



A Conceptual Study on the Application of Multi-Sports Analytical Band

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ABSTRACT

Sports Analysts Trainers or stat trackers use multiple devices and different equipment to track, record and analyse the statistical data of an athlete or a sportsman, this research paper talks about a conceptual device which can be a single replacement for all the equipment they carry.

Speaking about analysts, sports analytics is one of the most important parts of sports. Sports analysts are the people who keep records on how the team (or an individual player) performs, anywhere they are doing errors, their Positives, their Negatives etc. The analyst is the backbone of a sports team or a sportsman.

In some contact sports, we encounter brutal offenses such as Rugby, Kabaddi, etc. This band could also be used in measuring the intensity or impact at which the offense has happened thus allowing referees an easy chance at deciding for offence made on the field.

In the research, we have gone through 15 papers talking about Sports Analytical Band with 10 of them being only about Analytics while the remaining talking about Decision making systems or the impact measuring system feature.

INTRODUCTION

NEED FOR SPORTS ANALYTICS

We came across sports analysts, so now we are going to learn what their importance is and what is the importance of data analytics in sports (sports analytics). Consider yourself as a track event athlete, you are going to run in an international event in a few days and your coach is training you very well but according to him, the place you are getting trained, the weather you are in, practicing against people who are getting coached by him and finally has no statistics on the records made by international stars and no information about their current form.

It would take a miracle for you to win but imagine the same practice this way:

Imagine another track athlete under a coach and an analyst, a qualified one who has a lot of statistics and records of the recent track athletic event and tracks statistics and records of the international athletes or your competitors and knows how to keep you fit and knows everything beginning from what diet you should maintain to how much energy you should use for practice, etc.

So, who do you think will win if they both are up against each other? You would be lying if you say the first one is going to win. It is obvious that the second one who has more insights about their upcoming face-off way before they even saw each other would win.

He would have put training according to his opponent according to the weather and external factors which could affect him and overcoming them but in case of absence of an analyst that is the first athlete, would have lost because his coach has trained him according to their track and factors which the athlete has adopted since he began training. I hope the above situation has given a basic introduction to the significance; in easy words, we can define sports analytics as:

Sports analytics are the collection of relevant and historical statistics that can provide a competitive advantage to a team or individual and the individuals who collect the abovementioned statistics are called "SPORTS ANALYSTS"

DECISION-MAKING SYSTEM

Every sport needs a referee and the referee could be wrong as he is also a human especially in contact sports like kabaddi, kho-kho, and tag where the referees can never be 100% right all time because most of the referees cannot see a feather touch which happens most of the times in contact sport and this band could be the possible answer to that problem and various other sports including hockey, football, etc.

This band is not only used in sports but it could also be useful for people to see their pulse rate, steps taken and basically it measures your physical activity.

WHY IS DECISION MAKING SYSTEM IMPORTANT?

We all know sports has 2 results that being a winner and a loser. The aspect is decided by the person who has more experience and knowledge about the sport being played and that person is usually called umpire or a referee.

In contact sports, ex – kabaddi is India's most popular contact sport. We have seen many times that either raider claiming that he has touched the defender or the defender claiming that he has not been touched by the raider and sometimes, the camera could not able to show the contact or the touch or there are no cameras in use there, so how to find out the truth? Usually, umpires' decision would be final but what if the umpire could get to know that the person has the other person with the help of the band which is installed with sensors which can alert the umpire if the raider has touched the defender?

Now let's come to some global sport where their fouls of contact and let's come to our favourite sport of most of us, football. It is well known that it is a foul if we touch a football with our hands, so this product could tell you that you have touched the ball by giving a signal by lighting up after touching the ball with your hand. Since hockey goes with same rules except you cannot touch the ball with your body and the product could do the same which is lighting up when the ball touches body.

REVIEW OF LITERATURE

The market of gambling for IPL has risen exponentially throughout its existence since 2008. This paper investigates various analytical models of understanding the betting odds considered for betting by gamblers. The paper uses models like Naïve Bayes, KNN, Model Forest and some other models and sets to determine a predictive model.

This conceptual paper explores recent changes and activities of the analytical industry of sports in event management perspective. The paper talks about multiple case studies highlighting the requirements for organizing sporting events which are shown using a effects matrix. Analytics in this perspective is about setting of the ticket price to the event.

This paper talks about the wearable devices that could track and store the physical activities of the body during a sporting activity along with its advantages and disadvantages and the product we are researching about comes under this category. This paper describes about the shifting of paradigm in coaching, training, resting and recovery phases . It also showcases minor concerns about

Wearable biosensors have yet to be extensively explored for sports monitoring and analytics, but recent progress in lab-on-a-chip technology has laid a strong groundwork for such devices. An extensive comprehension of the cutting-edge wearable biosensing technologies could result in a notable influence on the expanding area of microfluidics for biosensing.

This article delves into the concept that access to and examination of vast data sets could enhance practice and revolutionize the scientific methods utilized in sports and exercise. The growing integration of information technology and data in sports is propelling this transformation. Pioneering techniques may offer a foundation for more impartial evaluation of coaching methodologies and novel scientific approaches. The emerging field of sports analytics could aid in addressing the obstacles involved in acquiring knowledge and insights from these large data sets. The study concludes that thorough analysis of significant data sets could advance our understanding in the realm of sports and exercise sciences..

The latest developments in wearable sweat sensors that can be placed on the skin enable personalized daily diagnosis and prognosis of diseases using a non-invasive, portable, and continuous monitoring system. These sensors use soft microfluidic technology to provide reliable and accurate quantitative analysis platforms that combine sweat sampling, storage, and different sensing capabilities. To analyze sweat, colorimetric methods such as enzymatic, chemical, or mixed reactions, as well as multiplex measurements of sweat contents, are utilized to diagnose various diseases.

During four matches of elite Australian football (AF), the capability of a wearable micro sensor device to detect tackles and impact events automatically was evaluated. The video observation was used as the benchmark measure. Out of 1510 "tackle" events identified, only 18% of them were confirmed as tackles. The remaining 25% of events were in general play where no contact was visible, and these events had significantly lower peak Player Load™ compared to those involving player contact. The tackle detection algorithm, which was initially designed for rugby, was unsuitable for detecting tackles in AF.

The need for precise methods to monitor shock impacts in real-world environments is evident. This scoping review aimed to provide an outline of the current methods used to evaluate shock impacts using wearable sensor technology in two areas: sports and occupational settings. The studies reviewed showed a lack of agreement regarding sensor placement and the interpretation of results. In the sports setting, the accelerometer was the most commonly utilized sensor type.

A comprehensive investigation of the utilization of micro sensors and associated terminology for evaluating sport-specific movements was carried out through a systematic review. The research involved a meticulous search of six electronic databases, and articles included were restricted to those that utilized athlete-mounted sensors for detecting sports movements, as opposed to sensors mounted on equipment for monitoring general movement patterns. This thorough review illuminated the broad use of micro sensors for detecting sport-specific movements across various individual and team sports. The results indicated diverse purposes, including the detection of movement and movement frequency, identification of movement errors, and assessment of

forces during collisions. However, there was inconsistent evidence on the efficacy of certain movements, such as tackling in rugby union, rugby league, and Australian Rules football.

During four Australian Football League matches, GPS and accelerometer data were gathered from players. The peak GPS and acceleration data were recorded when contact was made. The tackles were classified into three groups based on their intensity: low, medium, and high. The Peak Player Load, which is a modified vector magnitude of tri-axial acceleration, was significantly higher for high (7.5 ± 1.7 au.) and medium (6.1 km h^{-1}) intensity tackles compared to low (5.8 km h^{-1}) intensity tackles.

The use of wearable sensors to automatically detect human activity is now common in both competitive and recreational sports. However, the automatic classification of complex sports involving multiple athletes remains a challenge. In this study, we propose a new method for identifying these multi-player activities in video game sports, using a combination of location and inertial measurements in a set of interaction features. We demonstrate the effectiveness of our system in identifying tackles and scrums in Rugby Sevens, achieving classification accuracy levels of over 97%.

This paper proposes a new measure called the Performance Index, which allows for a comparison of all players in a game, regardless of their role. By combining a labelled historical dataset of player performances with the relevance of each feature based on playstyle, the Performance Index can be calculated for each player in a live match. This metric can be applied not only to esports, as demonstrated in the case study using Dote 2, but also to other team-based sports such as basketball, baseball, and football. The Performance Index has practical applications for professional teams, player analysis, and performance evaluation.

The evaluation of player performance is a complex and multi-faceted task that involves multiple criteria. When it comes to football player transfers, it becomes even more important to assess their performance based on their on-field responsibilities.

Due to various factors that affect player performance such as playing time, injuries, level of competition, strength of opponents, impact of actions in the game, and positions played, raw player performance data is not commonly used in this research field. Moreover, the transfer market has unique financial characteristics, which include transfer fees and player valuation. Elements such as athletic abilities, club facilities, tournaments, and player popularity are considered in determining transfer costs using machine learning. However, modelling transfer fees is a challenging machine learning task due to the wide range of inputs that are data-driven.

The field of Sports Analytics (SA) has gained prominence in the sports industry as most sports teams seek to enhance game plans and performance. To make progress in this area, it is essential to have a comprehensive understanding of the many sports-related operations both on and off the field. This has led to increased collaborations between different athletic programs and organizations with a deeper understanding of the processes involved. Utilizing statistical methodologies to gain a competitive advantage and improve performance outcomes has become essential for many sports-related disciplines. The extensive use of analytical tools in the sporting industry has generated a passionate interest in SA. In general, SA refers to the statistical evaluation of business and athlete performance data in both individual and team sports to assist with talent spotting, player scouting, athlete development, training priorities, team selection, game planning, and injury management.

The aim of this project was to improve the information systems already in place and establish new ones for Legends Sports Leagues, with the goal of enhancing organizational efficiency, offering valuable data analysis, and reducing the workload for human operators. To achieve this objective, the team updated and extended a Microsoft Access database containing previous league information, created interactive dashboards presenting actionable insights to fulfil business requirements, and developed a Natural Language Generating Java program to generate game summaries every week for Legends' three sports.

METHODOLOGY

In this conceptual paper we have gone through 15 Research Papers and various articles related to the topic of our conceptual product or device, where we found the answers for:

1. Is the device practically used in industry?
2. If yes, what is the technology used by them?
3. What is the various application of the device?
4. What are the various ways in which the device could be used in the industry?
5. Why is it important?
6. Can the device be used in every sport?
7. What are the challenges that would be faced by device?

We used the help of Google Scholar where we found research paper, some from renowned Sports Management teaching universities relevant to our device and the research problem which are mentioned above with citation and there were various other articles in Google Search where we found required articles.

FINDINGS

- (i). The conceptual device however is partially used in industry with limited features.
- (ii). There are many companies, including tech giants Apple who have created something very similar to the product or the device we are talking
- (iii). The technology used for the product is very similar from what we had thought could be used those being the accelerometer and GPS technology.
- (iv). There are various ways in which the device could be used in Sports Industry, but in our research, we found out that the device could also be used Fitness Industry
- (v). The device if executed could be used in every sport in whatever means required as the gadget can measure Impact, Touch, and various other required stats.
- (vi). The Decision-making system feature is used in Australian Football League which is a variant of Rugby where impact of Tackle is measures with an electric bands.

The conceptual device which is being discussed above is partially used as mentioned but with very little scope which provides a major opportunity that it could be very impactful when all the features which are discussed among different sports get combined.

CONCLUSION

The findings of the research show how impactful the conceptual device could be if it is introduced in today's world as the band would result in the following things to happen:

- 1) Easy Stat Tracking
- 2) Efficient stat tracking
- 3) Multiple uses
- 4) A band for both professional and for a layman's use

With that we would like to conclude that the multi-sport analytical band is very impactful and has numerous applications if introduced in today's sports Market.

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