Development of a Specialized System for Goalball's Game Tactical Analysis

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Abstract — **Computational Systems, from transactional systems, as discussed in this work, provide information during the departure of any sport. This information will help the technician to decide about the possibilities of reorganization of the team and analyze situations that the team has deficiencies. In this way, it is possible to act in the deficiencies to improve the technical performance and the team's tactical. The study had as objective to present the development of a digital system for the review of game of modality of goalball Paralympic. The information of the scout technician brings the reality of facts and help the coach to modify the staff of the best way to win the game. In some cases, the player who performs a move wonderful, may have committed three or four imperiling errors, an illusion to believe that the player is well in the block. This model of system propitiated an improvement in the understanding of the game by players, aiding in the "feedback" between the technical commission and athletes and helping in the identification of problems that occur with players during drills and games. The financial statements at run time showed that it is possible to analyze the team during the departure. The basic charts generated offer a preview of the results of the team, in real time. Another point considered is volume of information acquired during the time of departure, due to ease of data management. We conclude that the results obtained indicate that the digital system for analyses goalball game is a means needed for the analysis technique and tactics, both individually and collectively, serving as a tool for the preparation of strategies for drills and games and helping in the decision-making process.**

Keywords. System Information; Sports Adapted; Data Analytics; Data Mining.

I. INTRODUCTION

With the constant advancement of information technology, all sectors. try to take the best of what it has to offer. engagement technical decision-making systems have long guaranteed its space among the various global companies and lyricist Said eats standing out in the world of sports [9], [18], [22]. The popularization of mobile phones and tablets makes portability and ease of use are increasingly essential going in the globalized world, with people and businesses that require connection in all moments [5].

Information technology is increasingly used in the areas of health and sports, in more ways different. computer systems, derived from transactional systems, as discussed in this Article, provide information during the game in any sport. This information helps the coach to decide about the

possibilities of reorganization of the team and analyze situations that the team has deficiencies. Thus, it is possible to act on deficiencies to improve the technical performance and the team's tactical.

The clear majority of technical systems of scouts are transactional systems that require more than one operator to capture all information on performance in the departure [24]. The information can be collected after recording the game, confirming the performance of the team through a video [7].

Although many people still consider it a sport where the luck or exploiting the chances are the determinants of the outcome of the games and many coaches to continue using conservative methods in their training, this subjectivity, little by little, has yielded interpretations scientifically substantiated.

The evolution of goalball is characterized by a high requirement physical, technical, nutritional, and psychological, besides the tactical aspect that comes if constituting a decisive factor for the obtaining of success of a team [9]. The current goalball, has gained much more dynamism and requires that the players are in constant displacements, being with or without the ball. This has transformed the preparation specific tactic in an area of growing interest and allocated to digital systems of analyzes of game [24].

Given this fact, this study approached the development of a digital application for review of the game of the modality of goalball.

A. Information systems in sports

Information system "is an organized group of people, hardware, software, communication networks and data capabilities that collect, process and disseminate information in an organization" [21]. The information generated by information systems serve to assist professionals on the decisions to be taken.

The simplest systems based on notes made on paper, by a "trained analyst" frequency of hits and misses of the foundations made by each athlete during the match. The operator can watch the match live (in the stadium or on television) or may be based on recorded images [25]. Although laborious and only can handle a small amount of information at a time, coaches still use the note paper [28]. To COSTA [26] when done in a structured manner, provide relevant information on the performance of athletes and / or team, of course, the paper record can be replaced by electronic means, such as computer, tablet, and smart phone, facilitating the processing of information.

Various types of data, information and knowledge be influencing factors in decision making [22] Second [21] is defined as information "as data that has been converted into a meaningful and useful context for specific end users." The right information at the right time can lead to business executives, technical committees of sports teams and others to make decisions that make them succeed in carrying out their activities.

Quality information it is available timely information for decision and accurately as possible outlet [14] According Balieiro [11] Scout system is a statistical system that monitors a certain team in the fundamentals of volleyball or a certain team (usually the opponent) against the performed plays (attack position in the network, height, and speed of the ball, among others). Systems scout assist in replacement decisions players, survey distribution, position, and direction of the serve over a match. During the training, which helps to define foundations give more focus our attention, what or which players must accomplish specific activities of breeding grounds, among others.

B. The Goalball mode

The goalball and match with two teams with three players each throw balls against each other alternately in order to score goals in the opponent. Despite the different visual classification of athletes, all competing together and blindfolded so that no one is disadvantaged [25].
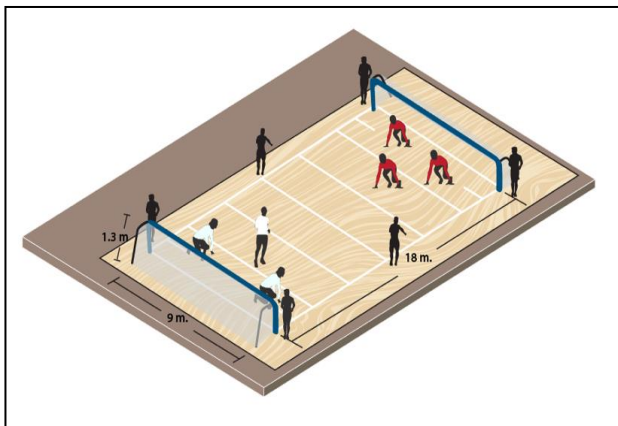

Figure 1.   Court representation and dynamics of a game of goalball.

The defense is held with the three players in the guidance area space lying on the floor to block the ball, also within a boundary area for this action (the area of defense or team). It is only allowed players to affect the defense of balls thrown by opponents with body contact with this area [12]. As the area of defense is the main point of reference for spatial orientation of the players, there are different markings inside differentiating it from other areas, which only have the rectangular external marking [11]. These internal appointments to the team area are references to the positions of players: left wing, right wing and center (or pivot).

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The game space is the same size of a volleyball court (18 meters long and 9 wide). The goals which are in the essential point of each side, measuring 9m wide by 1m30 tall [9]. Each half of the court is divided into three areas of 3 x 9m: area of attack or launch, guide area and the neutral area.

Players cannot invade the half-court opponent and limited by their area of attack, hit the ground ball or bouncing towards the opponent's goal. The rule does not allow the release of high balls and, therefore, the first contact of the ball with the ground after the release of the players must happen obligatorily within your team attack area in the image below we can see the court goalbal with its respective size and sector of the block Adapted from Morato 2012 [13].

Therefore, this work aims to adapt this methodology scout for goalball and development for digital platforms. Based on studies by Morato [2] and Tosim [7] where they have the algorithm sequence to the dynamics of goalball game, in the image below:
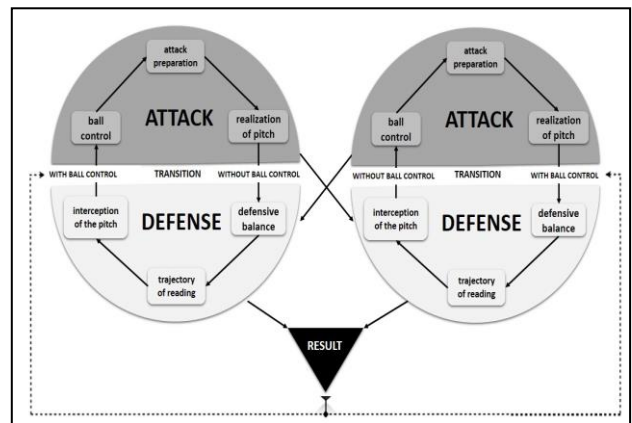

Figure 2.   Sequence of goalball games

For these authors the goalball has the following sequence for the offensive actions and defensive's:

• **Attack:** Ball control; Preparation of the attack and Consummation of the pitch.
• **Defense:** Defensive Balance, reading trajectory of the ball and intercept the pitch.

According Raimann [20], you can divide the scout as Technical and Tactical. This author presents a very typical situation: "Sometimes, a player makes a wonderful play after committing three or four incriminating mistakes.

The coach can be deceiving with the play and find that the player is well on the court "[11]. The information Scout Technical bring the reality of the facts and help the

coach to modify the team in the best way to win the game.

This monitoring system at the end, you can generate a statistical report performance data for each athlete by fundamentals, which in the hands of an appropriate professional can modify the most effective way team, or combine best moves.

C. Game Analys Systems

One of the sports that make more use of technology is fencing. One of the first innovations was the creation of a vest made of metal, which when touched by the sword, which is on the electricity, sends a signal indicating the touch [17]   and as in fencing, taekwondo also usually sensors to detect the touch, this sensor is below the padded vest, used to lessen the impact. The brutality turned into something more technical, with more beauty [3].

In tennis, the technology is already much more advanced, is called the Falcon's Eye, which has a system of cameras around the court strategically to capture, from all angles, the ball [10]. The images are passed from the camera to a central computer and there plays the path of the ball in 3D, where you can see precisely where the ball fell. This system is triggered only when an athlete feels harmed by the referee.

Decisions were more fair, accurate and exciting, helped the credibility of the sport and the product [4]. The simplest systems based on notes made on paper, by a "trained analyst" frequency of hits and misses of the foundations made by each athlete during the match. The operator can watch the match live (in the stadium or on television) or may be based on recorded images [27].

Although laborious and only can handle a small amount of information at a time, coaches still use the note paper [24]. To COSTA [12], when done in a structured manner, provide relevant information on the performance of athletes and / or team, of course, the paper record can be replaced by electronic means, such as computer, tablet and smart phone, facilitating the processing of information.

A very intense form of being in the world is through the possibilities that the vision allows us. Being in the world through the design and recognition of the world around us conflicts with the shapes, colors and primary sensations of being human. This is through the relationships and associations that allow us to converge our sensorimotor actions [19].

The analysis of statistical data collected in goalball (scout), is very important for the coach. From this analysis, the coach can get interesting information on the progress of not only the games but also in training, where athletes can see the scout their shortcomings and successes so that they can have a maximum performance during matches. However, there are few research projects involving scout this mode, which does not yet allow a clear view on the subject.

Currently there are two scout's models used by Brazilian teams of this sport, with forms of more technical collection, which require a certain time for your notes, has the variabilities error and the results are presented in later times.

Therefore, it is necessary to carefully define the criteria / categories and indicators to watch, prepare a knowledgeable and experienced in the analyzed mode

observer and use a proprietary system to record what is observed [5].

The specific literature on game analysis suggests that the game record is held in game context, during the competitions of excellence, to observe the highest level of preparation and sporting provision [27]; [12].

II. PROCEDURES

The organization in modules allowed to be developing all similar functionality together and sorted by optimizing the time schedule. In the first iteration are being developed the basic entries of the system: management team, athletes run games management, types of moves management, user management and the main screen of the system. In the second iteration management logs, main system registry, your data is generated from the speech recognition, standing out as the most important feature of the system. In the third iteration, it was expanded demonstrations of the data generated by the system and were carried out field tests.

IOS operating system was built based on the concept of direct manipulation, using multi-touch gestures. Interaction with the OS includes gestures like just touch the screen, slide your finger, and the movement of "tweezers" used to enlarge or reduce the image. Some applications use internal accelerometers to respond to shaking device (commonly resulting in the undo command) or rotating it (commonly resulting in change from portrait to landscape mode). IOS consists of four abstraction layers: The Core OS layer, the Core Services layer, the Media layer, and the Cocoa Touch layer.

In IOS, each application triggers a new process in the operating system, with the possibility of multiple application processes to run concurrently. The set of tools that enable the development of applications for iOS called iOS SDK (development kit for iOS). According Lecheta [17], this SDK can be used in various development environments, including Eclipse, which is an integrated development environment (IDE) open source, widely used for application development in Java programming languages, PHP C / C ++, among other more [12]. The IOS Tols Development (RTD) is a plugin that serves to integrate the emulator to the Eclipse IDE, providing facilities development. RTD maximizes Eclipse features so that you can configure new Apple projects, create an application interface, add components, debug your applications using the iOS SDK tools.

In order to test the developed application, we used the emulator that allows installation and execution of applications that could be installed on the development computer, for example. [3] The menus used by the mobile device or tablet work the same way in the emulator, which also enables the use of the Internet. This emulator is contained in the SDK IOS. According stated in Lecheta [5], IOS is integrated with the database SQLite, which facilitates the use of the database in the developed applications. Thus, it is projected a database to SQLite.

To develop this system, we used the ICONIX software development methodology, for prototyping and be oriented to be more suitable for low-5-sized systems (functional and structural), as in this proposal. Designed by ICONIX Software Engineering, the ICONIX is a simple and practical software development process, but is a powerful methodology accompanied by a component

analysis and representation of sound and effective problems. [4]

The ICONIX process works from the development of use case diagrams based on requirements gathering according to the interface. The listed functional requirements were registering player by his name; registering games to date information and numbers of players (shirt); registering the foundations made by players in the game, ie the history of the game. Each ground follow or follows a sequence of button presses; generate reports, corresponding reporting relating to players, total withdrawals, attacks or blocks, the amount of correct answers of each foundation, the total errors in a game or match. And the non-functional requirements identified were generating sets of backups; validating point, which corresponds to a number of reasons over a departure point is not possible to collect information from a given foundation.

III. RESULTS

Briefly, a goal in a game of goalball, starts with a pitch (where the player positioned in your area orientation, makes a pitch to which position of the opponent's court and what the outcome of the plea). Then, the blocking movement arises (who performed and what its effect). That done, you can repeat these actions occur to the goal, which is precisely when the hit occurs in offensive action and the failure to defensive action [16]. The figure and table below shows the sequence to yield Government Analyst used by the study team:
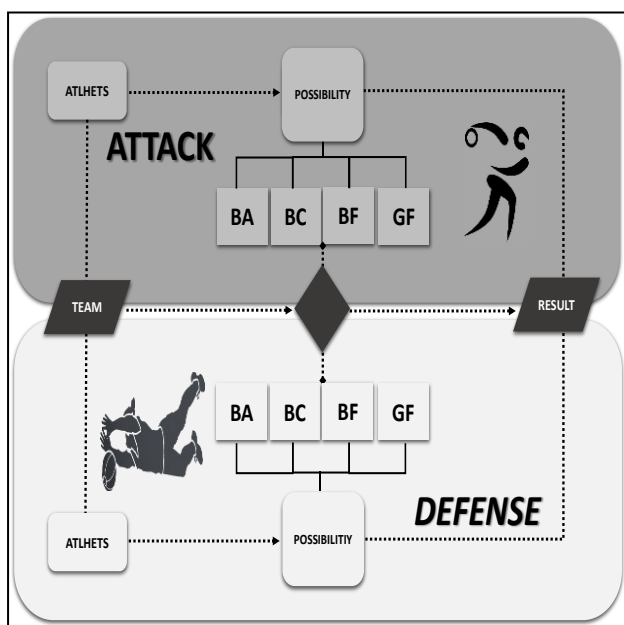

Figure 3.   Sequence for income analysis

Based on the raised requirements, an application was developed with the distinction of being mobile, in which it considered the versatility and usability of the system as the buttons and other input mechanisms, thus improving the fundamentals record time along a move.

Thus, the work has the positive factors mobility and usability. Once the data collection can be performed in the stands through easily accessible buttons on a touch screen, as in the work developed by Raimann [9] and

Niderauer [11] data entry is complex for the conditions of a game goalball, as they are via keyboard and command line.

This scout model provided an improved understanding of the game by players, helping the "feedback" between the coaching staff and athletes and contributing to the identification of problems that occur with players during practices and games.

The run-time demonstrations showed that it is possible to analyze the team during the match. The results generated provide a preview of the team's results in real time. Another point considered is the volume of information acquired during the start of the period due to ease of data management.

IV. CONCLUSION

With this study, we understand the importance of a digital application for the modality of goalball adapted sport, being possible to highlight the positive and negative points of the athletes in game situation, potentiating its performance in sports and aiding in decision-making on the part of the athletes and the technical commission.

The graphs generated offered a preview of the results of the team in real time and the volume of information acquired during the making of the game space, was very significant because of the ease of entry and of data management.

Thus, we conclude that the results obtained indicate that the digital system for anallise goalball game is a means needed for the analysis technique and tactics, both individually and collectively, serving as a tool for the preparation of strategies for drills and games and helping in the decision-making process.

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