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Applications of Internet of Things (IoT) in Sports World

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Abstract: ***The Internet of Things (IoT) is a huge new domain where researchers and scientists are at present trying to come up with mind blowing new ideas. IoT is a concept which has become very popular over the past few years with the increase of Internet-ready and connectivity-empowered embedded devices. In this research paper, we are going to study about how IoT can usher in a new era in sports, not only for the athletes but also for the spectators. This paper provides a brief idea about the vast possibilities of IoT in the sports world. The findings of this paper may also be able to provide a broader perspective to the roles that IoT can play in other sectors.***

Keywords: Internet of Things, Sensors, WiFi, ZigBee.

I. INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.[1] The world has come a long way since the term IoT was first coined. Major research and development have happened in the fields of mobile communications and wireless sensor technologies. At present more than 1.9 billion people in the world have smartphones and it is predicted that the number of devices connected to the internet will be in excess of 26 billion by the year 2020. Practical applications of IoT technology can be found in various fields today including healthcare, environment monitoring. The concept of Smart Cities completely depends upon IoT technology.

Sports have always been a big part of human life. A sport of any nature produces a lot of real time data which can be used to improve performances of an athlete and also enrich a viewer's experience. The technological advancement in the Wireless Sensory mechanisms has provided us with an opportunity to analyze all this relevant information and gain valuable insights.

The remainder of the paper will be as follows. Section 2 presents related work. Section 3 presents ideas how IoT can be used in Sports. Section 4 is about all the components and entities that will be required for implementation of IoT in Sports. Section 5 lists down all the opportunities and challenges. Section 6 mentions about the findings of the study. Section 7 provides a conclusion to the paper.

II. RELATED WORK

Although IoT is yet to be incorporated on a large scale in sports but there are instances where it has been inculcated on a small scale. Sports is one of the most rapidly growing areas for IoT technologies and since the scope is very high, there are a lot of corporates which are targeting sports and trying to connect sports to the internet.

Athletes are using wearable tech all the time in order to track their fitness. There are a few IoT-centered applications available in the markets which are beneficial to sportsperson such as Sensoria Smart Sock and Adidas MiCoach Smart Ball.

The Sensoria Smart Sock is a sock which is stuffed with sensors and it is purely designed for runners. It measures the distance covered and also keeps a note of the time required to complete the distance. In addition to this it also analyzes how hard the foot makes contact with the ground and determines the potential risk of injury.

The Adidas MiCoach Smart Ball consists of a sensor inside the ball which keeps a record of power and trajectory of kicks. It lets a footballer practice in a confined area and displays a visualization of how a particular kick would happen on a real ground.

The sports industry is huge in Sweden and hence the Swedish ICT has initiated the Internet of Sports in a bid to bridge the gap between Sports and Technology. Mobile sensor-based products such as the Nike+, sports watches, and apps like Runkeeper have been introduced pretty early over there.[2]

III. How IoT Can Works in Sports

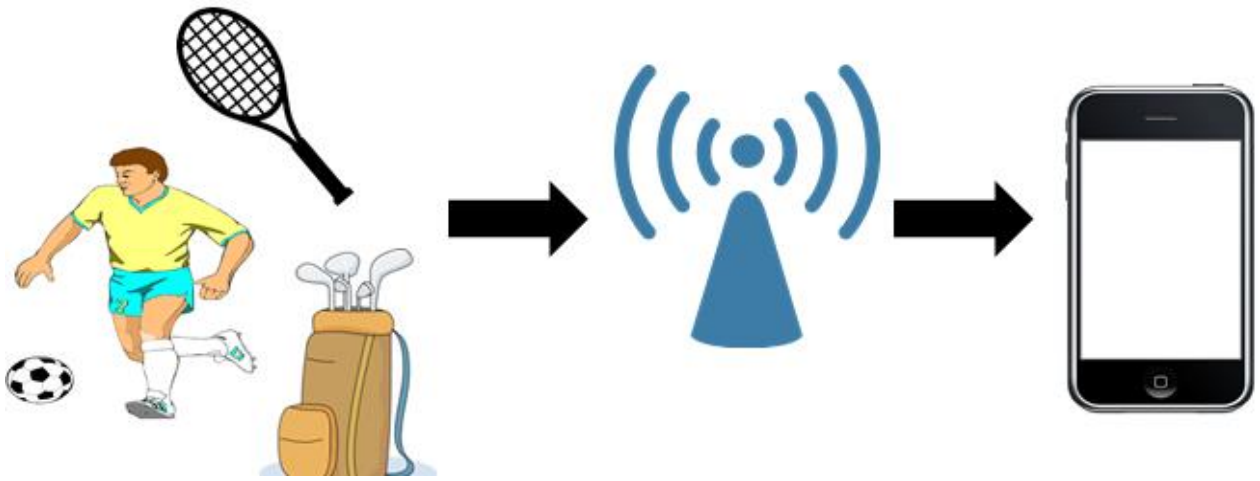

Fig 3.1

The technology which can enable IoT to be a part of Sports is similar to the technology that enables IoT to be part of any field. Sensors can measure anything from stress levels to temperature to altitude levels. The technology that connects all the various sensors and analyzes the data which it gathers has also become advanced.

1. Sensors can be used in various sporting equipment such as footballs, tennis racquets, shoes, watches, baseball bats, golf clubs etc.
2. These sensors can then relay all the important information such as a player's psyche, their heart rates, kick strength, stamina, mental health, golf swing etc. with the help of Bluetooth or any other wireless mechanism such as WiFi to nearby smartphones or handheld devices.
3. IoT can also help monitor a player's practice sessions and determine which player is putting in more efforts. Accordingly, a coach or manager can be able to evaluate who is training more eagerly to perform.
4. IoT can also easily determine if a player is putting too much pressure on their body and can help prevent the player from getting injured.
5. IoT can also play an important role in enriching spectator experience. Spectators in the stadium can get real time information on their smartphone about the game they are witnessing. They will be able to access information about a recently performed move by the player. They can also get to know about the confidence of a player by being able to check upon the current mental state of the player. The information that the spectators can get with the help of IoT is vast. And it will definitely add to their entertainment.

6. Not just with the player's performance, spectators could also easily order for food sitting in their seats without moving an inch.

IV. Components of IoT Applications in Sports

IoT Applications in Sports will have to follow certain architecture to be able to work efficiently. The following is a theoretical description of an architecture for the IoT system in Sports.[3][4]

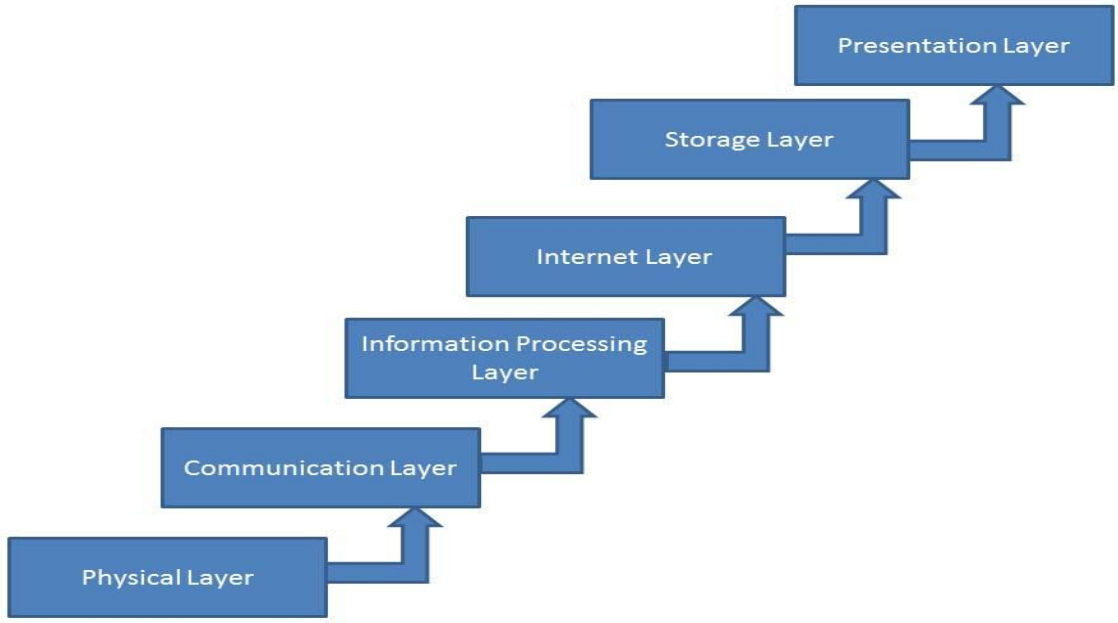

Fig. 4.1

1. **Physical Layer**:

   The lower most layer of the architecture. It consists of mainly all the sensors and other data collecting devices which can be infused into the sporting equipment or can be worn by the sportsperson.

2. **Communication Layer**:

   It needs to be made up of various communication protocols such as ZigBee etc. This will help in sending the sensory signal.

3. **Information Processing Layer**:

   Information obtained from the below layers should be processed with the help of open source hardware platforms.

4. **Internet Layer**:

   Internet is the main ingredient of IoT systems. The information after being processed should be sent to various cloud servers with the help of WiFi or 3G/4G.

5. **Storage Layer**:

   Vast amount of data can be generated. All the real time data can be of a huge volume. To be able to analyze and make use of the information obtained, there needs to be storage devices to store the information.

6. **Presentation Layer**:

   All the various smartphones applications or apps on other handheld devices which may enable everyone to access the information and view it efficiently comes under this layer.

V. Opportunities and Challenges

Opportunities:

1. IoT Applications in Sport can increase a sport's viewership.
2. It can help improve a sportsperson's performance.
3. It can help the coach and other managing staff in devising strategies to combat rival teams' plans at real time.
4. It can enable sportsperson to push themselves to greater limits.
5. The biggest advantage of it is that it can curb down injuries and even fatalities. Imagine if a player gets hit pretty badly and needs immediate medical attention, the sensors on the sportsperson will be able to notify the nearby hospital without any human intervention.

Challenges:

1. The biggest challenge in this is storage and security.
2. Large voluminous data can be generated through this. And hence it will require large data warehouses. Proper data handling algorithms should be put into practice so that unwanted and redundant data does not get stored.
3. All these technologies will also require a lot of battery consumption. Power failures need to be in check.
4. Sports are of different types. There needs to be a common structure put into place to provide better efficiency.

VI. Findings

There is a major market for IoT applications in Sports. But there are no particular fixed practices in place. The IoT companies need to plan well to bring in all types of sport under its radar. A proper architecture needs to be designed and standardized. Although many corporates have entered into this arena, it is still a very feasible market and there is scope for advancement which will only help in closing the gap between internet and sports.

VII. Conclusion

In conclusion, it can be easily said that IoT has a great future in sports. Many countries and sporting organizations have begun to incorporate IoT into their system. Still IoT in sports is at a very nascent stage and it will only get better. With the technological advancements in microcontrollers, the number of IoT devices is going to increase a lot in the world in the next 5 years and very soon people will be able to access various forms of real time data during a game or performance. And it will only lead to a better standard of play and improved sports performance as well as viewing. Coaching and other technical staff members of a team stand to benefit a lot from using IoT in sport.

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