Analyzing Patient Health Care Using BDCaM via Remote Sensing Using Context-Aware Monitoring

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Abstract - *The explosive growth of demands on big data processing imposes a heavy burden on computation, storage, and communication in data centres, which hence incurs considerable operational expenditure to data centre providers. Therefore, cost minimization has become an emergent issue for the upcoming big data era. Different from conventional cloud services, one of the main features of big data services is the tight coupling between data and computation as computation tasks can be conducted only when the corresponding data is available. Our proposal, the architecture model for context-aware monitoring, that adapts their behaviours to changing environments by analyzing huge data generated by AAL systems and stores in cloud platform. With the help of BDCaM model it facilities analysis of big data inside cloud environment. This system identifies the correlation between context attributes and the threshold values of vital signs. Using Map Reduce algorithm, over a huge context data of a particular patient, the system generates a set of association rules that are specific to that patient. To prevent data we are using RSA algorithm for encryption purpose over an AAL system and send to cloud. The advantage of this project is to refines patient specific rules from big data and simplifies the job of healthcare professionals by providing early detection of anomalous situations with good accuracy.*

Key Words: AAl, Cloud Computing, BDCam, MapReduce, RSA Algorithm

1. INTRODUCTION

Big data means really a huge data sets; it is a collection of unstructured data sets that cannot be processed commonly used computing techniques. Big data is not meant only for a data; rather it has become a complete subject, which involves various techniques, tools and frameworks in real time.

An every ambient assisted living (AAL) system consists of various different sensors and devices which generates large amount of patient-specific unstructured raw data each and every interval of time every day. A data that is generated from the system might be a few bytes of numerical values to several gigabytes of video stream. For example assume a single AAL system generates 200 kilobytes data every seconds on average then it will become 5.86 terabytes in one year. If any system targets to support say, 10 million patient records, then the data amount will be 28 Exabyte per year. Even healthcare system targets to analyse only continuous heart beats of cardiac patient in real-time inside the cloud environment, then it will produce around 14 Petabytes data every day from 7 million patients. Including these dynamically generated continuous monitoring data, there also large amount of data such as patient profile, medical records, disease history and social contacts. If we want to store all these data and patient history to predict any future abnormality accurately, then the representation of data will be in zetabytes in few years. Such necessitate the development of cloud-based assisted healthcare architecture.

Big data is certainly one of the biggest buzz phrases in IT today. Combined with virtualization and cloud computing, big data is a technological capability that will force data centres to significantly transform and evolve within the next five years. Similar to virtualization, big data architecture is unique and can create an architectural upheaval in the way systems, storage, and software infrastructure are connected and managed. Unlike previous business analytics solutions, the real-time capability of new big data solutions can provide mission critical business intelligence that can change the shape and speed of enterprise decision making forever.

Hadoop is a processing engine that is designed to handle extremely high volumes of data in any structure. The Hadoop distributed file system (HDFS), which supports data in structured relational form, in unstructured form, and in any form in between. HDFS is a reliable distributed file system that provides high through put access to data. The MapReduce programming paradigm which is meant for managing applications on multiple distributed servers. It is a framework for performing high performance distributed data processing and is based on divide and aggregate paradigm. In Chapter 1 introduce about the project concept and given the overview idea about the project. It also consists of objective of the Extraction and Analysis of the Online data from the massive data Centers with the help of need for study. In Chapter 2, we selected papers for literature survey with help of these paper we came to know what the Big data can do and how it help for Analysis of data to provide services to the customers. In Chapter 3, we listed the Hardware requirements and Software Requirements of our project and also it include that what type of software used in it. Software like Hadoop is used for creating the application. In Chapter 4, we explained about the existing system the problem definition of the existing system, then finally disadvantages of existing system. In Chapter 5, we discuss about the project domain and the detailed description of existing systems by analysis the literature survey of the existing techniques. We also then presented about the techniques and methods of our proposed methods. In Chapter 6, we concluded that by the use of Hadoop tool in big data, we get the more accurate result from the data store and revival in data center with the help of evolution process.

2. CHARACTERISTICS OF BIG DATA

2.1 Main characteristics (5V's)

Volume…refers to the vast amounts of data generated every second. We are not talking Terabytes but Zettabytes. If we take all the data generated in the world between the beginning of time and 2008, the same amount of data will soon be generated every minute. The quantity of generated and stored data. The size of the data determines the value and potential insight- and whether it can actually be considered big data or not.

Velocity…refers to the speed at which new data is generated and the speed at which data moves around. Just think of social media messages going viral in seconds. Technology allows us now to analyse the data while it is being generated (sometimes referred to as in-memory analytics), without ever putting it into databases. In this context, the speed at which the data is generated and processed to meet the demands and challenges that lie in the path of growth and development.

Variety…refers to the different types of data we can now use. In the past we only focused on structured data that neatly fitted into tables or relational databases, such as financial data. In fact, 80% of the world's data is unstructured (text, images, video, voice, etc.). The type and nature of the data. This helps people who analyze it to effectively use the resulting insight.

Figure 2.1- Components of Big Data

Veracity…refers to the messiness or trustworthiness of the data. With many forms of big data quality and accuracy are less controllable (just think of Twitter posts with hash tags, abbreviations, typos and colloquial speech as well as the reliability and accuracy of content) but technology now allows us to work with this type of data. Inconsistency of the data set can hamper processes to handle and manage it.

Validity…refers the most important aspect of big data. It costs a lot of money to implement IT infrastructure systems to store big data, and businesses are going to require a return on investment. At the end of the day, if you can't extract value from your data, there is no point in building the capability to store and manage it. The quality of captured data can vary greatly, affecting accurate analysis.

3. LITERATURE SURVEY

3.1 A Cloud-Oriented Context-Aware Middleware in Ambient Assisted Living

In this report, research into ambient assisted living (AAL) strives to ease the daily lives of people with disabilities or chronic medical conditions. AAL systems typically consist of multitudes of sensors and embedded devices, generating large amounts of medical and ambient data. However, these biomedical sensors lack the processing power to perform key monitoring and data-aggregation tasks, necessitating data transmission and computation at central locations. The focus here is on the development of a scalable and context-aware framework and easing the flow between data collection and data processing. The resource-constrained nature of typical wearable body sensors is factored into our proposed model, with cloud computing features utilized to provide a real-time assisted-living service. With the myriad of distributed AAL systems at play, each with unique requirements and eccentricities, the challenge lies in the need to service these disparate systems with a middleware layer that is both coherent and flexible. There is significant complexity in the management of sensor data and the derivation of contextual information, as well as in the monitoring of user activities and in locating appropriate situational services. The proposed CoCaMAAL model seeks to address such issues and implement a service-oriented architecture (SOA) for unified context generation. This is done by efficiently aggregating raw sensor data and the timely selection of appropriate services using a context management system (CMS). With a unified model that includes patients, devices, and computational servers in a single virtual community, AAL services are enhanced. We have prototyped the proposed model and implemented some case studies to demonstrate its effectiveness [4].

3.2 A Wearable Smart Phone-Based Platform for Real Time Cardiovascular Disease Detection via Electrocardiogram Processing

In this report, cardiovascular disease (CVD) is the single leading cause of global mortality and is projected to remain so. Cardiac arrhythmia is a very common type of CVD and may indicate an increased risk of stroke or sudden cardiac death. The ECG is the most widely adopted clinical tool to diagnose and assess the risk of arrhythmia. ECGs measure and display the electrical activity of the heart from the body surface. During patients' hospital visits, however, arrhythmias may not be detected on standard resting ECG machines, since the condition may not be present at that moment in time. While Holter-based portable monitoring solutions offer 24-48 h ECG recording, they lack the capability of providing any real-time feedback for the thousands of heart beats they record, which must be tediously analyzed offline. In this paper, we seek to unite the portability of Holter monitors and the real-time processing capability of state-of-the-art resting ECG machines to provide an assistive diagnosis solution using smart phones. Specifically, we developed two smart phone-based wearable CVD-detection platforms capable of performing real-time ECG acquisition and display, feature extraction, and beat classification. Furthermore, the same statistical summaries available on resting ECG machines are provided [5].

3.3 Data Analytics in Ubiquitous Sensor-Based Health Information Systems

In this report, Sensor-based intelligent and ubiquitous systems are important in the context of "Intelligent Infrastructures". In this scenario, healthcare is one area where sensors and mobile platforms will become more useful and the application must have the capability of analysing the data feeds from sensors to extract useful meanings. Various data analytics methods such as data-mining techniques or stream processing and continuous event processing techniques are useful in this regard. This paper is a broad survey article where we look into the emerging trends in Ubiquitous Healthcare Information Systems focussing on the use of analytics techniques to cluster patients into similar groups, or to process streaming data for detecting abnormal medical conditions as early as possible. Considering the size of the population and hence the volume of data, there are several architectural challenges such as scalability and availability of the platforms and support for "big-data" handling. We try to summaries how these problems have been addressed and whether the solutions are adequate or not [6].

4. NEED FOR STUDY

The real issue is not that you are acquiring large amounts of data. It's what you do with the data that counts. The hopeful vision is that health sevice will be able to take data from any source, harness relevant data and analyze it to find answers that enable

1) Reduce the cost that spend between health care service

2) Time reductions

3) Smarter health care decision making

For instance, by combining big data and high-powered analytics, it is possible to:

- Firms have easy access to data regarding the performance of their body
- Easy access of data that patient really care about
- To make the condition to know about their body condition
- The message are extracted with the right tools and gives feedback

5. EXISTING SYSTEM

In existing systems, situations are classified by generalized medical rules or fuzzy rules which are not always applicable for every kind of patient. A context-aware monitoring has proved its advantage for processing and managing large amount of contexts gathered from AAL systems.

An attribute value set AAL is converted to a numerical value. Some context attributes already have numeric values (e.g. HR, BP, room temperature). Numerical annotations are used for contexts having nominal value (e.g. activity). The static or historical contexts that have Boolean values (e.g. symptoms) are combined in a single binary string which results a decimal value (e.g. 001100 converted to 12) [1].

The context aware services identification process using high level generalized rules. The model lacked an important feature such as personalized knowledge discovery which could be derived from a large amount of patient data stored in the cloud platform.

The need for an abstract context-aware framework that improves the confidence of abnormality detection in the home healthcare environment by correlating physiological statistics with various physical activities and environmental factors.

The use of cloud computing enables faster learning with greater knowledge from continuously generated big data gathered from heterogeneous contexts of various assisted living systems. This also improves the discovery of user-specific rules with stronger support. The improved knowledge of understanding the patient's situation through iterative learning of present contexts and substantial historical data can reduce the transmission of repeated false alerts to the remote monitoring systems [15].

6. PROBLEM DEFINITON

It generates false alarms because patients are made to press wearable button in case of emergency. System does not identify the abnormal conditions of a patient accurately. This system even asks frequent questions to patient about their condition. Even this system cannot sense the future conditions at early stages.

A cloud-oriented context-aware middleware (CoCaMAAL) and proved its advantage for processing and managing large amount of contexts gathered from multiple AAL systems. In CoCaMAAL, we described the context-aware service identification process using high level generalized medical rules. The model lacked an important feature such as personalized knowledge discovery which could be derived from a large amount of patient data stored in the cloud repositories.

7. PROPOSED SYSTEM

This project deals with the various important feature of remote monitoring application is to identify the abnormal conditions of a patient accurately and so send appropriate alerts to care givers. For that reason build an innovative architectural model for context-aware monitoring, BDCaM that uses cloud computing platforms. With the help of BDCaM model it facilities analysis of big data inside cloud environment. This system identifies the correlation between context attributes and the threshold values of vital signs. Using Map Reduce algorithm, over a huge context data of a particular patient, the system generates a set of association rules that are specific to that patient. Every generated context of AAL systems is encrypted using an RSA Algorithm that will provide data security and sent to the cloud. A number of distributed servers in the cloud store and process those contexts to extract required information for decision-making using this novel technique.

Develop a 2-step learning methodology. In the first step, the system identifies the correlations between context attributes and the threshold values of vital signs. Using Map Reduce A priori algorithm, over a long term context data of a particular patient, the system generates a set of association rules that are specific to that patient. In the second step, the system uses supervised learning over a new large set of context data generated using the rules discovered in the first step. In this way, the system becomes more robust.

8. ARCHITECTURE

Digital Healthcare is a cluster of new and emerging applications and technologies that exploit digital, mobile, sensors, analytic (raw data) and cloud platforms for treating and supporting patients in Fig 8.1. This digital data are saved in cloud storage in encrypted form. Were this data is decrypted and moved to big data tool for analysis the data and improving the data more analytic for of data. Digital Healthcare is necessarily generic as this novel and exciting Digital Healthcare innovation approach is being applied to a very wide range of social and health problems, ranging from monitoring patients in intensive care, general wards, in convalescence or at home – to helping doctors make better and more accurate diagnoses, improving drugs prescription and referral decisions for clinical treatment.

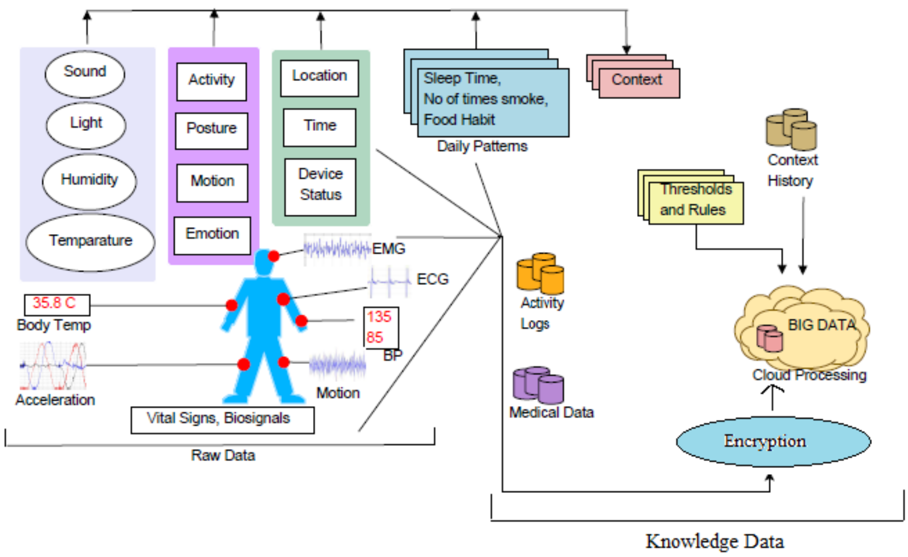

Fig 8.1- Cloud-based Component System in BDCaM Model

9. CONCLUSION AND FUTURE WORK

It brings healthcare flows and data/message management intelligence into the ecosystem for better stream processing, operational management and regulatory compliance. By asserting security control into the service layer with native e-Health features our solutions ensure regulatory compliance.

The user can easily aware of his/her own health conditions. This will save the time of the user instead of going to hospital regularly, it allows the relatives of the patients to know about the health condition of the patient from anywhere. This project is useful to monitor the patient's health care which increases the human life. In future, we intend to extend the model with more context domains.

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