



ISSN 2278 – 0211 (Online)

Design and Implementation of GPS and GSM Based Intelligent Ambulance Monitoring with Patient Health Care

Dr. Shantanu K. Dixit

HOD, Department of Electronics and Telecommunication, Solapur University, Maharashtra, India

Ashwini A. Joshi

Student, Department of Electronics, Solapur University, Maharashtra, India

Abstract:

Monitoring during the golden hour of patient transportation helps to improve medical care. Presently there is different physiological data acquisition and transmission systems' using cellular network and radio communication links. Proposed project presents design and implementation Ambulance system for emergency patient transportation employing ARM 7. The monitoring (server) system at hospital monitors ambulance location as well as Accident victim vehicle using Google map. It also include biomedical sensors to monitor heart bit rate and temperature of patient through SMS. The front end application at the monitoring system is developed using visual basic software in Personal Computers. It can display location of ambulance and status of heart bit rate and temperature of patient. After receiving SMS hospital can prepare their staff for proper treatment of coming patient

Keywords: ARM7, 89C51microcontroller, PIC microcontroller, sensors, 3 axis accelerometer

1. Introduction

Immediate medical attention to critically ill patients and accident victims requires a system to transmit vehicle location information. A centralise monitoring system required in hospital which have information of accident victim vehicle and ambulance location. The doctor needs to understand the physical and physiological condition of the patient so that the right decision regarding administration of drugs and transport destination can be appropriately taken. Hence there is a need for communication between the staff of the ambulance and the monitoring station. The requirement can be achieved by using system in ambulance which uniquely transmits location information and status of patient through parameters i.e. heart bit rate and temperature etc. The system needs to include biomedical sensors to transmit status of patient. All systems are connected to each other through wireless communication which transmit information and data .Use of GPS and GSM modems for higher communication links will make system more effective and fast response Even with this there is also need of traffic control during transportation of emergency patient so valuable time of response can be saved. System will be interfaced with wireless RF module to transmit low signal. Including all these requirements system will found to be very useful for emergency treatment of patient during transportation. Proposed project achieves all requirements by including four units called as Ambulance unit, Monitoring Unit, Vehicle unit and Signal Unit. Ambulance became intelligent due to interfacing biomedical sensors.

2. Proposed System

Figure 2.1 shows a system designed in which four units are working simultaneously with GPS and GSM modem to achieve all requirements. Ambulance unit built around ARM7 with biomedical sensors and one vehicle unit with three axis accelerometer and limit switch.

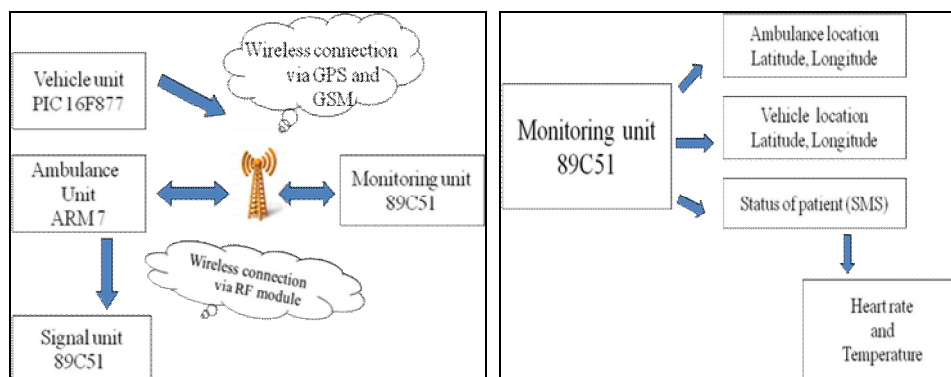


Figure 2.1 Proposed Systems Figure 2.2 Proposed Systems display of Result

Figure 2.2 includes all units are connected with wireless connectivity to server unit. Server unit displays Ambulance location and vehicle location using Google earth map application through readings of latitude, longitude transmitted via GSM. A SMS send to doctor's mobile to display status of patient of through parameters Heart beat rate and temperature during transportation. Project uses Visual Basics Software in PC at monitoring unit.

2.1. Ambulance Unit and Monitoring Unit

Figure 2.3 shows Ambulance unit placed at ambulance and built around ARM7 LPC 2138. LCD display and KEYPAD is used to enter mobile no to contact with server unit at Hospital. Ambulance unit interfaced with GPS and GSM for wireless communication. IC 4052 is switching IC. It works as Demux when data is received through GPS receiver and work as Mux when transmitting data through GSM. Biomedical sensors used to read heart beat rate and temperature during transportation through ambulance. One RF ID reader interfaced to read the tag at signal and transmit low signal through RF module. Wireless RF module is CC2500 used to transmit low signal using wireless communication. MAX232 used to generate compatible voltages (3.3.v to 5.5v.) for transferring as well as receiving data machine to machine. Figure 2.4 shows PC and GSM interfaced with Microcontroller 89C51. It is at monitoring station. PC with Visual basic software used to display Ambulance and vehicle location using Google earth map application. LCD display used to display count of inbox of message received from Ambulance and vehicle unit. It also transmits message to expert doctor for expert advice. SMS includes patient's status.

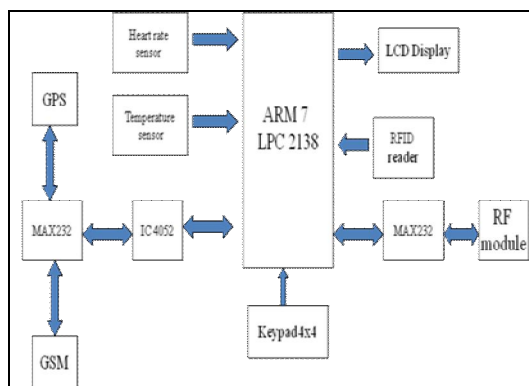


Figure 2.3 Ambulance unit

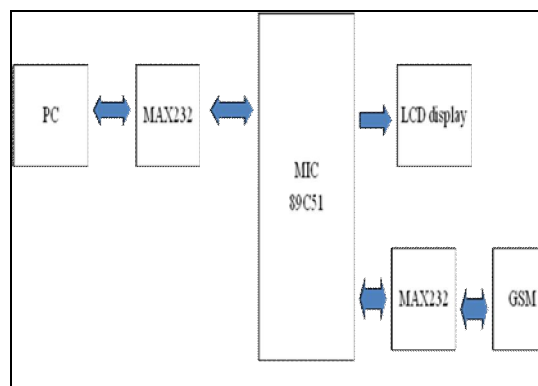


Figure 2.4 Monitoring unit

2.2. Vehicle Unit and Signal Unit

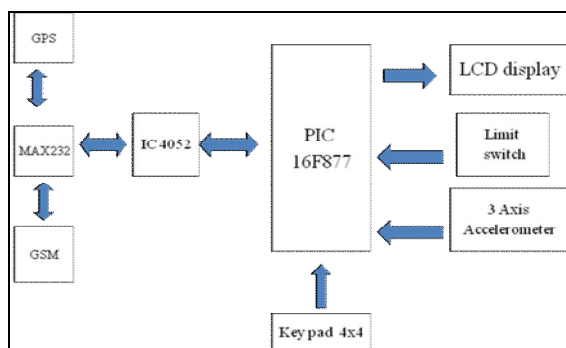


Figure 2.5 Vehicle unit

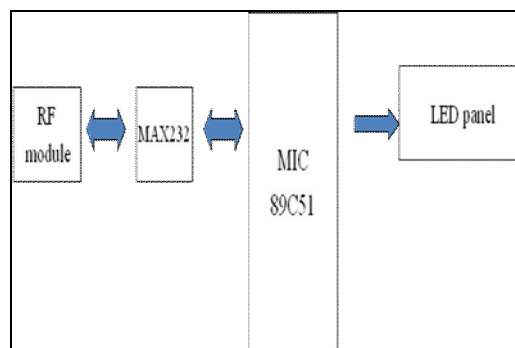


Figure 2.6 Signal unit

Figure 2.5 shows PIC 16F877 interfaced with KEYPAD to enter mobile no to communicate with Monitoring unit. It placed at vehicle which connected to Monitoring unit. 3 axis accelerometer senses tilt in vehicle even in motion also which gives X and Y coordinates with reference to gravity. X coordinate have maximum limit $X \geq 385$ and minimum limit $X \leq 280$. Similarly Y coordinate have maximum limit $Y \geq 385$ and minimum limit $Y \leq 280$. The accident detected if readings of X coordinate and Y coordinate are greater than maximum limit or less than minimum limit. Major damages to the vehicle detected using Limit switch. If limit switch pressed for 30sec then also it confirms accident detected. LCD display displays X coordinate and Y coordinate and count for 30 secs. IC 4052 switches GPS and GSM to receive location and transmit message. Figure 2.6 shows signal transmitted by Ambulance unit after reading tag by RFID reader received at Signal Unit through RF module. Microcontroller 89C51 used to process signal received and control traffic at signal for coning ambulance by changing Light RED to Green. High density LEDs used in LED panel with series 569-010x-xxx.

3. Results

Figure 3.1 shows result obtained on PC at Monitoring unit. Figure shows the display of Ambulance location and Vehicle location using Google earth MAP. Figure also includes Display of reading of Latitude in Google Search Window which transmitted through message by Ambulance unit and Vehicle unit. Hospital No 1 Mobile no. named text box contains mobile no of Expert Doctors. Status of Heart beat rate and Temperature transmitted through message to Doctor on given mobile no. Button on Window stats communication between PC and Monitoring unit. Same Button is used to stop communication between PC and Monitoring unit

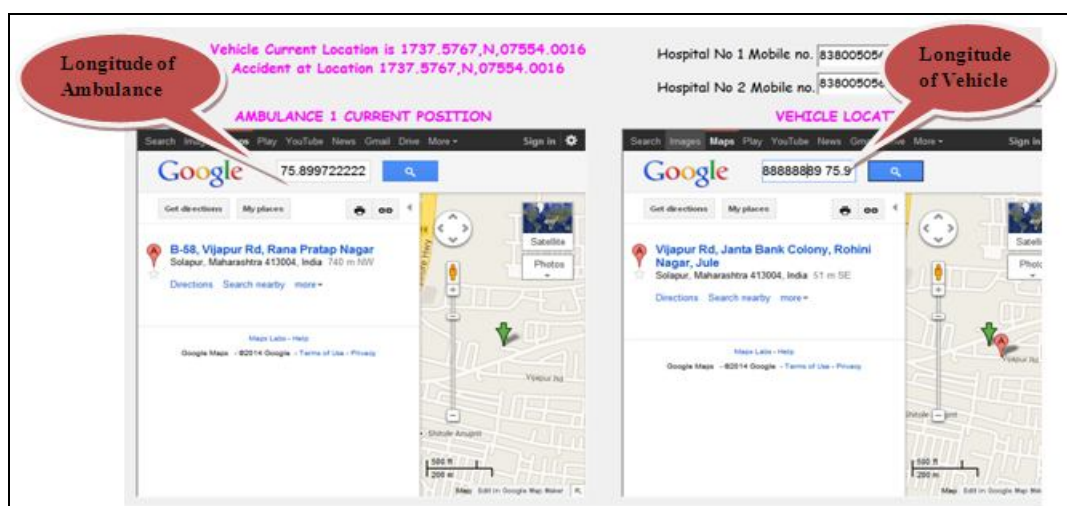


Figure 3.1 Display of Ambulance and Vehicle location with longitude

Ambulance Unit			Vehicle Unit		
Location	Latitude	Longitude	Location	Latitude	Longitude
Vijapur road, Janata bank, colony, Rohini nagar, Jule solapur.	17.626388888	75.8684386,13	Vijapur road rohini nagar jule solapur, maharashtra . 413004	17.623611111	75.8968024,16

Table 3.1 Readings of ambulance unit Vehicle location

Table 3.1 shows sample readings of latitude and longitude which obtained on same screen. Readings of latitude and longitude transmitted through message by Vehicle unit and Ambulance unit.

3.1. Reading of Heart beat rate and Temperature of patient

Temperature 0C	Heart Rate Beats Per minute
27	214
27	37
26	98
26	143

Table 3.2: Readings of Heart beat rate and Temperature of patient

Table 4.1 shows reading of Heart beat rate and Temperature of patient during transportation through Ambulance. Monitoring unit transmit status of patient through SMS to Experts Doctor.

3.2. Reading of X Coordinate and Y Coordinate

Table 3.3 shows readings of X coordinate and Y coordinate of 3 Axis Accelerometer. 3 Axis Accelerometer in Vehicle unit detects tilt in the vehicle in motion. Tilt sensed by 3 Axis Accelerometer campier with the maximum and minimum values of coordinate. X coordinate have maximum limit $X \geq 385$ and minimum limit $X \leq 280$. Similarly Y coordinate have maximum limit $Y \geq 385$ and minimum limit $Y \leq 280$. The accident detected if readings of X coordinate and Y coordinate are greater than maximum limit or less than minimum limit.

Sr. no	X coordinates	Y coordinates
1	388	349
2	387	348
3	387	348
4	388	349
5	387	348

Table 3.3: Readings of Heart beat rate and Temperature of patient

4. Conclusion

The project saves a few critical minutes of response times by monitoring location of ambulance from Hospital. Ambulance unit built around ARM7. Status of patient transmitted through Parameters Heart beat Rate and Temperature with Ambulance Location. Project found very useful for emergency treatment of patient during transportation as expert doctors connected to the system. Vehicle unit using 89C51 microcontroller detect accident using 3 Axis Accelerometer and limit switch. It transmits information of vehicle location which provides medical facility within short period of time to accident victim. Signal provided to signal unit using RFID reader's controls traffic and valuable time can be saved. Monitoring unit using 89C51 receives information from ambulance unit. It displays status of patient with location of Ambulance and vehicle. The hospital can prepare its staff for proper treatment of coming patient.

5. References

1. Mohammad A. Al-Khedher, 'Hybrid GPS-GSM Localization of Automobile Tracking System' International Journal of Computer Science & Information Technology (IJCSIT) Vol 3, No 6, Dec 2011.
2. 1Baburao Kodavati, 2 V.K.Raju, 3S.Srinivasa Rao, 4A.V.Prabu, 5T.Appa Rao, 6 Dr.Y.V.Narayana, 'GSM and GPS based vehicle location and tracking system', International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 1, Issue 3, pp.616-625
Shriram K Vasudevan, Sivaraman R, Subashri V, 'Design and Development of an Embedded System for Monitoring the Health Status of a Patient', I.J. Intelligent Systems and Applications, 2013, 04, 64-71 Published Online March 2013
3. K. Satyanarayana, 1 A. D. Sarma, 2 J. Sravan, 1 M. Malini, 1 and G. Venkateswarlu, 'GPS and GPRS based telemonitoring system for emergency patient transportation', Hindawi Publishing Corporation Journal of Medical Engineering Volume 2013, Article ID 363508, 9 pages <http://dx.doi.org/10.1155/2013/363508>.
4. Ms. Sarika B. Kale, Prof. Gajanan P. Dhok, 'Embedded system for intelligent ambulance and traffic control management', International Journal of Computer and Electronics Research [Volume 2, Issue 2, April 2013]
5. RONOJOY GHOSH, ASHUTOSH BHUSHAN, PRASUN KANTI GHOSH, VIVEK SHAH 'Intelligent Ambulance Traffic Assistance System', (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 4, No. 8, 2013
6. Shilpa S. Chavan (Walke) 1, Dr. R. S. Deshpande 3, J. G. Rana 2 'Design of intelligent traffic light controller using embedded system', Second International Conference on Emerging Trends in Engineering and Technology, ICETET-09