

An Android Application for Real-time Referee Observers

Gregorio Bernabé and Javier Cuenca

Computer Engineering, University of Murcia, Murcia, Spain

Keywords: Mobile Applications, Football Match, Observer, Referees, Real-Time.

Abstract: Football matches are consolidated as the events with the greatest number of followers in the world. These matches are managed by a group of referees. An observer evaluates the referees by watching the match in the stadium and making notes about important determinations, including the main right and wrong decisions. We present an Android application for mobile devices to facilitate the task of the observer, allowing the observer to pay attention to the game and partially automating the report on referees.

1 INTRODUCTION

The global mobile application market is growing constantly. The market is dominated by Android (Google, 2015) and Apple (Apple, 2015). One explanation for this growth is that mobile devices are almost always with their users, have continuous wireless connectivity, and feature increasingly capable user interfaces. Thus they can serve as ubiquitous input devices and sensors for user reactions, emotional responses, and opinions at large public events.

Nowadays, huge numbers football matches are played all around the world, managed by a referee helped by two assistant referees and a fourth official (Vogt, 2010) (MacMahon et al., 2014). The complex work of the referees is evaluated by an expert in real-time, following the match in the stadium and making notes about the different situations and times. Once the match is finished, the referee observer quickly analyses the performance with the referees in a suitably quiet place. During the analysis, the observer mentions the positive and negative points and writes them in a report. After the match, the referee observer completes a full report for the referee, the two assistant referees and the fourth official. The format of the most extended report in Europe is designed by UEFA (3rd Team, 2014). For the referee, the observer has to mention different sections, like the application and interpretation of the Laws of the Game (FIFA, 2015), disciplinary control, personality, cooperation with the assistant referees and the fourth official, physical fitness, general comments and advice on performance and personality, and a summary with the referee's strong points and main keys for im-

provement. The assistant referees' performance must be included in the report mentioning some important decisions including times. Furthermore, general comments on the fourth official must be added.

Currently, in a match the notes are made with pen and paper, so observers spend a lot of time not paying attention to the game or referees. The observer has a watch to control the time, and for each note the time is registered, as are the originator, and possibly a description of the action. After the match, the observer has to make a quick summary to talk through with the referees, and some details or important decisions may be forgotten if the incidents are not clearly annotated. Moreover, the observer spends a long time on preparing the report.

In this work, we present an application to facilitate and partially automatize the observer's report of a soccer referee. This Android (Google, 2015) application allows observers to take notes while keeping their eyes on the match. There are several typical situations or events in a match (foul, goal, penalty, yellow or red card, substitution, offside, etc) that can be stored automatically by the app with inclusion of the minute, the second, and the originator of the situation. The notes are sorted automatically, so facilitating the observer's task when analysing the match with the referees. Moreover, if there is a video of the full match stored in a particular server, the app will automatically send the different minutes and seconds of the situations signalled, and the referees and the observer receive the video sequences edited in order to see the main right and wrong decisions. Finally, the organized notes facilitate the preparation of the report on referees.

The rest of the paper is organized as follows. Section 2 describes the design of the application. An experience on the use of the application is shown in section 3. Finally, section 4 summarizes the work, concludes the paper and introduces future work.

2 APPLICATION DESIGN

The design criteria include simplicity, so the observer can focus the attention on the match, and short-term usage, because the situations arise quickly and interaction might involve stating opinions about the current event. This gives the observer the opportunity to observe quickly past events in the match, thus forming a partial analysis of the performances of referees.

The app is structured in two displays. In the first, the observer inserts the names of the teams, the date and the time. The second allows the user to store different events of the match related to the referees, as we can observe in Figure 1. On the upper left of this display, the time of the match is controlled by an Android chronometer with one button to start the count of each part and a second button to stop the time. A switch is used to select between the first and the second part. In the centre, the observer can include decisions of the main referee (for example fouls of each team (*Falta*), yellow or red card for a player (*TA* or *TR*) and the goals (*Gol*)) just by touching a button for each situation. Moreover, other specific actions of the referee can be selected by particular buttons, as for example advantage (*Ven*), acceleration (*Ace*) and positioning (*Pos*). For each assistant referee, there are three buttons to save their main activities, such as an offside (*FJ*), to allow the game to continue because a player is not in an offside position and is in line with the second opponent (*No*), and a foul near his zone (*Fal*). All events can be stored with additional descriptions or comments, inserted by the observer using an Android *EditText*. Moreover, all the actions are saved including the exact instant of the match (minute and second of each half) plus the player involved. On the lower left of the display, there is a zone to save substitutions in both teams (*Cambio*). In the right part, the events are displayed, automatically sorted by goals, yellow and red cards, substitutions, fouls, advantage, positioning, and other events and actions of assistant referee 1 and 2. Statistical data are received by the app from a server. These data include the average number of fouls, yellow and red cards, goals and penalties per match for each team. We have used the default *http* client from the *org.apache.http* package to implement the client-server communication in Android. This part allows the observer to see a sum-

mary of the main decisions of the referees and the behaviour of both teams compared with averages of other matches in one season. The observer can mark an event, and if the file with the video of the match is available in a particular server, the application will automatically send the different events and the video sequences are chopped. The data will then be processed by a script on the server. Finally, the observer and the referees will receive several pieces of video in order to analyse the main right and wrong decisions in the match.

A further important issue of the application is energy consumption. Usually, a Samsung Galaxy Tab 10.1 (Samsung, 2015) that is fully charged at the start of the game has a battery level of about 92% at the end of the game if the video of the match is available, taking into account that between two and five video sequences are considered per match. This low power consumption assures to the observer a high level of mobility and independence.

3 EXPERIENCE

The first experience of using the application was with a group of 30 observers of referees, in Murcia (Spain). All observers used the app to follow live one match. After that, they were asked to answer a questionnaire regarding their level of satisfaction in relation to the functionality, simplicity, interactivity, usability, registered information and free comments or suggestions about their experience. All observers reported that the app allows a better monitoring of the referees' task in real-time because observers keep their eyes on the game and the decisions of referees. Furthermore, the analysis of the match with the referees is easier and referees receive real-time feedback. Moreover, the observer can complete the report quickly, because the app organizes the notes. The additional property of the selection of the main events of the game allows the referees to observe their right and wrong decisions, improves referees' knowledge for the next match and clarifies the performances, so facilitating their inclusion in the report.

4 CONCLUSIONS

We have proposed the first Android application to facilitate and partially automatize the observer's report of soccer referees. The app allows observers to make notes, without losing right of the actions and to store the minute, the second and the originator of a typical situation with a simple touch on a button. Typical



Figure 1: Display to store different events of the match related to the referees.

events in a match, like fouls, goals, penalties, yellow or red cards, substitutions, offsides, etc, can be automatically stored and organized to facilitate a fast analysis of performances of the referees by the observer. Important decisions can be marked by the observer to automatically obtain the desired video sequences. These properties allow observers to carry out the report on referees more quickly.

Experiences show the app helps observers to keep these attention on the match, and the different events are stored and organized automatically, which simplifies the meeting with the referees and the preparation of the report.

Currently, the app is being tested by a group of observers to suggest modifications and improvements. After this phase, the proposed app will be made freely downloadable from the Android Market, with monthly updates containing bug fixes and new features.

We are developing a new property based on the use of the referee's GPS. The app receives the positions and the distance travelled by the referee in a match, so allowing observers to have a clear idea about positioning and to advise on possible improvements. The proposed app could be generalized for other observers or referees of sports like indoor soccer, basketball or handball.

ACKNOWLEDGEMENTS

This work was supported by the Spanish MINECO, as well as European Commission FEDER funds, under grant TIN2012-38341-C04-03. We are grateful to the reviewers for their valuable comments.

REFERENCES

- 3rd Team, T. (2014). *Blog About International Football Refereeing specialized in UEFA*. <http://footballrefereeing.blogspot.com.es/2013/08/referee-observers-reports.html#.VTYpzmK2lh>.
- Apple (2015). *Apple Home Page*. <http://www.apple.com/>.
- FIFA (2015). *Laws of the Game*. <http://www.fifa.com/development/education-and-technical/referees/laws-of-the-game.html>.
- Google (2015). *Android Home Page*. <http://www.android.com>.
- MacMahon, C., Plessner, H., Pizzera, A., Oudejans, R., Raab, M., and Mascarenhas, D. (2014). *Sports Officials and Officiating. Science and Practice*.
- Samsung (2015). *Samsung Galaxy Tab 10.1 Specifications*. <http://www.samsung.com/global/microsite-galaxytab/10.1/spec.html>.
- Vogt, R. (2010). *Preventive Officiating: How a Referee Avoids Trouble on the Soccer Field*.