International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2018 IJSRCSEIT | Volume 3 | Issue 3 | ISSN : 2456-3307

A Service Oriented Architecture for RTA Cases in Radiology Using Frequent Data Item Sets

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ABSTRACT

The Radiological Department has the major role in healthcare industry. Radiological Department primarily deals with all the Road Accident cases. This paper proposes a novel method of developing a service oriented architecture in healthcare information system (HIS) for radiological service using data mining techniques. Web services provide a way of using software as a service. Developing a Service Oriented Architecture (SOA) enables this software to be used anywhere at any time and on any device. Data mining is an emerging as a field of computer science that can be used for various applications. This proposal aims at developing a healthcare information system as a web service that can be used for Road Transport Accident (RTA) cases for radiological department it uses prediction techniques of data mining.

Keywords: Data Mining , Association , Itemsets, Algorithms.

I. INTRODUCTION

The development of information systems and computer technologies has enabled the automation of the activities in every field of the real-world; this has induced a fast increase in the information available, the development of high volume data warehouses and finally, the emergence of Data Mining. The latter corresponds in a set of techniques and methods which from the data (typically stored in a data warehouse) extract usable knowledge in various fields such as environment, public health, pharmacy, biology, etc. However, the growing market draws attention to distributed Data Mining because data and software are geographically distributed over a network instead of being located in a single site. Moreover, the cost is another reason for the distribution: data mining in distributed environments would only increase the cost of licenses because of the need for multiple copies of different types of tools. To optimize investment, users prefer to use components that respond to their specific needs. However, since the arrival of Web and cloud computing, distributed data is now much easier to access. Furthermore, distributed computing in heterogeneous environments has become much more feasible. At the same time, service-oriented architectures (SOA) are becoming one of the main paradigms for distributed computing. SOA provides solutions for integrating diverse systems that support interoperability, loose coupling and reuse. To full-fill clients need one service invoke another service/services. It is possible that there is some evolution among these external services. Through an approach based on services, especially service-oriented architecture (SOA), integrated services can be defined to support the distributed data mining tasks in grids and the Web. Such services can address most aspects taken into account in data mining and knowledge discovery in databases (KDD). Moreover, the most important SOA implementation is represented by web services. The popularity of Web services is mainly due to the fact

that they are standardized (adoption of universally accepted technologies, such XML, SOAP, HTTP, WSDL, UDDI.). Web Services are simple, flexible and independent from both platforms and languages. Furthermore, their adoption by a number of communities, including the grid community, indicates that the development of data mining applications based on Web services is likely be useful to an important user community. Such Web service is particularly met in business environments where time and data intensive transactions are performed between customers and offered services/products. Regarding our field of interest, namely epidemiology, it is worth noting that data mining has attracted a great deal of attention in the epidemiological information processing, as well as in medical and public health areas as a whole. [1]

2. Simple Object Access Protocol

SOAP is the protocol that is responsible for routing messages between the client and the server. It is a lightweight XML-based messaging protocol. SOAP is based on XML and thus it provides good 32interoperability between applications. SOAP implementations provided by vendors typically consist of two pieces: a client side Proxy that handles the SOAP message creation and result message cracking to return the result data, as well as a server piece that implements the Web Service logic. The server piece tends to be an application server that calls out to custom Web Service classes that is created on the server side and that contain the business logic of the Web Service. The server code essentially consists of simple methods to handle inputs and outputs via parameters and return values respectively. The logic in the actual method may contain any functionality. In essence it is the breaking of the business tier from the presentation tier [2].

3. Web Services in .NET

The .Net framework introduces Web Services as an integral part of the architecture, making it very easy to create and consume these services with minimal amounts of code written. In .NET framework, Web Services are featured as the new component architecture in the distributed age where not only Internet exposure is handled through them but also common reusable business and application services. The .Net framework abstracts most of the internal logic that handles the remoting details of method calls over the wire and Visual Studio.Net builds support for Web Services directly into the development environment. Thus server side logic is made easily available to client applications. There are three major components that make up a web service.

- ✓ The Web Service on the Server side
- ✓ The client application calling the Web Service via a Web Reference
- ✓ A WSDL Web Service description that describes the functionality of the Web Service

A Web Service in .Net consists of a .asmx page that either contains a class that provides the Web Service functionality or references a specific external class that handles the logic in an external class file. Classes are standard .Net classes and the only difference is that every method that is exposed to the Web is prefixed with a attribute. Once the .asmx page has been created, the Web Service is ready for accessing over the Web. .Net provides a very useful information page about the Web Service showing all the methods and parameters along with information on how to access the Web Service over the Web.

4. Client Application

Client applications can be any type of application from a Web backend aggregating data to display custom content to clients to a Fat Client application running Windows forms. The process of connecting a client application in Visual Studio.Net is always the same though you set up a Web Reference, add the Web Reference namespace and then simply call the methods of the Web Service. The method call

actually calls a proxy object, which invokes the remote Web Service. The proxy base class contains all the black box magic that performs the SOAP call over the wire and the proxy class simply calls work methods in the base class.

As part of our study, we are interesting by the above field by study the health problems currently affecting road accident for RTA cases in the tamil nadu region. Road accident Indeed, an important issue in the field of radiography for RTA cases. The available data in the field are complex, heterogeneous and uncertain, and it is not easy for medical industry to produce predictive rules linking. The main aim of our study will be to provide to experts in the field prediction models for male and females involved in the frequent road accidents in tamil nadu region. Predictive variables will include two physiological parameters (age and gender, mode of injury).

To this end, we set up a service-oriented data mining platform applied to RTA cases. This work was done in collaboration with experts from the public health in the tamil nadu region. The Propose model (i) data storage and preprocessing, and (ii) predictive rule extraction in the field of radiology.[2]

II. RELATED WORK

This paper first investigates the data mining applications on centralized medical databases, and how they are used for diagnostic and population health, then introduces distributed databases. The integration needs and issues of distributed medical databases are described. Finally the paper focuses on data mining studies on distributed medical databases [3]

This paper the commercial application of data mining is focused in terms of mobile computing and its management's services. And hence it's being brought into the consideration that the focusing of data mining techniques and its applications in mobile computing. Now a day's tracing the location of mobile is quit vital and important so this problem can be overcome through writing a appropriate algorithm and application development so it can be helpful to trace and capture smoothly and easily mobile computing management by applying Data management techniques and its approaches. According to the application and algorithm mobile location is traced out through mapping depending upon their classes and category and identified mobile network denoted as mobile reporting map and then mobile devices gives their current position. [4]

The paper presents a change management framework for a citizen-centric healthcare service platform. A combination between Petri nets model to handle changes and reconfigurable Petri nets model to react to these changes are introduced to fulfil healthcare 4goals. Thanks to this management framework model, consistency and correctness of a healthcare processes in the presence of frequent changes can be checked and guaranteed. [5]

A review of the literature related to the use of SOA in Industrial Automation Systems is given to set up a context for the discussion of the proposed in the above paper SOA IEC 61499 formal model. The presented, in the above paper, formal model and the execution environment architecture are discussed towards a better understanding of the potentials for the exploitation of the SOA paradigm in the industrial automation domain. SOAP and Web Services even though introduced in some PLCs have considerable performance overhead that is a big barrier in their use. The use of these technologies at the integration level of the device software constructs, greatly increases the performance overhead as well as the complexity at this level with questionable benefits regarding flexibility. Other technologies provide feasible solutions to this level of integration. [6]

This paper proposes a novel framework based on Divide-and-Conquer (D&C) for cost estimation for building SOA-based software. By dealing with separately development parts, the D&C framework can help organizations simplify and regulate SOA implementation cost estimation. Furthermore, both cost estimation modeling and software sizing work can be satisfied respectively by switching the corresponding metrics within this framework. Given the requirement of developing these metrics, this framework also defines the future research in four different directions according to the separate cost estimation sub-problems. [7]

The SOA based systems software, the successes software factors, the components of it and the rules of each of the component developers. Then defined the functional and nonfunctional requirements attributes and the importance of them in the maintenance process. Finally present the importance of maintenance process in the SOA based systems and give some approaches in three issues in maintenance (the analysis influencing in the whole system, the understanding of services attributes, and the testing of services.) and explained each other. Finally the SOA maintenance topic still need other efforts to enhance the services maintenance process and it still a big space for researchers to support this area of research with new effective and creative approaches. [8]

In this paper through studying challenges of information systems in electronic city and with concentrating on advantages of service oriented architecture, a new architecture for integration of systems in electronic city and overcoming the challenges of information systems security to providing accurate information and efficient services to consumers. [9]

This paper is to describe the importance of SOA in telemedicine through distributed system architecture design and implementation, which is developed in .Net platform using external web services. The architecture of telemedicine system which have developed is comprises of three layers that are Presentation Layer, Business Logic Layer and Data Layer. [10]

III. PROPOSED METHOD

Our approach, as illustrated in Figure1, is structured into two stage First, stage I includes the data warehousing that is part of a process of knowledge discovery in databases (data integration) and the preprocessing preparing exploitable data in the data mining process. Second, stage II, consists in the realization of the proposed work, for data mining based on service-oriented architecture, to extract RTA case predictive models, based on the exploitation of data issued from the first stage.

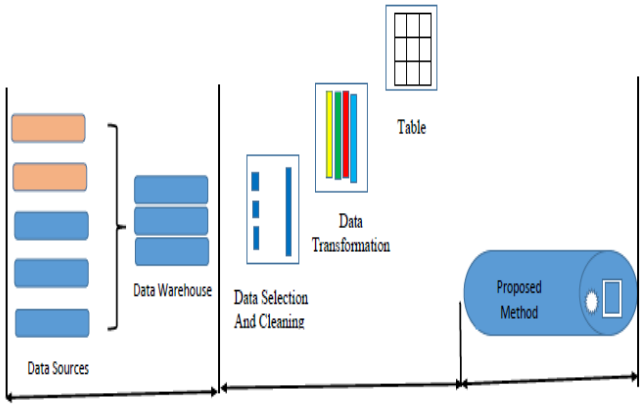

Figure 1. Proposed architecture

Data Warehousing and Pre Processing for proposed Method

The first stage of our approach is composed by two parts. Firstly, the design and the realization of the data warehouse, with the objective of obtaining a unique source of data to carry out the data Pre Processing tasks for proposed method. For this, the architecture of the data warehouse is articulated around three axes: Integration, Building, and Structuring.

The integration step allows to extract and to group data coming from different data sources. These are

recovered, coded, and stored in the global source. The building step consists in extracting the relevant data and copying it in the warehouse based on the multidimensional concept.

Finally, the structuring step is aimed at reorganizing the data in the warehouse in the Data Marts. It is worth noting that the data warehouse consists of a centralized collection of materialized and historical data.

Secondly, data from the warehouse is very diverse and heterogeneous and is not necessarily entirely exploitable by the data mining techniques. To circumvent this issue, the preprocessing step is needed to obtain exploitable data, especially in the form of tables of individuals/variables. To this end, the following steps were used: (i) Data selection, that applies filters allowing us to select a subset of rows and/or columns, (ii) Data cleaning, in order to process missing data (suppression of records - enrichment by external sources was also carried out during the creation of data warehouse, finally, (iii) Transformation and dimension reduction in order to obtain reduced data groups.

Proposed Method: A Service-Oriented Data mining

Data mining tasks of the proposed method include several basic services. Each of these services is adapted to a specific usage context. The process of services selection and composition is based a apriori on predefined rules. The proposed Method is a runtime environment that is designed and implemented according to a multilayer structure: Data Access Services Layer, Data Mining Services Layer and User Services Layer:

The Data Access Services Layer (**DASL**) ensures the publication and searching of data, outcome from PHASE I, to be mined in our APESS platform, as well as handling metadata describing available data. In other words, the DASL is responsible for the access interface to data sets and all associated metadata.

The Data Mining Service Layer (**DMSL**) is a fundamental layer in our APESS platform. This layer is composed of generic and specific web services that provide a large collection of machine learning algorithms written for knowledge discovery tasks. In DMSL, each web service provides different data mining tasks including among others classificat ion, clustering, association rule mining. They can be published, searched and invoked separately or consecutively through a common GUI.

The User Services Layer (**USL**) provides the user interaction with the system and offers facilit ies for visualizing the extracted knowledge models by the visualizat ion services module. In addition, users may want to make specific choices in terms of defining and configuring a data mining process such as algorithm selection, parameter setting, and preference specificat ion for web services used to execute a particular data mining application.

Finally, the Enterprise Service Bus (**ESB**) is a convenient middleware technology to apply SOA. Also, it is aimed at both: (i) ensuring the interconnection and (ii) managing the mediation of communicat ions and interactions between services. Since the ESB is solving all integration issues, each layer in our APESS platform only focuses on its own functionalities.

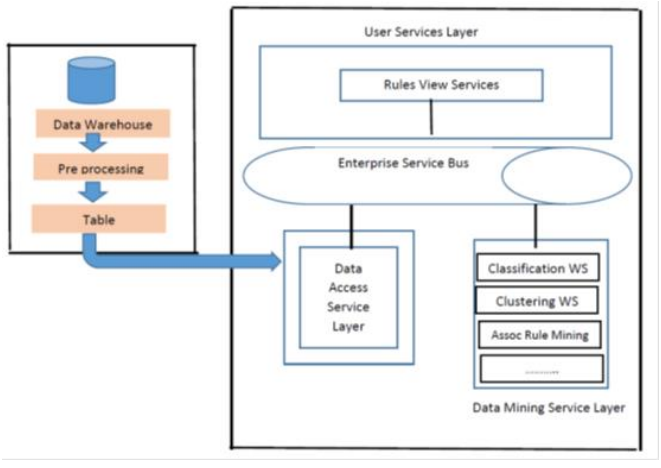

Figure 2. Proposed Method

IV. EXPERIMENTS

In our study, we used our proposed method for extracting RTA cases prediction models for

radiography in the tamil Nadu region. There are number of man and women including children's are met the accidents here we have found 24.41% of male between the age group 21-30 likewise 28.57% the female between the age group 21-30. Safety is important of our human life so the awareness of the people. To this end, the data used to evaluate our approach came from data records of radiography material requirement in hospitals, there are many kind of accidents in occurs at the time of crossing the road, travelling etc..

Table 1. Mode of Injury

s.no	Mode of injury	Male	Female	Percentage male	Percentage female
1.	Two Wheeler VS Two Wheeler	44	7	52.38	50.00
2.	Two Wheeler VS Person	12	-	14.28	--
3.	Two Wheeler VS Three Wheeler	2	-	2.38	--
4.	Two Wheeler VS Bicycle	4	-	4.76	42.85
5.	Two Wheeler VS Four Wheeler	13	6	15.47	--
6.	Three vs fourwheeler	1	1	1.19	--
7.	Four wheeler vs two wheeler	4	-	4.76	--

The above table1 represents the road accident of RTA cases includes mode of injury for male and female

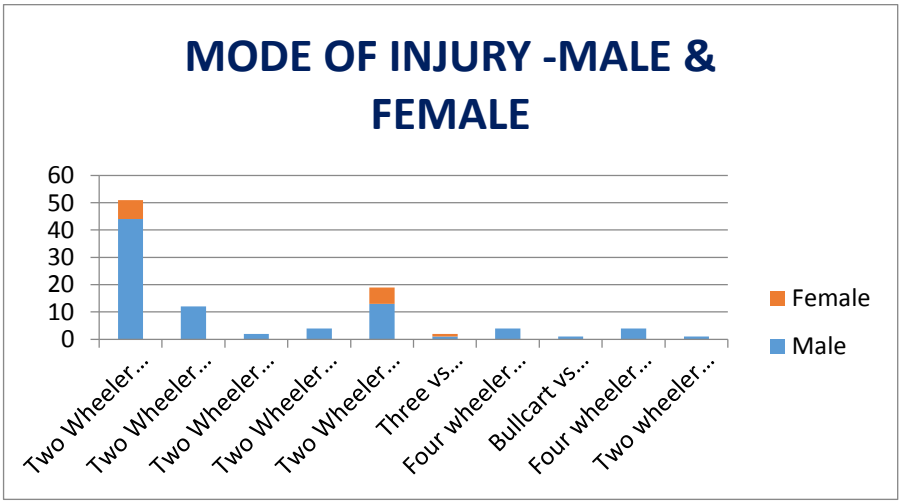

Figure 2. Mode of injury male and female

The above figure 2 says the road accident of RTA cases for male and female

Table 2. Mode of injury age wise

s.no	Age	Male	Female	Percentage of male	Percentage of Female
1.	0-10	4	1	4.65	7.14
2.	11-20	10	1	11.62	7.14
3.	21-30	21	4	24.41	28.57
4.	31-40	14	2	16.27	14.28
5.	41-50	16	4	18.6	28.57
6.	51-60	13	2	15.47	14.28
7.	61-70	6	0	7.14	0.0
8.	71-80	2	0	2.32	0.0

The above table2 represents the road accident of RTA cases for age wise male and female

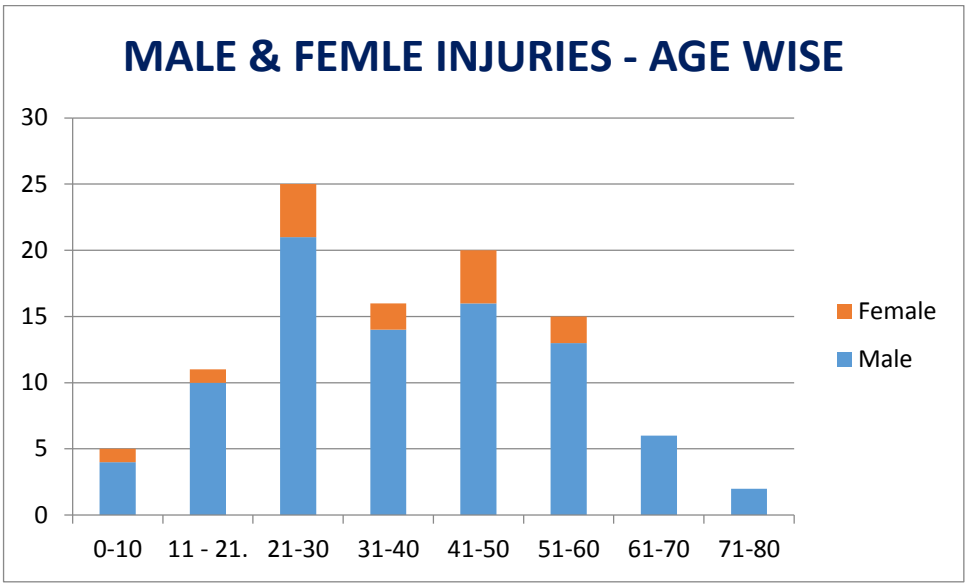

Figure 3. mode of injury are wise

The above figure 3 says the road accident of RTA cases for male and female age wise

V. CONCLUSION

In this article, we have used a new method for service-oriented architecture and data mining, in the field of health information system for radiology department. Our method provided prediction model of road accident, using data mining algorithms by generating frequent accident prediction rules. Practically, the proposed method allows extracting model for RTA cases, based on the exploitation of the real data of road accidents for RTA cases.

VI. REFERENCES

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