INTEGRATION OF DATA MINING AND INTERNET OF THINGS – IMPROVED ATHLETE PERFORMANCE AND HEALTH CARE SYSTEM

Thirunavukarasu B[#1], Dr T.Kalaikumaran[2], Dr S.Karthik[3]

Department of Computer Science and Engineering, SNS College of Technology, Coimbatore, India
[1]bs.thirunavukarasu@gmail.com, [2]hodcse@snsct.org, [3]profskarthik@gmail.com

Abstract— **The body health of an athlete is important to get his victory. During the practice session, athletes have great chance of getting problems in their body conditions. The health of the athlete is also to be monitored along with the practice to make required improvements in their performance. The body condition is monitored using sensors and the respective time series data are stored in the remote database (at the internet) so that the body condition can be monitored anywhere globally by any specialized doctors. The stored data is fetched and analysed to predict the body condition of the particular athlete according to period of time. Based on this analysis of body condition during the practice, the expected improvements can be made with good future practice conditions which suits the person's body condition.**

Keywords— **Data Mining, IoT, data mining and sports, prediction in sports, IoT and data mining, sportsman application.**

I. INTRODUCTION

There exists various systems [1] to monitor the people for their health. The patient may not be able to present at the hospital often and hence the patient monitoring could be done with the help of the WBAN (Wireless Body Area Network).Based on this monitoring, the illness prevention [9] is achieved even without having one to one contact between the patient and the doctor.

In the sports department, large amount of statistical data are gathered and they are tested [2] to assess the future performance of the player by converting the data gathered into knowledge. But one drawback in that is that, the physical advisor is needed to be near always.

The data mining have lot of applications. Now-a-days, in the era of information, we are supposed to deal with huge amount of data. The information are used to predict the future by which the required improvements are made. These technique of data mining and internet of things can be used to provide centralized cloud analysis [3]. The analysis are made at the remote side and the prediction is provided at the distributed system.

A. Data Mining

Data Mining is semi-automatic technique [4] of extracting the useful information from the huge data base. Many useful information are gathered and the knowledge is discovered.

The major reason that data mining has attracted a great deal of attention in information industry in recent years is due to the wide availability of huge amounts of data and the imminent need for turning such data into useful information and knowledge. The information and knowledge gained can be used for applications ranging from business management, production control, and market analysis, to engineering design and science exploration. In fig 1, the architecture shows the overall flow of the operations performed.

Mining is mainly classified into two types. Descriptive data mining, which describes data in a concise and summative manner and presents interesting general properties of the data. Predictive [5] data mining, which analyses data in order to construct one or a set of models and attempts to predict the behaviour of new data sets. Predictive data mining, such as classification, regression analysis, and trend analysis.

Many people treat data mining as a synonym for another popularly used term, Knowledge Discovery from Data, or KDD. Alternatively, others view data mining as simply an essential step in the process of knowledge discovery.

Knowledge discovery as a process and an iterative sequence of the following steps:

- Data cleaning (to remove noise and inconsistent data)
- Data integration (where multiple data sources may be combined)
- Data selection (where data relevant to the analysis task are retrieved from the database)
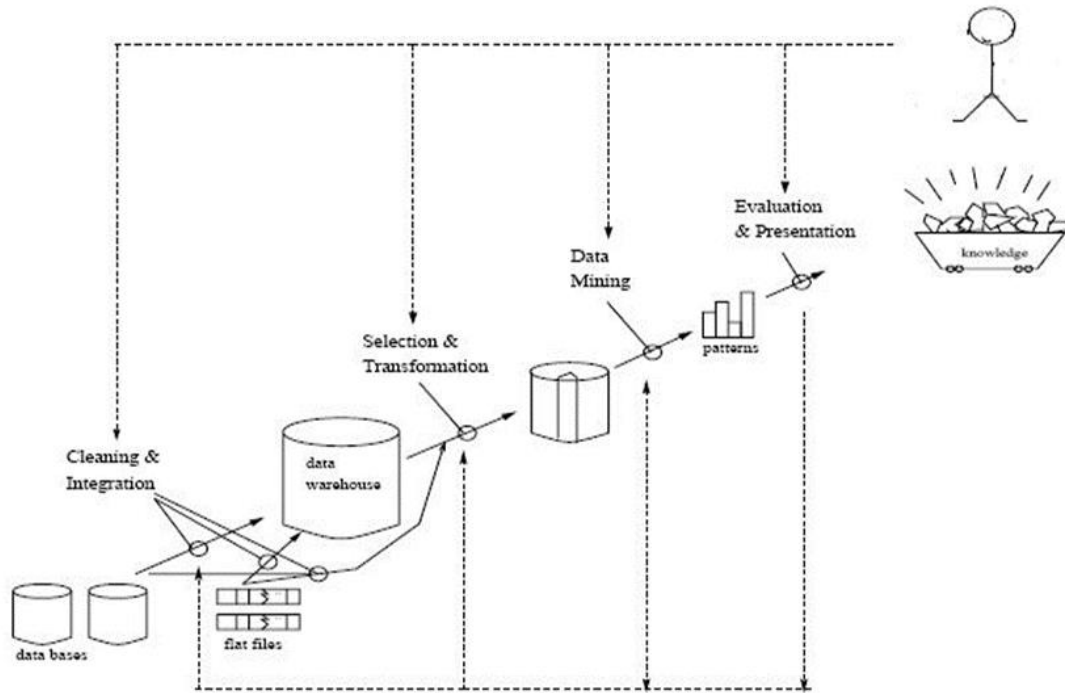
Fig. 1. Data Mining Architecture

- Data transformation (where data are transformed or consolidated into forms appropriate for mining by performing summary or aggregation operations, for instance)
- Data mining (an essential process where intelligent methods are applied in order to extract data patterns)
- Pattern evaluation (to identify the truly interesting patterns representing knowledge based on some interestingness measures)
- Knowledge presentation (where visualization and knowledge representation techniques are used to present the mined knowledge to the user.

II. METHODOLOGY

A. Sports, IoT and Data Mining

Internet of Things [6] comes into action when there is case, the ordinary objects have inter-connected microchips within them. These microchips are used to track the device and also sense the surroundings to report to other machines and to other people. It is also called as M2M [7], which states many meaning, Man to Machine, Machine to Man, Machine to Machine, etc. in IoT, the human being will have interactions with the things or objects, where the object reports the status to the human at frequent intervals. Instead of Man to Machine interaction, even the objects can interact with other objects, in which the object reports its status to another object. IoT can be applied in many sectors. Some among them includes

- Agriculture
- Medicine
- Telecommunication
- Environment Monitoring
- Home Automation
- Manufacturing, etc.

There are various techniques used to implement the IoT. Some of them are

- RFID

Radio Frequency Identification uses radio frequency waves to identify the items around the environment. It tracks items in Real Time and provides important information about the specific item.

- Sensor Networks

Sensor Networks are used to detect the physical changes that are happening around the environment. The virtual world is bridged with physical world by the use of Sensor Networks.

- Microcontrollers

They are computer chips that are used in electronics. The main purposes of the microcontrollers are to fetch, store and retrieve data. It enhances the network power and provide options for independent decision making.

- Biometrics

Biometrics are used to recognise the living things and people. Authorization are provided using finger prints, iris scan, face reorganization, etc.
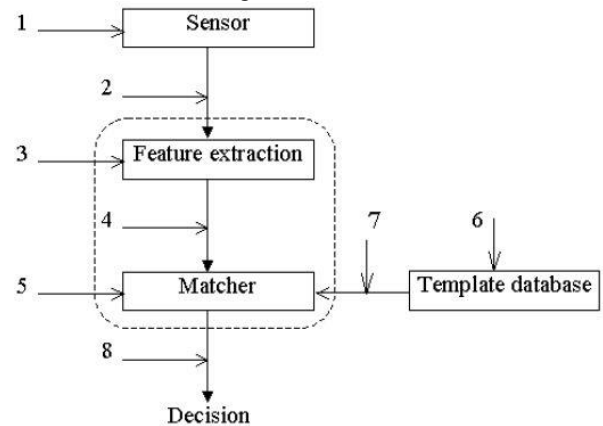

Fig. 2. Biometrics and Data Mining

The Fig 2. Indicated that, initially the sensors are used to recognise the physical actions or to monitor the human parts, and then the extraction of data is made. Once the extraction is made, the template database which contains the original

authenticating data is compared with it. Based on comparison, where the analysis of image are made, the authentication is provided.

Sports is an important sector, where the health issues of a person varies time to time based on the practice. The sportsman need to change their body conditions to support the game. These sudden changes in the body may affect them physically. So the proper changes in the health consultants should be changed according to the time.

There exists some cases in which, the physical trainer and doctor are needed to be with them in all the time. But this is not practically possible. So using internet is the best option. Thus the doctor can view the report of the athlete anytime in the internet and can provide the suggestions and body reports more often even if the doctor is at outside the bound.

Just storing the body condition of a sportsman is alone not enough to provide the prediction on the body condition. We need to analyse the data that are stored in the data base using OLAP tools. This OLAP tools which are available in online, will use the data sets stored, and provide the prediction of the athlete's body condition.

The human temperature is a main factor, by which one can predict the body condition. Sudden changes in food habits, physical works, etc. will create great problems in the athlete's body if proper monitoring is not done.
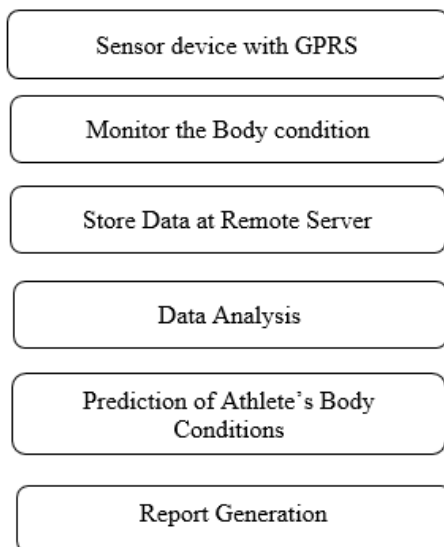
B. Flow of the System

Fig. 3. Flow of the system

The Sensor devices are attached with the athlete's suit. The attachment is made interior without disturbing the athlete's concentration. Different types of sensors are used to gather the different information about the human body. The body condition is monitored and the data are stored in the remote web server. The data are taken to webserver using the GPRS connections.

The web server is implanted with data base that makes these options possible. The data base at server is access using server scripting languages and the predictions are made. These predictions are then reported which gives the information about the athlete.

C. Data Acquisition

Different kinds of sensors are used to monitor different kinds of information. The sensors, senses the environment and makes record of the sensed data. The sensing data may be any kind like, temperature, motion, light, etc. These sensor monitor [8] the athlete's body and gather different information needed to predict the basic body conditions.

The Metabolic Responses [9] during the training with increased power load of the athlete are monitored by using the cycloergometers. The strain gained by the athlete in accordance with the increased power load when increasing the speed is monitored and the physiological data are collected.

Motion Sensor

The motion of the athlete is monitored and the light levels are recorded. This motion sensor is integrated to the data base and the recorded data are monitored. The smart practice [10] environment is maintained by this kind of data acquisition.

Thermal Sensors

The thermal sensors [11] are used to monitor the athlete's body temperature. Temperature is a parameter that have close relation with the environment. This body temperature is a time series data collected at frequent interval and the data is stored in the Remote server through the GPRS connection. The data thus gets stored in web server (Remote Server). Similarly the athlete's heart beat also are monitored and the time series data are stored in the data base.

Fig 4. Indicates how the human body is monitored for gathering the thermal data.
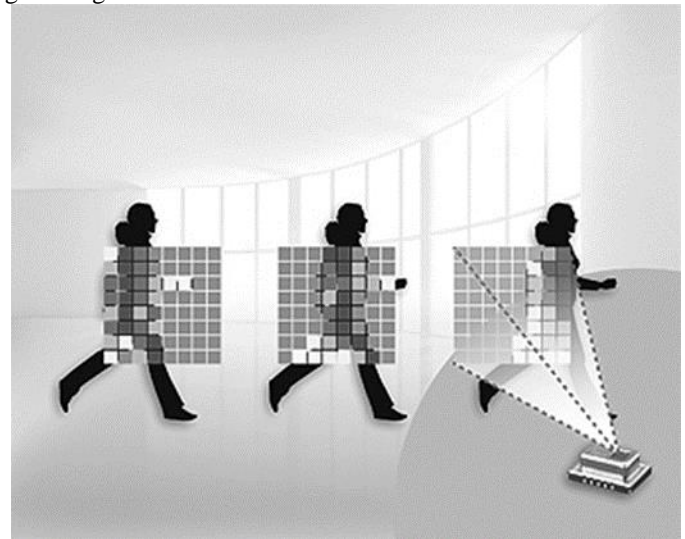

Fig. 4. Thermal information of Athlete

D. Data Analysis

Once the Data are gathered using sensors, the data are processed and transmitted to the server through GPRS network. The data at server are fetched using OLAP tools and the reports are generated. These reports are nothing but the predictions based on the data that we gathered from the athlete.

III. CONCLUSIONS

The implementation of Data Mining Techniques and Internet of Things in sports will provide good health conditions to the athletes. Making this, the body condition could be viewed by any specialized person irrespective of the place. By proper continuous prediction of the body condition, the practice of the athlete becomes mote safe and effective. There is also no need for doctors to be always near. The future predictions will also help the society to conclude on future sportspersons.

REFERENCES

[1] H.-C. Wu, C.-H. Lin, K.-C. Wang, S.-C. Wang, C.-H. Chen, S.-T.Young and T.-S. Kuo, "A mobile system for real-time patient-monitoring with integrated physiological signal processing," in Proc. 1st Joint BMES/Eng. Med. Biol. Soc. Conf.,Atlanta, GA, 1999, p. 712.

[2] N. Saranummi, "Information technology in biomedicine," IEEE Trans.Biomed. Eng., vol. 49, no. 12, pp. 1385–1386, Dec. 2002

[3] Balu Srinivasulu,Kaliyaperumal Karthikeyan, Mungamuru Nirmala, Merugu Chandramouli "Comparative Analysis of Cloud Computing Utilities" Journal of Emerging Trends in Computing and Information Sciences VOL. 3, NO.10 Oct, 2012

[4] Ranshul Chaudhary, Prabhdeep Singh, Rajiv Mahajan "A Survey on Data Mining Techniques" International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 1, January 2014.

[5] Meghana Deshmukh, Prof. S. P. Akarte "Predictive Data Mining: A Generalized Approach "International Journal of Computer Science and Mobile Computing, Vol.3 Issue.1 January-2014, pg. 519-525.

[6] Dlodlo N, Foko T, Mvelase P, and Mathaba S "The State of Affairs in Internet of Things Research" The Electronic Journal Information Systems Evaluation Volume 15 Issue 3 2012, (244- 258), available online at www.ejise.com

[7] Geng Wu, Shilpa Talwar, Kerstin Johnsson, Nageen Himayat, and Kevin D. Johnson, Intel, M2M: From Mobile to Embedded Internet IEEE Communications Magazine - April 2011

[8] Shayama Subair, Pand Lizy Abraham "Analysis of Different Temperature Sensors for Space Applications" International Journal of Innovative Science, Engineering & Technology, Vol.1 Issue 6, August 2014.

[9] Surbhit Jain, Anshu Gupta, Praveen Kumar Malviya "A Zigbee Based Wireless Patient's Monitoring System"The International Journal Of Science & Technoledge, Vol 2 issue 4 April 2014.

[10] Yingying LI Silvia Chiusano, Ing. Vincenzo D'EliaProceedings of the Third International Symposium on Electronic Commerce and Security Workshops (ISECS '10).

[11] J. A. Stankovic, et al, "Wireless Sensor Networks for In-Home Health-care: Potential and Challenges,"in High Confidence Medical Device Software and Systems (HCMDSS) Workshop, Philadelphia, PA, June 2-3, 2005