shown in Fig. 3 while flow chart of module software is shown in Fig. 4.

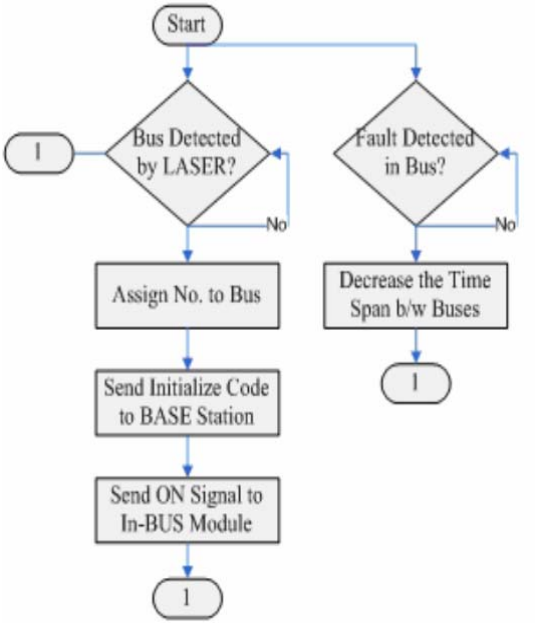

Figure 2: Flow Chart of BUS Station Module

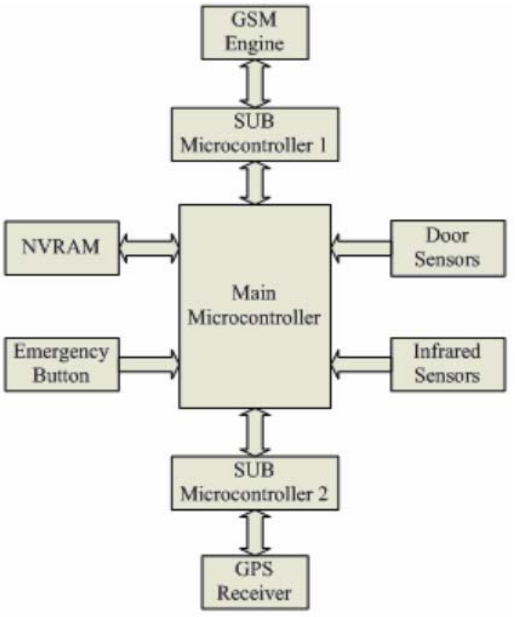

Figure 3: Block Diagram of In-BUS Module

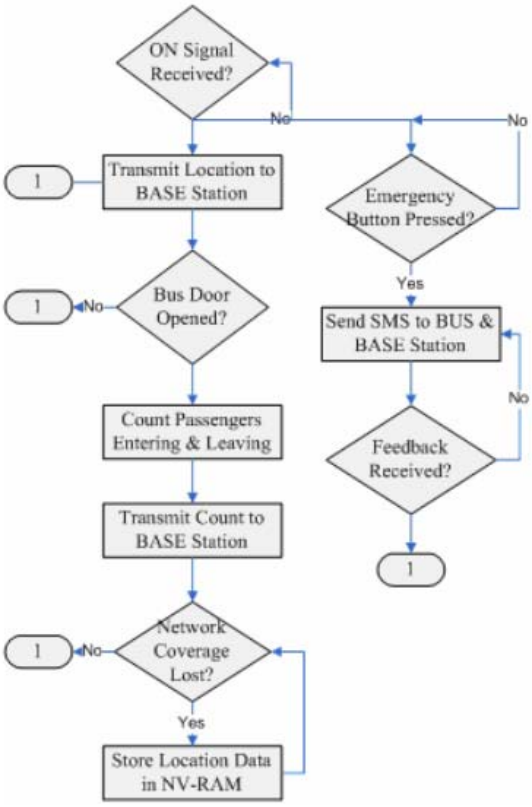

Figure 4: Flow Chart for In-BUS Module

c. BASE Station Module

This module is the central part of the network. It accepts location information of buses through respective GSM modems and maps the information on Google Map for visualization. It also receives the number of passengers entering and leaving the bus on per stop basis from In-BUS Module for statistical analysis. The message received is of the form “20, 10, 2345.3522N, 09022.0288E”. The first two strings denotes the number of passengers entering and leaving the bus respectively and next two strings denotes the location information; all separated by commas. Another GSM modem is used to get the user request of location information of a particular bus. An example of the query put by the passenger is of the form “33U” or “33U10”. In first instance i.e., “33U”, ‘33’ is the route number and ‘U’ designates the direction flag while in second instance i.e., “33U10”, additional digit ‘10’ denotes the bus stop number where the passenger is standing. The microcontroller attached with this GSM modem passes on the user request to the PC dedicated for that route number. The PC after processing the request data sends desired location information in form of bus stop name to microcontroller. The microcontroller then transmits this information back to the user. The information that passenger will receive contains the location of all buses out of terminal in desired direction in former query while in case of later query, he will get the location of those buses which are coming towards the particular bus stop number in desired direction along with time information. The time information is embedded in message to account for any delay in processing the user request. BASE station also monitors the emergency situations transmitted from In-BUS Module. In addition to this, the station keeps record of security issues and traffic congestion conditions and directs the driver to change the

route if desired. The block diagram of the module is shown in Fig. 5 while module software is shown in Fig. 6.

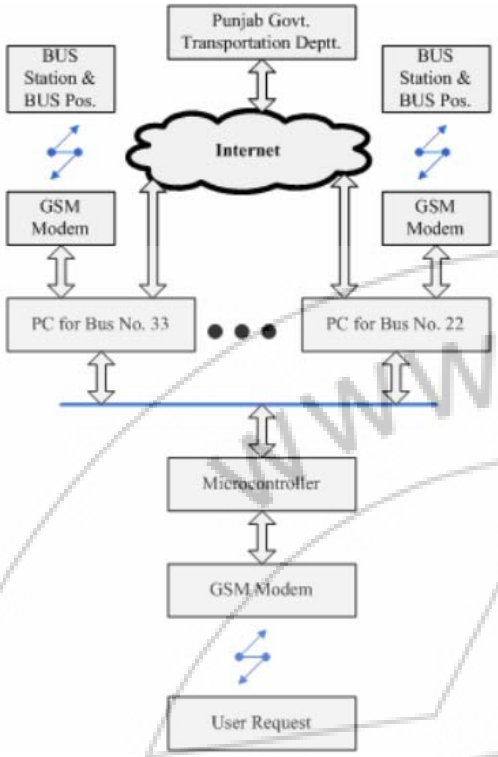

Figure 5: Block Diagram of BASE Station Module

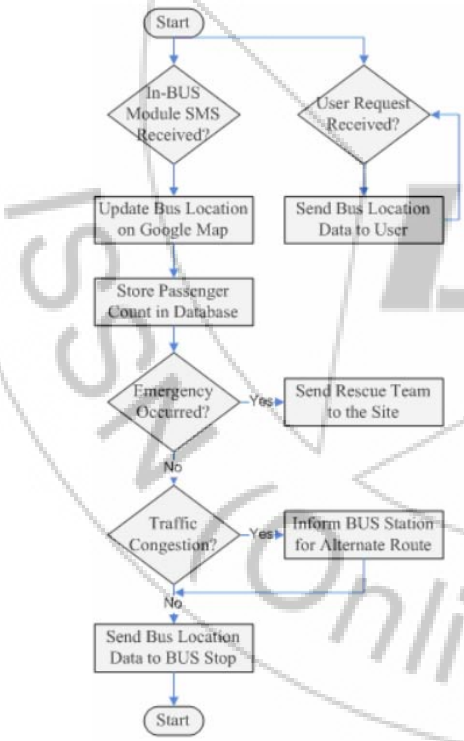

Figure 6: Flow Chart for BASE Station Module

d. BUS Stop Module

This module is installed at every bus stop to let the passenger know about the location of buses coming towards that stop. It comprises of a GSM modem, a NV-RAM and dot matrix display; all interfaced to 89C52 microcontroller. This module is installed at every bus stop to let the passenger know about the location of buses coming towards that stop. It comprises of a GSM modem, a NV-RAM and dot matrix display; all interfaced to 89C52 microcontroller. Message contains information of those buses only which will pass by the designated stop. First two digits of a sub-string denote the bus route number followed by the bus stop name which is the current location of bus coming towards the specified stop. Microcontroller after retrieving the stored information displays it on a 3x15 dot matrix display. The Microcontroller refreshes the information with a rate of 10 seconds. In case of an emergency situation, the location of next incoming bus is displayed. The block diagram of this module is shown in Fig. 7 and flow chart of module is shown in Fig. 8.

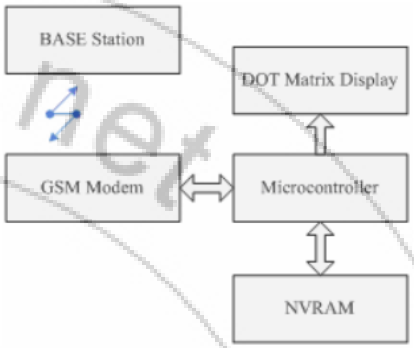

Figure 7: Block Diagram of BUS Stop Module

4. Results/ Outputs

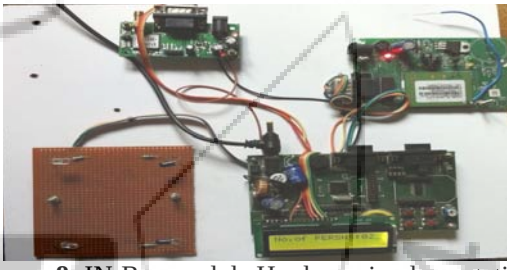

Figure 8: IN-Bus module Hardware implementation

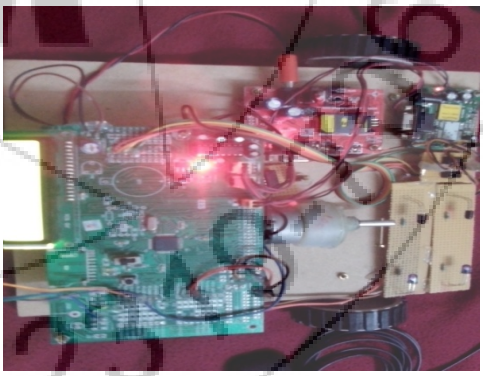

Figure 9: Hardware implementation of in bus module

Figure 10: Initialization of the Module

Figure 11: Message format in mobile

Figure 12: Number of persons in the bus count

5. Conclusion

A low cost transportation management system based on integration of GPS and GSM data is designed. The systems consist of various modules which are wirelessly linked with GSM modems. Cost effective SMS service of GSM network is used for the transfer of data between the modules. A new service, to facilitate the people who use public transport for travelling, is introduced inside the city. The service provides the user with current location information of desired buses based on which the user can adjust his schedule accordingly. The service therefore reduces the waiting time at the bus stop. This system provides a user friendly environment to the people of a city to overcome the difficulty in finding bus route as well as saving lot of time.

6. Future Work

The system can be made automatic by installing cameras at bus terminals which can automatically read the license plate number of buses thereby eliminating the operator. An automatic route guider display can be installed in buses to better update the alternative route in case of serious road congestions. Fare collecting system can also be automated by providing another mobile service to which all the passengers using public transport are subscribed.

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