

Medical Care System Using VORD Methodology

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ABSTRACT

Is technology serving the humanity? Current IT developments are affecting the every walk of life, of the human-being of this planet. As the computer technology is impacting very valuable effects on today's life, it's also playing a very positive and beneficial role in the field of medical. This paper brings to light, how the information technology can play a vital role in saving the precious human-lives, as well as how IT can help out the people in any emergency situation in their homes, before reaching to the hospitals. The paper describes the design and implementation phases of the "Medical Care System" (MCS). It reveals the momentous aspects of computer technology and its development effects on today's society. The proposed system also brings to light that how the computer technology is mounting the luxuries of today's life by introducing new amazing aspects in every field of life. The system is developed to help out the people in a rapid, easy and a cheap way, when they faced any emergency situation in their homes, like "Asphyxia and Obstruction of Air Passages", Bites and Stings, Electricity Shock etc. The system also has a unique interface, that can help out to any individual, that how to give "First Aid" on the road in an accident situation, by using a cellular phone. The successful implementation of this system can play a vital role in saving human-lives as well as to lend a hand to the people in a very rapid way in any emergency situation, on their doorsteps.

Keywords: Portability, Litheness, Fault Tolerant, Asphyxia and Obstruction of Air Passages, Internet Security, Software Standards.

1. INTRODUCTION

Information technology continuous advancements have opened the number of constructive possibilities in our today's life that were a trance in the past. Now a day's computerized system are playing a very valuable role in every walk of life. Whether it's an educational field, business or entertainment side, no one can deny from their priceless contribution. Computer technology is also playing a vital role in the medical field and is caused in saving, millions of precious human-lives.

"Medical Care System" (MCS) is also a contribution from the computer technology in saving the humanity.

"**First-Aid**", immediate and temporary treatment of a victim of sudden illness or injury while awaiting the arrival of medical aid. Proper early measures may be instrumental in saving life and ensuring a better and more rapid recovery. The avoidance of unnecessary movement and over-excitation of the victim often

prevents further injury. Conditions that require immediate attention to avert death include cessation of breathing (asphyxia), severe bleeding, poisoning, strokes, and heart attack. The essentials of first aid treatment also include the correct bandaging of a wound; the application of splints for fractures and dislocations; the effective methods of cardiopulmonary resuscitation (CPR) and artificial respiration; and treatment of shock, frostbite, fainting, bites and stings, burns, and heat exhaustion [1].

An emergency medical technician-paramedic is a licensed and/or certified out-of-hospital health-care provider. EMTs represent the uppermost level of pre-hospital health care providers and serve as managers of pre-hospital treatment teams. They work under the direction of a physician—often by two-way radio—to evaluate and manage acutely ill or injured patients in ambulance services or other life-support units [2].

First- Aid awareness is much more essential in today's life. People have to face so many emergency situations in their daily lives, like Burns, Drowning and Near-Drowning, Fainting, Foreign Body in the Eye, Fractures and Joint Injuries, Frostbite, Heat Exhaustion and Heatstroke etc. All these symptoms required immediate, proper and correct attention, because proper early measures may be instrumental in saving life and ensuring a better and more rapid recovery.

By getting data facts, visiting different hospitals, it comes to know, that most of the cases are in a very bad situation due to the absence or inaccurate First-Aid procedure. So many death cases occur due to the unavailability of the medical treatment on time.

“Medical Care System” (MCS) is an attempt to provide the awareness of the “First-Aid” to the community in an easy, cheap and rapid way, at their door steps. People can interact with the system, simply by connecting with the internet and the system will show them “First-Aid” procedures for different situations that required medical treatment, in various forms like written instructions as well as visual representation, “how to provide “first-aid” to the victim by visualization”. The people can access the experiences and guidelines of the specialist and experienced doctors 24 / 7, for any emergency situation. The system will also provide a unique interface for the cellular phone, so that any individual can access the system, to provide “first aid” on the road during a road accident. The system will also facilitate the people by giving the facility for connecting with the specialist doctor for the advices in any worst situation while they are unable to get satisfactory information from the system for the specific patient.

A successful implementation of the System can improve the image of the hospital, doctors as well as catch the attention of more patients.

2. MCS ANALYSIS AND DESIGN

This section is designed to give an idea about the analysis and design of the proposed system. It starts with introduction to the requirements elicitation and analysis for MCS. Viewpoint-Oriented Requirements Definition (VORD) method is explained and used to analyze MCS.

2.1. MCS Analysis

Requirements elicitation and analysis is the next stage after the initial feasibility studies. In this activity, we work with the proposed system end-users to find out the application domain, what services the system should provide, the required performance of the system, hardware constraints, and so on.

Requirements elicitation and analysis may involve a variety of different kinds of people (Stake-holders) in the application. Stake-holders include end-users who will interact with the system and everyone else in an organization which will be affected by it. Elicitation and analysis is a difficult process for a number of reasons:

- Stakeholders often don't really know what they want from the computer system except in the most general terms; they may find it difficult to articulate what they want from the system. They may take unrealistic demands because they are unaware of the cost of their requests.
- Stakeholders in a system naturally express requirements in their own terms and with implicit knowledge of their own work. Requirements engineers, without experience in the customer's domain, must understand these requirements.
- Different stakeholders have different requirements and they may express these in different ways. Requirements engineers have to discover all potential sources of requirements and discover commonalties and conflicts.
- The economic and business environment in which the analysis takes place is dynamic. It inevitably changes during the analysis process. Hence the importance of particular requirements may change. New requirements may emerge from new stakeholders who were not originally consulted.

The VORD (Viewpoint-Oriented Requirements Definition) method has been chosen as an activity-oriented framework for MCS elicitation and analysis [3], [4].

2.2 VORD (Viewpoint-Oriented Requirements Definition) Method

For any medium sized or large systems, there are usually different types of end-user. Many stakeholders have some kind of interest in the system requirements. Different viewpoints on a problem see the problem in different ways. However, their perspectives are not completely independent but usually overlap so that they have common requirements. A key strength of viewpoint – oriented analysis is that it recognizes the existence of multiple perspectives and provides a

framework for discovering conflicts in the requirements proposed by different stakeholders. The VORD method considered viewpoints as a receiver of services. In this case, viewpoints are external to the system and receive services from the system [3]. Viewpoints may provide data for these services. The analysis involves examining the services received by different viewpoints, collecting them and resolving their conflicts.

Interactive systems deliver services to end-users. Consequently, the most effective viewpoint – oriented approach for interactive systems analysis uses external viewpoints. These viewpoints interact with the system by receiving services from it and providing data to the system.

2. 2.1 The Advantages of VORD Method

- Viewpoints are external to the system so they are a natural way to structure the requirements elicitation process.
- It is relatively easy to decide if something is a valid viewpoint. Viewpoints must interact with the system in some way.
- Viewpoints and services are useful ways of structuring non-functional requirements. Each service may have associated non-functional requirements. Multiple viewpoints allow the same services to have different non-functional

requirements in different viewpoints. The VORD (viewpoint – oriented requirements definition) method [4] has been designed as a service-oriented framework for requirements elicitation and analysis.

2. 2.2 The Principle Stages of the VORD Method

As shown in figure 1 the principle stages of the VORD method are viewpoint identification, structuring, documentation and mapping.

- Viewpoint identification, which involves discovering viewpoints that receive system services and identifying the specific services provided to each viewpoint.
- Viewpoint structuring, which involves grouping related viewpoints into a hierarchy. Common activities are provided at levels in hierarchy and are inherited by lower-level viewpoints.
- Viewpoint documentation, which involves refining the description of the identified viewpoints and services.
- Viewpoint-system mapping, which involves identifying, objects in an object-oriented design using services information, which is encapsulated in viewpoints.

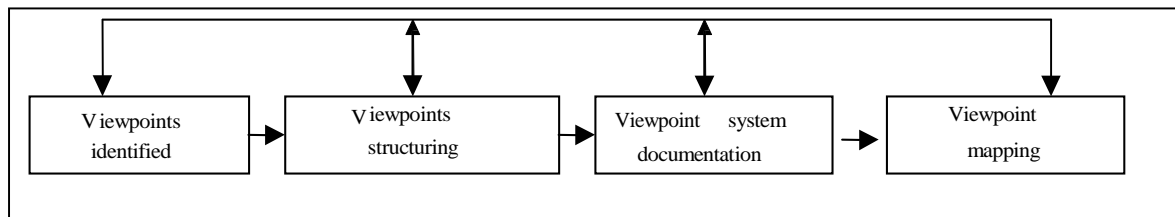


Figure 1 The Principle Stages of The VORD Method

2.3 Viewpoints in MCS

2.3.1 The Victim

This is the person who is endured in sudden illness or injury.

2.3.2 Paramedic

He is usually the key person who provides “first aid” in any emergency situation. In any sudden case, this person will interact with the system and try to find out the proper and accurate first aid for any injury or illness.

2.3.3 Hospital Staff (Nurse/Receptionist)

It will be the hospital staff who is interacting with the system and facilitating the people who want to get “first aid” information, about any sudden case. He or she is also responsible to establish conversation between a specialist doctor and a first aid provider, if he/she failed to get satisfactory material about any special case from the system or

he tried the present first aid methods but the victim did not get any pleasing results.

2.3.4 Specialist doctor

He is a specialist doctor who is responsible for the medical treatment of any sudden case, or to provide online help to any “first aid” provider.

2.3.5 System Administrator

System Administrator is responsible for the maintenance and the technical issues related to the system, and he is responsible to make sure the availability of the system to the users, 24/7.

2.4 Viewpoints Structuring

The above mentioned viewpoints can be grouped and structured in a hierarchal form which can represent the activities for each viewpoint. The structure is given below in figure 2.

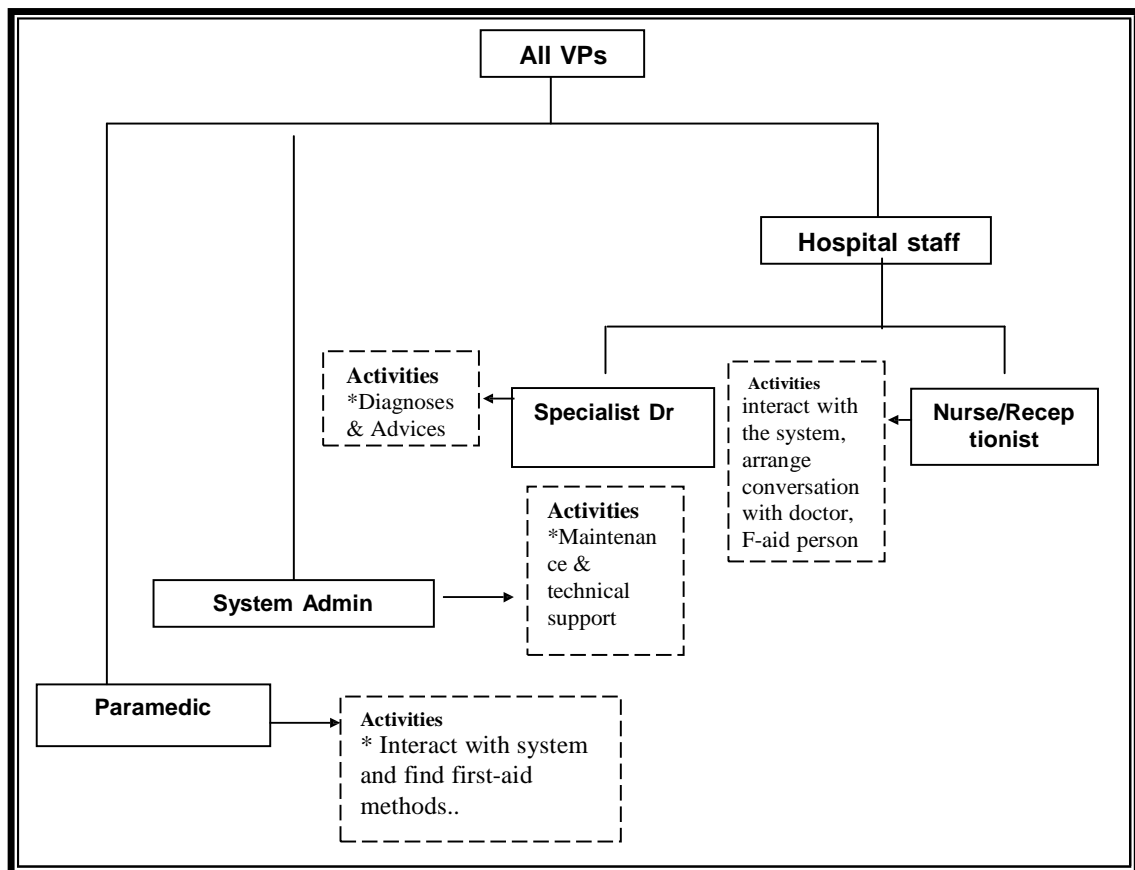


Figure 2 Viewpoints Hierarchy

2.5 MCS Events Sequence

To show how the proposed system could interact with its stakeholders we present the events

sequence activity diagram indicated in figure 3 by using Unified Modeling Language (UML) [5].

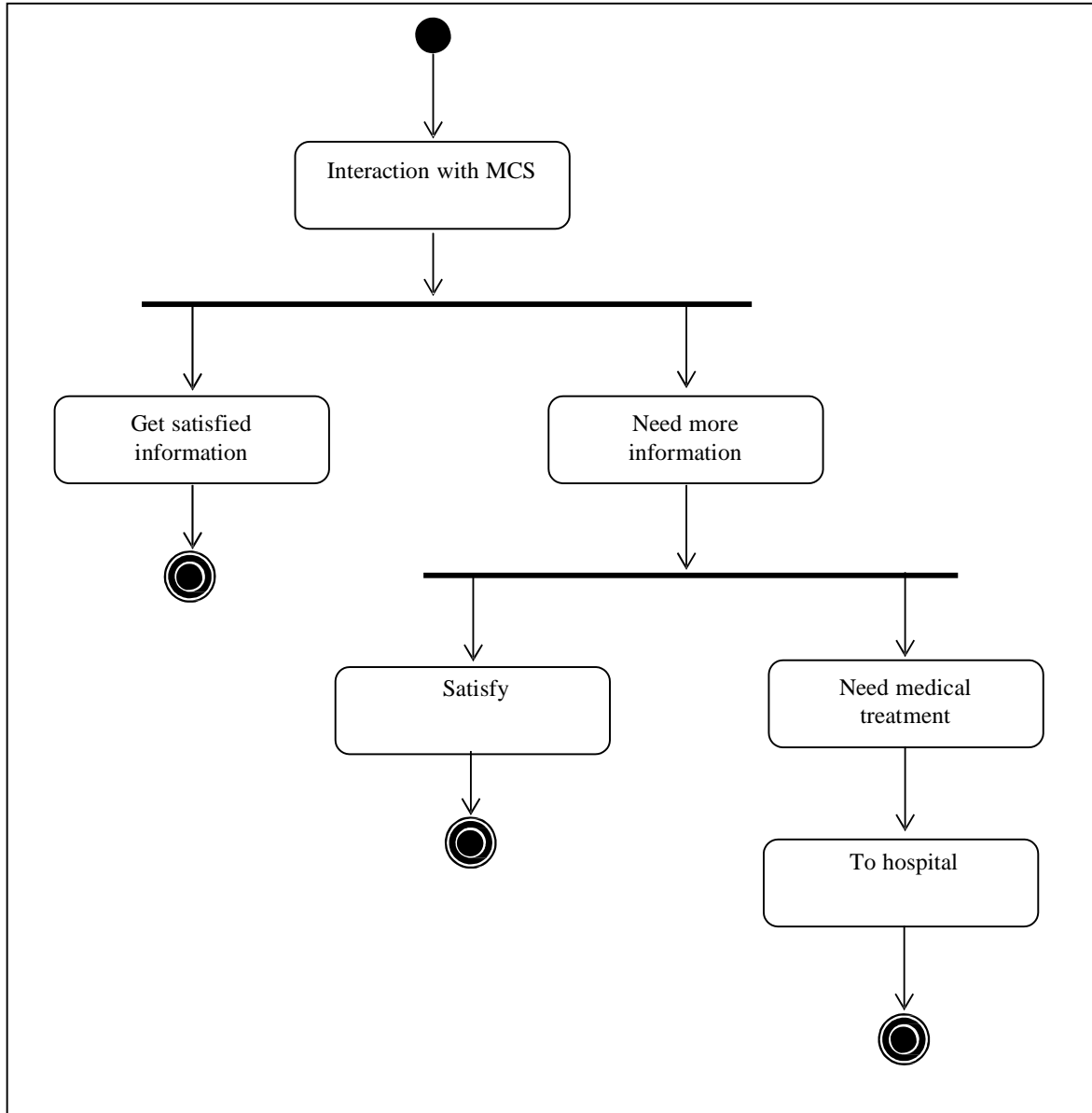


Figure 3 Events Sequence diagram.

3. DESIGN AND IMPLEMENTATION

3.1 Development Environment

Java is a programming language that is well suited for designing such type of software that work in conjunction with the internet [6]. Additionally it's a cross platform language, which means its program can be designed to run the same way on Microsoft Windows, Apple Macintosh and most versions of UNIX, including Solaris. Java extends beyond desktops to run on devices such as televisions, wristwatches, and cellular phones as it is small, secure, and portable [7]. Java's strength include platform-independence, object oriented nature, as well as easy to learn. [8].

Due to the above mentioned powerful features of the java programming language, it is desired language for the development of the proposed system.

Furthermore, java has JSP (Java Server Pages), Struts, EJBs (Enterprise Java Beans), like dominant technologies that create attraction for the development of distributed web applications.

3.2 Structure of the System

The proposed system is a distributed web application, containing three modules.

1. Web Application
2. Cellular Phone Application
3. Desktop Application (Server Side Application)

Struts are used as architecture for the said system, which is famous model view controller pattern.

Apache Struts is an open-source web application framework for developing Java EE web applications. It uses and extends the Java Servlet API to encourage developers to adopt a model-view-controller (MVC) architecture. It was originally created by Craig McClanahan and donated to the Apache Foundation in May, 2000. [9]. Through the web application of the system the Paramedic can interact with the system and can find the first-aid methods according to his/her needs.

In a standard Java EE web application, the client will typically submit information to the server via a web form. The information is then either handed over to a Java Servlet which processes it, interacts with a database and produces an HTML-formatted response, or it is given to a Java Server Pages (JSP) document which intermingle HTML and Java code to achieve the same result. Both approaches are often

considered inadequate for large projects because they mix application logic with presentation and make maintenance difficult.

The goal of Struts is to cleanly separate the *model* (application logic that interacts with a database) from the *view* (HTML pages presented to the client) and the controller (instance that passes information between view and model). Struts provide the controller (a servlet known as ActionServlet) and facilitate the writing of templates for the view or presentation layer (typically in JSP, but XML/XSLT and Velocity are also supported). The web application programmer is responsible for writing the model code, and for creating a central configuration file `struts-config.xml` which binds together model, view and controller. [9].

EJBs (Entity Java Beans) are used an application layer between browser and data base. Enterprise JavaBeans (EJB) technology is the server-side component architecture for Java Platform, Enterprise Edition (Java EE). EJB technology enables rapid and simplified development of distributed, transactional, secure and portable applications based on Java technology. [10].

The Enterprise Java Beans (EJB) 3.0 specification vastly improves the simplicity of programming enterprise beans. This promises to increase your productivity as a developer. [11].

The cellular phone application is developed using J2ME (Java to Micro Edition) to facilitate any individual who wants to interact with the system using cellular mobile phone in any accident situation on the road. That is basically a Midlet and data moved from Midlet to JSP and from JSP to EJBs (inside application server which is Bea Web Logic) and then to the database. The basic functionality is to display a unique interface on a constrained memory and user interface cellular device.

The desktop application (server side application) that is communicating with the database through Bea Web Logic, which is an application server for sending and retrieving data from the data base.

4. CONCLUSION

The design and development phases of the proposed system (MCS) are described in this paper. The paper brings to light the salient features of the system. MCS is a very strong idea in the medical field. Currently available online "first-aid" information is not according to the specific need and not to the point according to the specific situation e.g. the paramedic has to

spend too much time to find any particular info about any sudden case.

The proposed system will be developed according to the needs of the community. The system will provide the exact first-aid information about any sudden situation, so that any individual could get completely to the point information.

There will some visual presentations, “that how to provide first-aid in particular situation” so that any individual can see and can act according to that.

One of the salient features of the proposed system is that, it will provide a facility to the people to communicate with the specialist doctors, if they are unable to get satisfactory results after acting upon the advices that were provided by the system.

The successful implementation of the system can play a vital role in saving the human-lives as well as improving the image of any hospital and the medical professionals.

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