2nd International Symposium on Big Data and Cloud Computing (ISBCC'15)

Ontology based Public Healthcare System in Internet of Things (IoT)

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Abstract

Internet of Things is a growing technology that is predicted to discover new drugs and medical treatments. The efficiency and quality of healthcare have high potential features as flexibility, adaptability, affinity, cost shrinkage, and high speed. This technology helps us to understand the specific risks related to security and privacy. This paper targets on a Healthcare information system based on ontology method. In particular, security and privacy challenges are analyzed in the proposed Ontology-based healthcare information system. Emergency medical services (EMS) are a type of emergency service dedicated to providing out-of-hospital acute medical care, transport to definitive care. Moreover, a functional infrastructure plan is provided to exhibit the unification between the proposed application architecture with the Internet of Things and ontology hierarchy.

Keywords: Internet of Things (IoT); Emergency Medical Services (EMS); Healthcare Information System; Ontology.

1. Introduction

Internet of Things (IoT) is mainly to connect the world through multiple devices. In healthcare system IoT is mainly used to access the information quickly. Internet of Things is mainly interconnected by more number of devices with the use of internet. In healthcare system, Internet of Things is mainly built to access the large scale of information. It defines that, grid of computers can deliver software and data. For detail, this technology can be most accomplished by multiple servers as retail businesses, whose needs can be strictly met by the cumulative usage. Here, Ontology based emergency medical service system provides the way to collect, integrates, and interoperates IoT data. Based on the Ontology Construction in emergency medical service, decision can be made in Internet of Things (IoT). For this decision making process, decision support system (DSS) can be used. Through Ontology construction, Decision for the healthcare system can be made.

In emergency medical services, doctors, patients, nurse records are stored in the database and it can be accessed in ontology OWL (Web Ontology Language) format. Here the Meta data modelling is used to classify the records that have been stored in the database. That model can be easily helping us to map the input data to the output data. The main advantage of Meta data model is, it can handle noise and incomplete data occurred in the ontology data. IoT can act as the backbone of the healthcare system for information sharing. The rest parts of the paper are organized as follows. In section II, IoT data model is proposed and tackle the problem of accessing the heterogeneous IoT data. In section III, methodology is described. In section IV, the details of how to implement the Ontology based IoT data.

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2. Data model for IoT – based medical services

In healthcare system, delivering the information to the doctors, patients at the point of emergency will improve the quality of healthcare in emergency medical service. At sometime, health records of the patients and detail of the doctors are stored in different hospitals or stored in different location of the database, it is difficult to collect these records [1]. For that, ontology can be constructed to resolve these problems and to make correct decision at emergency period. In order to support the Ontology content accessing, this paper introduces a resource model to locate and get clinic data which are stored in heterogeneous hospital information systems. In the proposed method, clinic data of patient is defined as resource with unique URL address. Related clinic data of one patient is collected together to form a combinational resource, and could be accessed by physician if authority is assigned to the physician. Finally, case study is discussed to illustrate the method of clinic data accessing through Internet from different healthcare units. The result shows that the clinic data of patients could be accessed more conveniently.

In healthcare service, doctors, patients, physicians play a major role and they also involved in an entire servicing. Doctors need to access the patient record from anywhere by storing it in a distributed manner [3]. Patients also needs to about the doctors availability and the equipments status (busy/free). In order to help patient accessing doctors' availability status, a resource model is needed for this accessibility.

3. Techniques

Today's world there are so many health problems for the people here some problems are easily curable and some problems are unknown to the doctors. So in that situations the doctors need to know the treatment. To conquer this type of problems we suggested a new era of technology called Ontology based IoT Technology. Here the doctors have to prepare the document about the critical cases which the doctor has ever seen. While preparing a document, the doctor needs to mention some points they are as follows

3.1 Collecting and Inferring the Information

Real-time information of the patient is collected and it can be uploaded in the database by the admin. Then, the doctors must register their details into the database. Each doctor and patient have unique id in the database. After collecting the patients' record, mapping should be done with the existing record and the newly collected one to find the hereditary disorders. Here if the doctor found any disease that doctor has ever seen then, at first doctor has to indicate the symptoms of that disease and add it to the document to inform other doctors, if any doctor finds the same disease cases. It is desirable only if the doctors in different region are interconnected.

3.2 Finding possible reasons and solutions

Match the newly collected patients' details with the related components of the patient to find the possible reasons of the diseases. Suggesting the experts about the diseases from collected information. After checking all symptoms of the patient the doctor conclude the disease and how it occurred and is it curable by normal treatment or patient go for special treatment, all these concerns are notified.

3.3 Emergency DSS

Decision Making Process is about a Coordination and Information sharing among task groups. Actions need adjustment to the changing events during decision implementation. Facilitate information communication through Ontology data accessing. After analyzing these things, the doctor will made arrangement for the treatment, here the doctor will mention what the medicines are given to the patient and the dosage of it. There are some points that the doctor has to follow while treating the patient. Mention the medicines and dosage to the document which are given to the patient.

4. Implementation

4.1 Current System

In the Current system the doctors do not construct any ontology about new diseases so it is very difficult to cure. At that time doctor couldn't know about the newly upcoming disease in other countries. Also in the current system doctors do not able to make decision in case of any emergency [6-7].

4.2 Proposed System

In this proposed system Ontology based Internet of Things (IoT) is introduced in medical science because through ontology decision making process is easy for all the doctors in emergency time. After that the doctor knows about the diseases and builds the ontology for the treatment by handling this we can shorten the death rate. The position of hospital and doctor will get increased by sharing the information through ontology database. For that, disease details such as symptoms, treatment, causes, effect are all constructed in ontology format and put into various databases. Doctor also provide the treatment process and what medicine does the patient to have.

4.2.1 Ontological Modelling

Ontological modelling refers to explicitly specifying the active model through the resource [2]

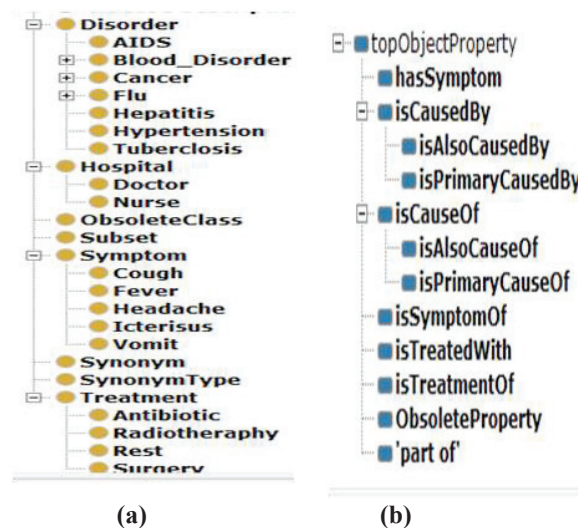(a)   (b)

Figure 2: Activity Ontologies (a) depicts the medical classes for describing medical activations (b) illustrates the properties used by the context and healthcare systems.

description framework. It defines an activity modelling as ontological classes and all actions in ontology are considered as the properties of the ontology concepts. In the figure 2, finding the symptoms for the disease is shown.

The ontological model of finding the symptom for a disease i.e., FindingSymptom concept, can be defined by the action properties hasSymptom, isCausedBy, isSymptomOf, isTreatedWith in addition with properties such as an patient identifier patID, patient disease disID. Object properties describes relationship between two individuals. Datatype properties describe relationships between individuals and data values. Here the properties may be range and domain. To characterize the properties in the class, datatype properties can be used. The Ontology Construction is as follows

5. Result

Emergency medical rescuing process can involve multiple types of resources. The coordination of multiple resources is complex. In our method, the user use Internet of Things (IoT) platform to coordinate data across organizations, through the tool named PROTÉGÉ [4]. Here the Protégé tool is used to denote the relationship.

In emergency medical service, ontology data model is used to share the information through the various databases [5]. Sparql query can be used to retrieve the information or owl/rdf file from the database. In existing system, ontology model is not used but in proposed system, through ontology data model doctors can cure the patients quicky.

Table 1. Rehabilitation System.

Disease	Treatment
Hepatitis	Liver Transplant
Leukemia	Chemotherapy
Acetaminophen	Hepatotoxicity

6. Conclusion

In this paper the admin introduced a IoT technology in medical science. It is widely needed for doctors and this technology helps us to cure the patients in easiest way, if any new disease is explored. Here, we employ the existing enhancement of ontology based models for authenticating the treatment process. By using Internet of Things will help us to cure the patient in a short period of time. Internet of Things will create a major brunt on medicine, and contribute to an overall improvement in its quality.

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