Automated Safety and Online Healthcare System

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ABSTRACT

This paper aims at designing and development of an Automated Safety & Online Healthcare System in which we are focusing on the intelligent integration of various technologies to come out with a single integrated system for Accident detection, notification and aftermath practices. Our proposed system presents completely an innovative idea for detection of an automobile accident and post-detection measures. We have customized our research in mainly five modules: Crash detection module, GSM interface module, PRF module, Universal Database Module and, the last and most important Web module.

Keywords: *EMS, GSM, PRF, Universal database.*

1.0 INTRODUCTION

There were nearly 6,420,000 auto accidents in the United States in 2005. The financial cost of these crashes is more than 230 Billion dollars. 2.9 million people were injured and 42,636 people killed. About 115 people die every day in vehicle crashes in the United States -- one death every 13 minutes. The disproportionately high fatality rate for highways and rural areas - (in general where immediate help cannot be given in case of some crash) crash victims have been attributed to several factors (Sled Test Results). The most prominent factor statistically is undoubtedly delayed in delivery of emergency services to crash victims as shown in figure 1.

A look on the remedial systems provides us with sophisticated systems. Some which are efficient in notifying the crash, some talk about effective reaching of the place while the others clearly mention the after work performance when a crash occurs. But difficult to accept the strange fact is as many as thousands of life has been lost and are being lost in years even if we have many working organizations.

This paper aims at designing and development of "Automated Safety & Online Healthcare System" which provides online global medical care anywhere in the world. The service is integrated with the accident module to present a complete cost effective solution to the surface accidents.

This paper focuses on one more very important issue. Right now there are thousands of Websites where consumers can access volumes of medical information, receive prescriptions and even schedule online appointments with real doctors. When these sites get into marketing, there can be some real conflicts of interest and the patient isn't served well. Here we have come up with a solution of having a single Online Healthcare system to control the whole information around the world.

Figure 1: Problems of today

2.0 MOTIVATION

There are different solutions for accident detection exists in market. In developed countries like U.S, we found out that the solution existing for the same incorporates G.P.S (Global Positioning System) which needs satellite interaction (Clayton, Dyke & Lu, 2006). This solution is clearly very costly and sophisticated. In short, these systems are not possible to be implemented in developing countries like India due to their very high cost and highly sophisticated mechanisms.

Secondly, whenever an accident takes place, the individual to be operated needs to be tested for his medical parameters like blood group, anesthesia test, Oxy-meter test and others, which wastes a lot of time during the so called "Golden Hour". We have come up with an idea of implementing a PRF (Personnel Radio Frequency) Card which gives total medical history of the victim without any test needed. This saves lot of time in the critical period and the person is directly operated without any medical tests hassle. The idea is to have a totally innovative Global Database connected with our website which provides total safety to any person anywhere round the globe.

3.0 ORGANIZATION OF THE PAPER

This paper consists of mainly five modules: Crash detection module, GSM interface module, PRF module, Universal Database module and, the last and most important Web-based service module. This system, as shown in figure 2, presents completely an innovative idea for prevention and detection of accidents and post-detection measures. Initially, we have discussed the each module separately to give a good understanding of each module. And finally we have given the complete integrated system which gives the complete picture of the whole system.

3.1 A Brief Overview of the System

Whenever some crash takes place, the Crash Detection Module fixed in the vehicle gets activated, thus activates the GSM Interface Module (Birdsong, Schuster, Carlin, Kawano & Thompson, 2006) and sends an automated voice message to nearest EMS services with the help of local cellular towers. Once the voice message has been transmitted, a communication link will be automatically established so that the Emergency unit dispatchers can verify the crash and the location. Using information from the crash vehicle, personnel at the nearest hospital can provide immediate assistance to the victims of the crash with the help of their individual PRF card.

Every PRF card number is associated to the Universal database through the online software from where that particular individual's information can be accessed of a registered person. This allows updating of the particular person's database whenever he or she meets the doctor and some new medical prescriptions is given to him/her so that latest information about the person should be available in the database. So, with the help of this PRF Module, whole previous medical parameters will be known. Thus, instead of wasting time in checking his/her medical parameters; treatment can be started directly in minimum time. Once again parameters can be updated in his/her database after treatment.

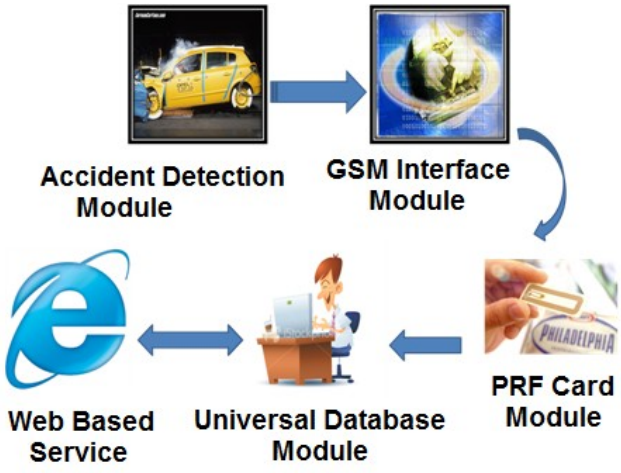

Figure 2: Modules description

4.0 ARCHITECTURE OF THE SYSTEM

It uses fundamental 3-tier architecture as described in figure 3 for the implementation of the desired system design. The goal of the three schema architecture is to separate the user applications and the physical database. The schemas can be defined at the following levels:

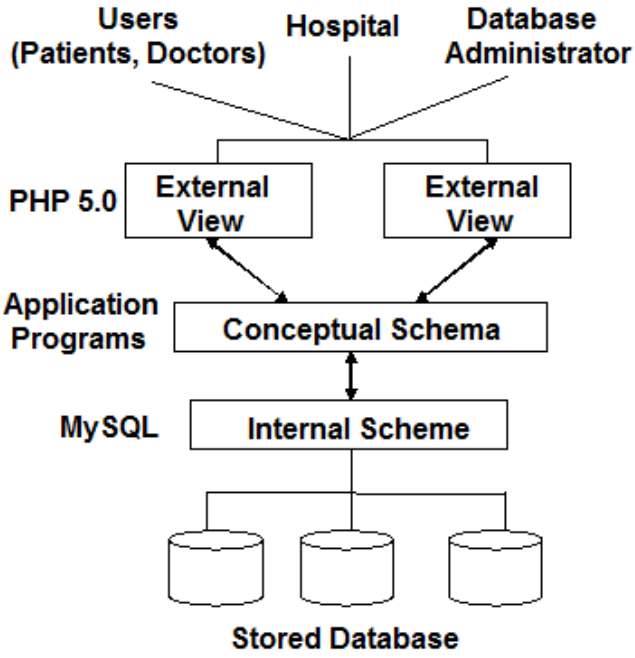

Figure 3: 3-Tier architecture

The External or View level – includes external schemas or user views. Each external schema describes the part of the

database that a particular user group is interested in and hides the rest of the database from that user group. It is represented using the representational data model. We have used PHP 5.0 for the front end.

The conceptual level – has a conceptual schema which describes the structure of the database for users. It hides the details of the physical storage structures, and concentrates on describing entities, data types, relationships, user operations and constraints. Usually a representational data model is used to describe the conceptual schema.

The internal level – has an internal schema which describes the physical storage structure of the database. Uses a physical data model and describes the complete details of data storage and access paths for the database. We have used MySQL for Backend database.

4.1 Accident Detection Module

In our design, this module consists of GMR sensor (Giant Magneto resistive) which detects a change in the magnetic field strength as the sensing mass moves causing a corresponding change in the output voltage or current from the sensor. The GMR sensor is used to determine crash severity for timely deployment of occupant restraint system. The module is described in the figure 4 along with the operation of GMR sensor in figure 5 and Static Test of GMR Sensor in figure 6.

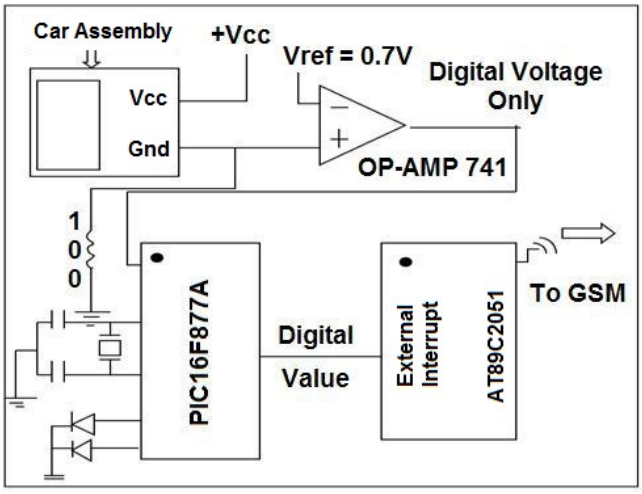

Figure 4: Accident detection module

The sensor comprises a housing adapted to be mounted on the vehicle in a position to sense and respond to deceleration pulses. Within the housing is a body containing a tubular passage in which is mounted a movable deceleration sensing mass. The mass is movable in response to a deceleration pulses above a threshold value bias from an initial position along a path leading towards a Magnet Field Sensor that is connected via suitable wiring to the operating mechanism of an inflatable air bag or seat belt tensioner.

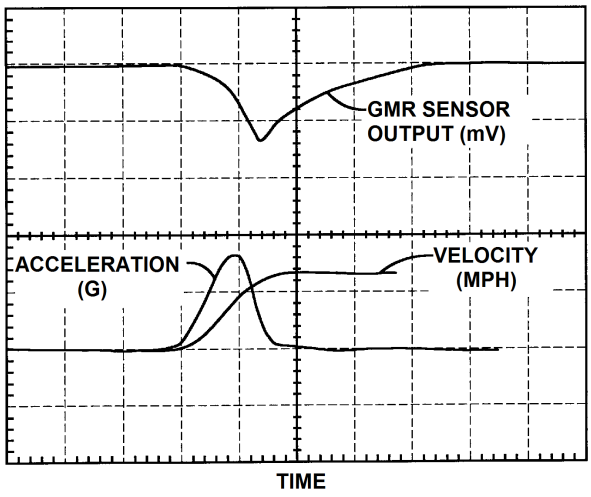

Figure 5: Operation of GMR sensor

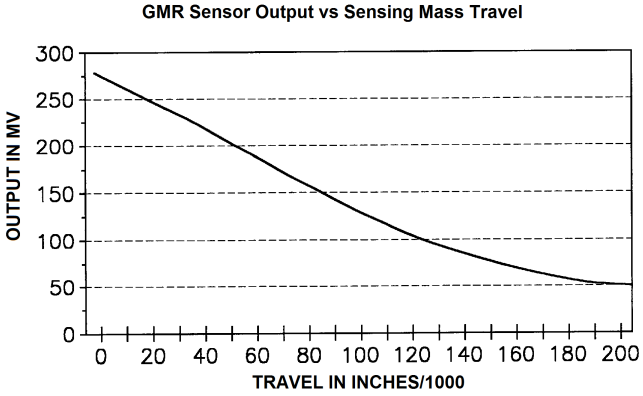

Figure 6: Static Test of GMR Sensor

4.2 GSM Interface Module

Once we get the digital value of the signal, it is then fed to another micro-controller – AT89C2051 that waits for an interrupt (in case of any collision). In case of any crash, the Interrupt Service Routine (ISR) of the micro-controller runs, which in turn activates a GSM interface (figure 8) and a message, in the form of text, is sent to the Patrolling Services/ Emergency Medical Services (EMS), for emergency help. The architecture of GSM is shown in figure 7.

4.3 PRF (Personnel Radio Frequency) Module

Every registered patient is issued a PRF card (inner structure is shown in figure 10) which when sensed by the RFID reader (Jang & Chang-soo, *20060038665*) will open the patient's database link in the Universal database. With the help of this PRF card, his previous medical details can be accessed, as shown in figure 9, which actually help the new doctor to start his treatment in minimum time without wasting time in checking his medical parameters like blood group, blood pressure, breathing rate, anesthesia dosage,

etc. Software for the RFID reader has been designed in PHP 5.0 & Java.

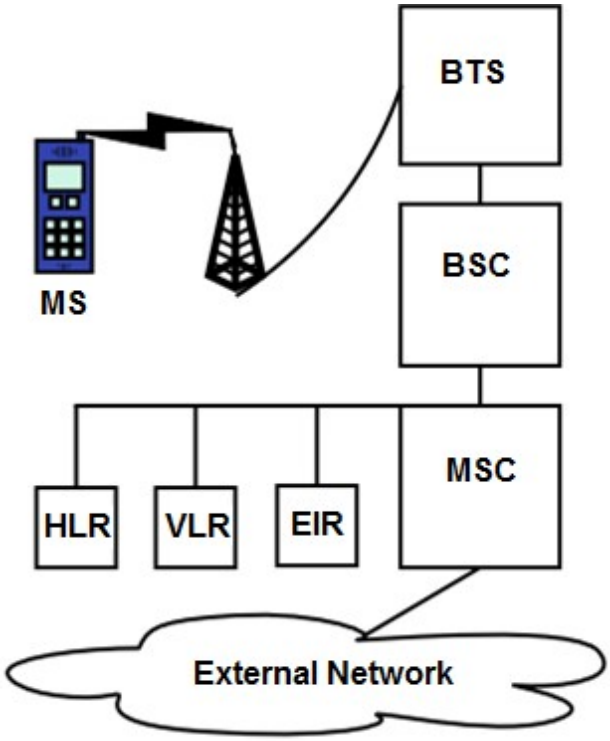

Figure 7: GSM System architecture

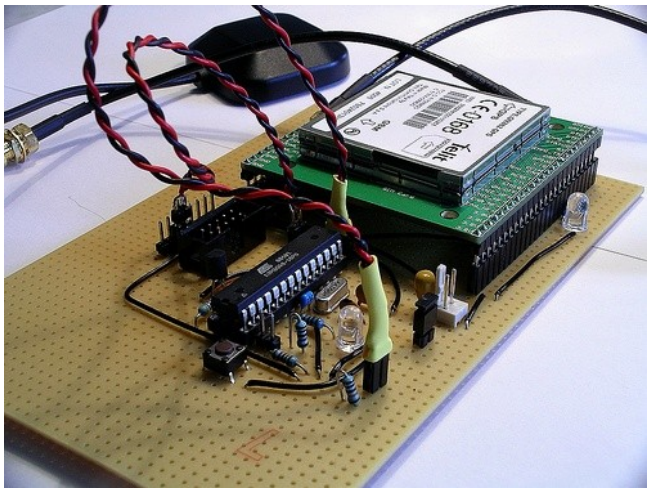

Figure 8: Implementation of GSM module

4.4 Universal Database Module

This is the main focus of this paper because here only each and every details of every member of our system will be stored whether it is a hospital, doctor or a patient. This database consists of the names of registered hospitals along with their complete details about the facilities, specializations, staff, infrastructure, etc. This database also contains the details of every registered doctor which includes their area of specializations, availability, locations, etc. This database also contains the details of people from all over the world which includes their personnel information, Health record, Medical test history, etc. Proper management of this module is very important for successful working of this whole system as shown in figure 11. This module has been designed using PHP 5.0 in front end (for administrator access) and MySQL in back end.

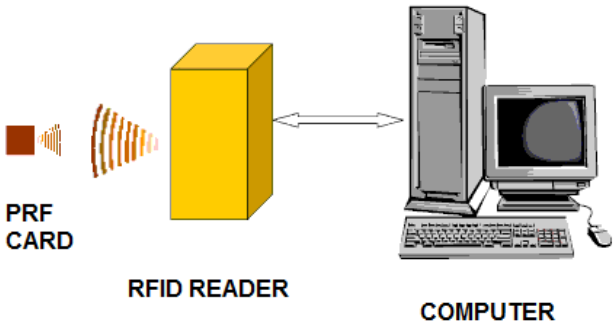

Figure 9: RFID system

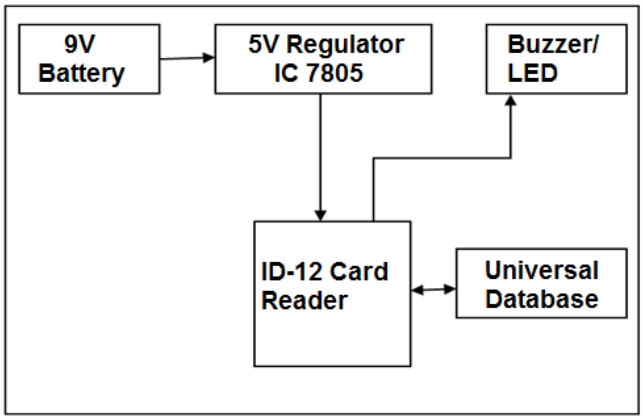

Figure 10: PRF internal architecture

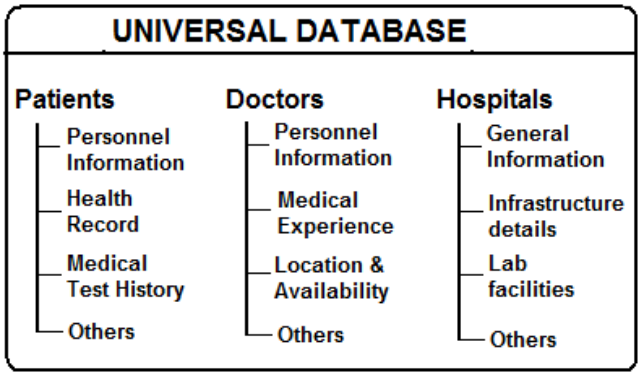

Figure 11: Universal database structure

4.5 Web Module

This module is online software which is having the options for the hospitals, doctors and patients to register themselves with their complete details as shown in figure 12 and 13. Thus, it is actually controlling a Universal database of

hospitals, doctors and patients. The whole database will be controlled by the administrator. This software will be floated online where anyone can register themselves with some minimum charge and can utilize the services of getting treated anytime anywhere in the world. This website provides opportunity to discuss one's problems and get their solutions through our "*Forum section*".

- This software has been designed using PHP-5.0 in front end and MySQL in back end.
- There is a need for a big web team to manage and control this large amount of database.

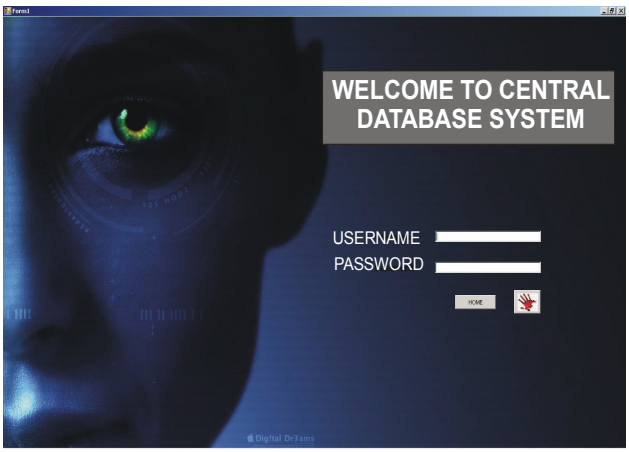

Figure 13: Login page for the web module

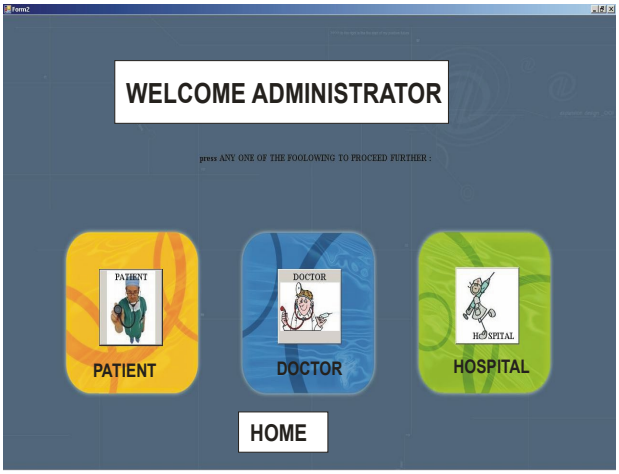

Figure 13: Web template for the web module

4.6 Integrated System

The figure 14 shows the complete integrated system. The accident detection module along with GSM interface detects and notifies the accident to local EMS services (indicated by ambulance). Then, the victim is operated in the hospital after accessing his details through his PRF card.

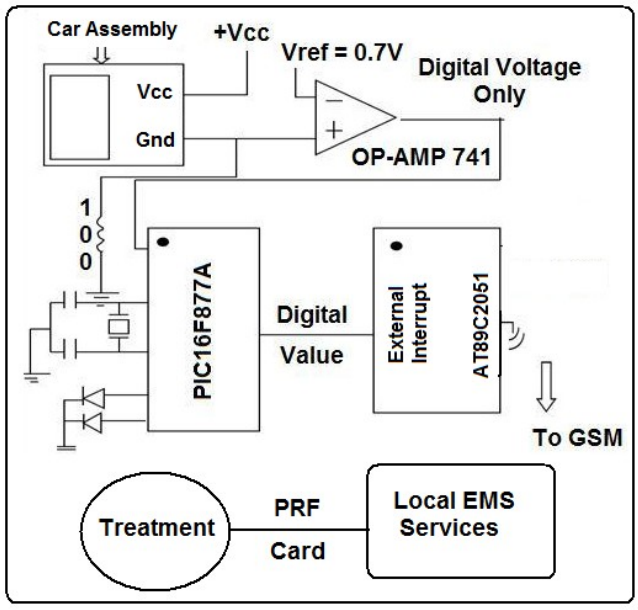

Figure 14: Detailed design of the system

5.0 CONCLUSION

This innovation will be very helpful in case when the patient moves out of his/her native location. In case if he/she meets with some accident and needed urgent medical care, he/she can be easily treated in any of the nearest available hospitals with the help of his PRF card which is connected with our software.

There are some issues which need to be taken care. Firstly, the governments of different countries will have to go for a collaboration to provide instant medical services anywhere in the world. Secondly, to make it successful, maximum hospitals and emergency medical services will have to come forward to join with us and provide service to the world to eliminate the problem of having number of different web-based medical services which lead to ineffective care for the patients.

6.0 REFERENCE

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