from the bus and so the counter decrease by 1 and the green color LED start to light. Then after, when the number of people in the bus is above the required (i.e. overload is happened) the buzzer alarm start to buzzing and the GSM automatically send message the serial number of the bus to bus station and bus stop terminal.

VI conclusions

Overload monitoring system is becoming increasingly important and it is more secured than other systems. It is completely integrated so that once it is implemented in all vehicles, then it is possible to control the bus. By using ARDUINO Microcontroller, PIR sensor and GSM modem we can control the overloading of transportation system. Controlling method in this project can reduce crowdedness and car accident in public transportation. In the result shown in chapter four, if the number of people inside the bus is above the required, the buzzer alarm start sounding. The GSM modem automatically sends the message to the bus station module and bus stop module, and so the driver will punish according to the rule. This system has many advantages such as large capability, wide areas range, low operation costs, effective, Strong.

VII References

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