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The Video Database for Teaching and Learning in Football Refereeing

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***Abstract*—**The following paper describes the video database tool used by the Fédération Internationale de Football Association (FIFA) as part of the research project developed in collaboration with the Carlos III University of Madrid. The database project began in 2012, with the aim of creating an educational tool for the training of instructors, referees and assistant referees, and it has been used in all FUTURO III courses since 2013. The platform now contains 3,135 video clips of different match situations from FIFA competitions. It has 1,835 users (FIFA instructors, referees and assistant referees). In this work, the main features of the database are described, such as the use of a search tool and the creation of multimedia presentations and video quizzes. The database has been developed in MySQL, ActionScript, Ruby on Rails and HTML. This tool has been rated by users as "very good" in all courses, which prompt us to introduce it as an ideal tool for any other sport that requires the use of video analysis.

***Keywords*—**Video database, FIFA, refereeing, e-learning.

I. Introduction

THE use of video databases for teacher education is not something new. There are several experiences that have introduced the video database in training. One of the earlier experiences is the one promoted by the Centre of Learning, Teaching and Technology at the Hong Kong Institute of Education, which designed a video database in 2003 to store all Institute-produced instructional videos for retrieval and sharing [1]. Throughout the years e-learning systems have kept the pace with technology, following the direction of Cloud computing [2], [3]. Cloud computing creates virtualized resources that can be made available to users. Users do not require any specific knowledge about the concept of this technology to connect their devices to the server where applications have been installed and use them. Users can communicate via the Internet with remote servers, and these servers exchange their computing slots themselves [4]. As far as teaching and learning environments are concerned, the application of Cloud computing not only relieves the educational institutions from the difficulties of managing complex IT infrastructure and maintenance activities, but also leads to huge cost savings and allows educational institutions concentrate on their core activities of teaching and research [5].

In FIFA referee training, video has been a very important teaching material. It started to be used with the arrival of the electromagnetic videotapes. In 2004, FIFA approved the RAP (Refereeing Assistance Programme) and since then, FIFA has driven the development of teaching materials for referees that use video as the main visual element.

Interactivity options in video have been incorporated thanks to technological advances in multimedia design tools, the expansion of the Internet and improvements in programming languages.

Initially, in the first teaching materials, interactivity options were very simple, practically limited to the possibilities of selection of menu options to access DVD units.

In 2006, we began to work the concept of learning materials with interactive video [6] and the first visual designs for the Interactive Laws of the Game were created [7].

In 2010, a new multimedia interface was developed. It included its own player with video test and video analysis affordances, such as slow motion in clips and the possibility to show all metadata for each video [8]. Several experiences have proved the suitability of slow motion display and external data in order to contextualize and add value to the videos [9].

Over several years, we generated a huge amount of video clips that are stored on DVDs and internal and external hard drives. All metadata was stored in XML files, along with information associated with each clip: kind of foul, reasons, etc.

In 2012, we began to collect all the metadata and upload it to an online database with the aim of finding them by topics and using them as learning objects. Learning objects are conceived as effective and efficient means for providing virtual content that could be re-used and shared. Learning objects make learning resources shareable and reusable [10].

Thus, the first model of the CloudLab database began to be used in technical refereeing courses among FIFA instructors.

II. Design of the Database

A. Database Modules

Search tool. It is the window where the search of clips is allowed. Fig. 1 shows it incorporates several options to refine the search: tournaments, topics, decisions, etc.

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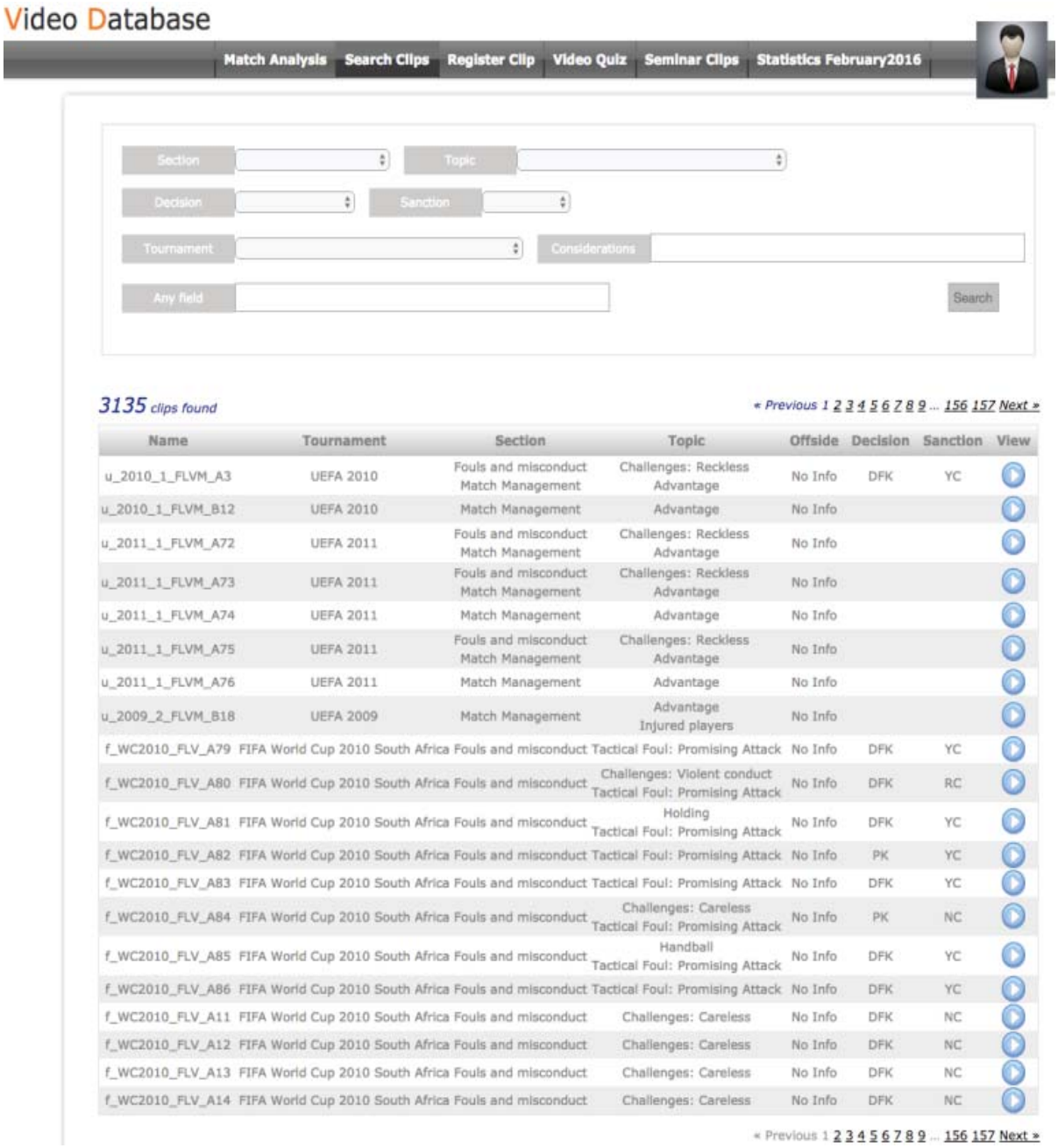


Fig. 1 CloudLab's search tool

Presentation Creator. This option allows users to create a presentation from existing clips in the database, as in Fig. 2. Users can include the title of the presentation and download the presentation with videos in high resolution and in a custom template. The download system is synchronized with the users' Dropbox account.

Creator of evaluation activities. Fig. 3 shows this module, where the instructor can generate different learning and assessment activities, such as the Video Test.

B. Users and Profiles

The CloudLab platform has six profiles: assistants, referees, national trainer, FIFA instructor, coordinator and administrator.

The FIFA referees and assistant referees have access to the video search module to perform video tests online and check their results. National instructors can also create and download presentations. The FIFA instructors can develop evaluation activities. There is also the coordinator profile, which can also assign activities to different users and access the results of several instructors. Finally, the administrator profile has access to all modules and can manage certain additional monitoring functions within each module.

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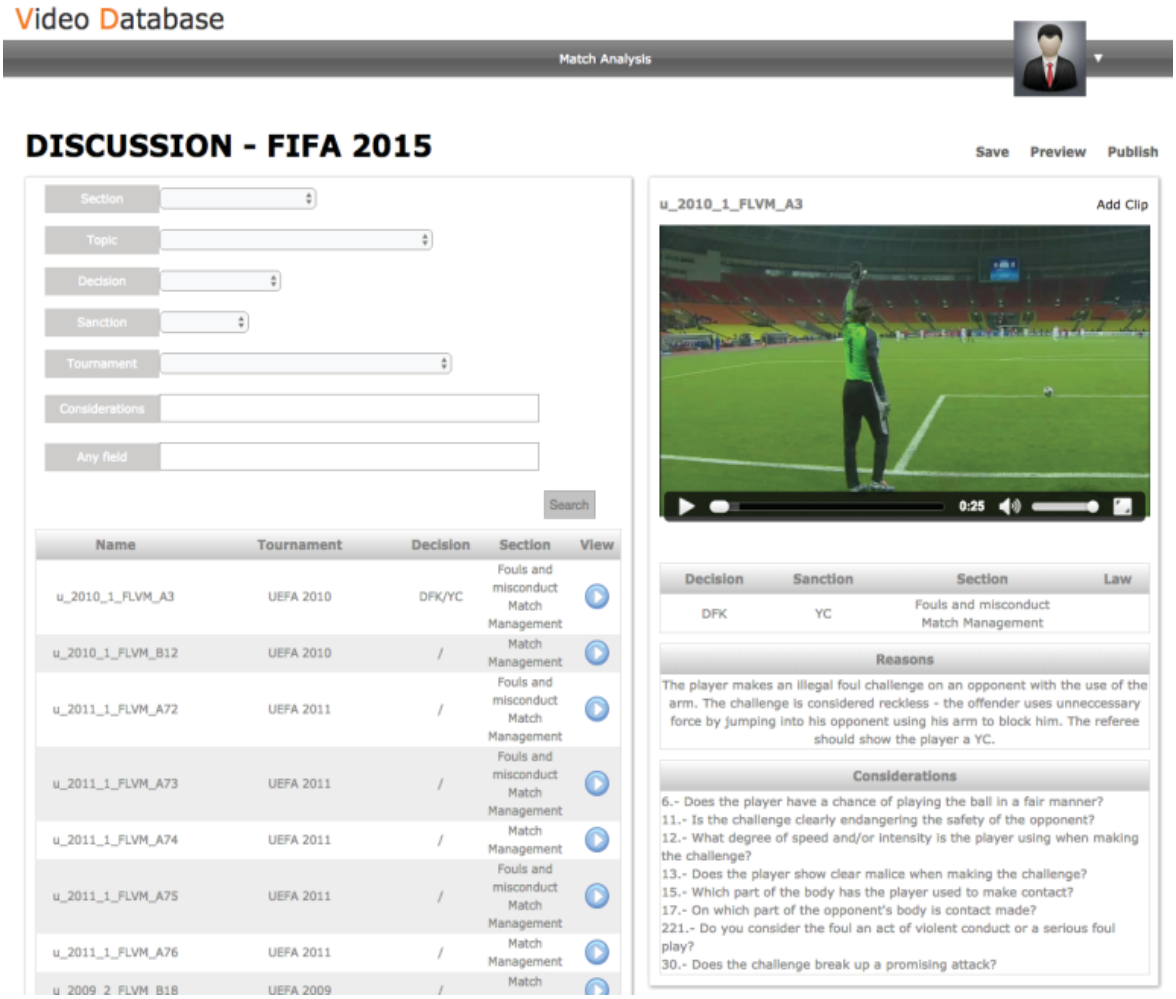


Fig. 2 Screenshot from the presentation's selection of clips process

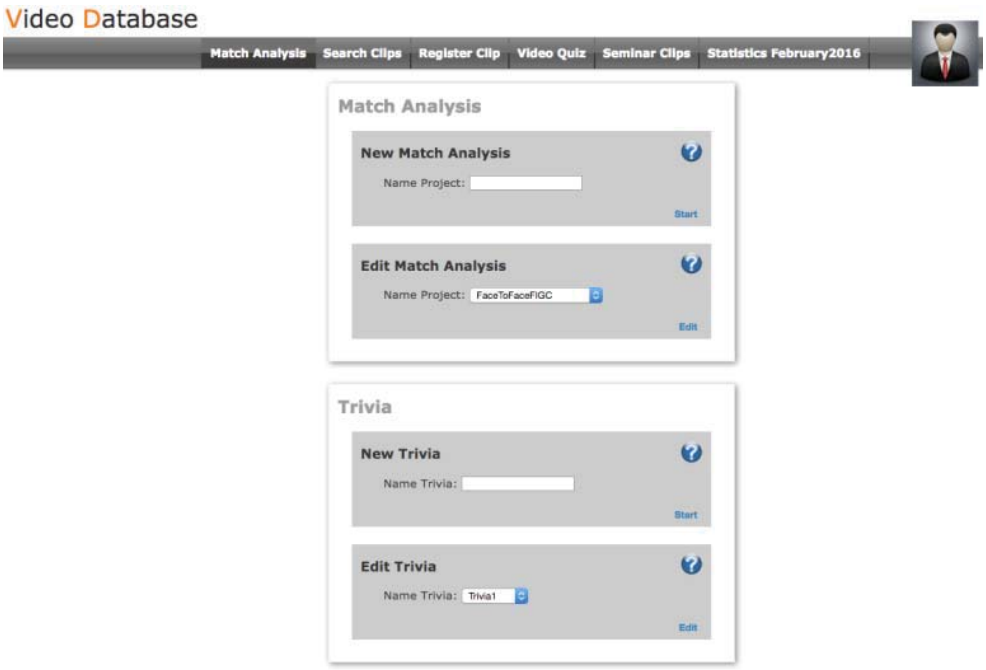


Fig. 3 CloudLab's evaluation activities creator

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C. Use of Database in Courses

The database was firstly introduced in 2013 in a FUTURO III Seminar for FIFA technical instructors, held in Zurich (Switzerland). Since then the database has been used in FIFA FUTURO III courses and FIFA RAP courses. These courses are three-four days long, and they are structured in different sessions that cover the analysis of new refereeing situations and the use of new methodologies and technologies in refereeing teaching and learning.

Previously to each course, the coordinator registers all the participants in the system. As part of the course, there is a session focused on the use of the video database. In this session, a demonstration about the database's functionalities takes place, while the participants follow the demonstration using the database in their own computers. They are prompted to perform three main activities: video search, creation of presentations and elaboration of video tests for referees and assistant referees. Also, at the end of the session, each instructor is asked to create a presentation about a specific topic, which will be presented by him/her in another session.

FIFA instructors are later responsible in their regional courses to follow the same teaching methodology, which means they will use the database to teach regional instructors to create presentations and video tests for their referees and assistant referees.

D. Use of Technology

The platform is based on an object-oriented programming language that uses the MVC (Model-View-Controller) architecture. This development environment, known as Ruby on Rails, easily enables communication between the web application and the database. Fig. 4 summarizes this technology.

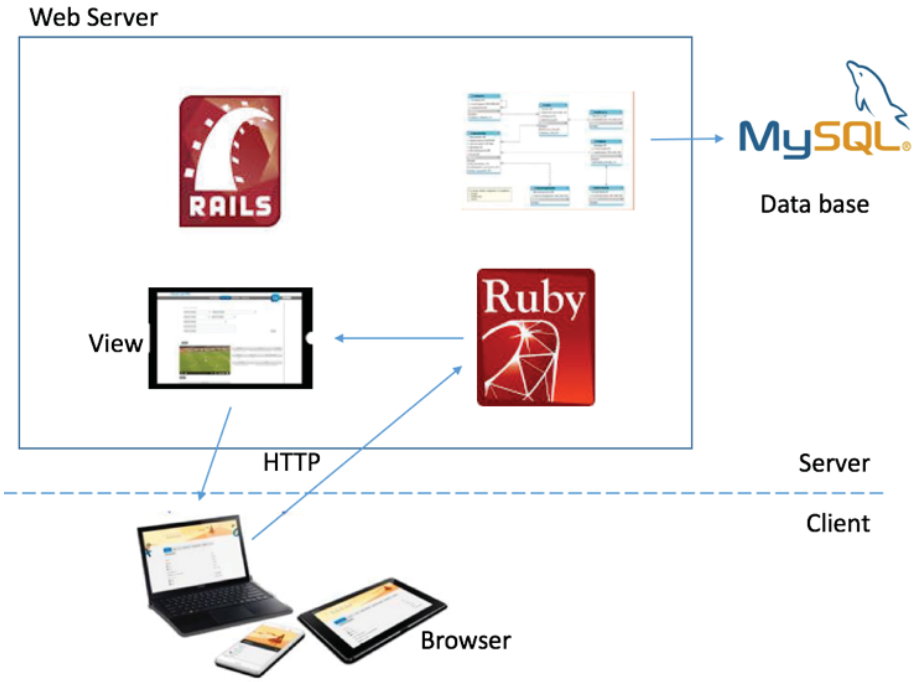


Fig. 4 Model-View-Controller scheme

The system has a client / server architecture. It consists of the following elements:

1. Database

It is responsible for handling user requests (an Apache server is used). It also stores the system information, namely MySQL and tables that meet a set of standards that can store information and make it accessible from anywhere.

2. Client

It is responsible for interacting with the system, sending requests and receiving results from the server. These tasks are performed through web browsers such as Firefox or Chrome.

Ruby is the language used to manage customer requests. It is a language created by Yukihiro "Matz" and it works as a "bridge" between the database and the displays or templates where the user sees the information.

3. Multimedia Presentation: Flash

Finally, multimedia presentations are made in Adobe Flash with ActionScript programming language, which can integrate animations, videos, images and texts with innovative designs, as in Fig. 5. These presentations allow to seamlessly integrate the information stored in the database through XML files, markup language developed by the World Wide Web Consortium and used to store data in a readable form. They can be played offline from any Mac or PC, with a maximum efficiency in the use of slow motion video in high resolution.



Fig. 5 Example of a multimedia presentation

III. Results and Discussion

Since 2013, the database has been used in more than 744 courses in the FIFA Refereeing Assistant Program and currently has 3,135 clips, from 38 tournaments held by FIFA, UEFA, CAF and CONCACAF for the last six years.

The platform has 1,835 users (489 referees, 231 referee assistants, 1,055 national instructors, 44 FIFA instructors, 14 coordinators and two administrators).

A. Kind of Presentations

One of the most important utilities of the database is allowing users to create their own presentations. "Fouls and Misconduct," "Offside" and "Positioning" are the more popular topics chosen by instructors in their presentations.

B. User Experience

After each course, the FIFA coordinator sends participants a user experience questionnaire to evaluate the course, stressing the importance of the positive and negative points of all sessions.

The following responses have been obtained from the comments about the use of the database as teaching material in seminars. The most representative answers have been chosen from 15 questionnaires randomly selected among a set of 60.

The design of the questionnaire was prepared by FIFA and it consisted of open questions about the positive and negative points of the course about the technological innovation and quality of the teaching materials. In general, they give a very positive feedback, using several adjectives related to the quality and usability of the tool:

- "Innovative and creative new teaching materials were introduced. Congratulations".
- "Very good quality teaching materials, (…)".
- "Very excited by the new initiatives of Teaching Material (very interactive, and stimulates discussion by participants)".
- "Fantastic learning tool with the online database labhipermedia and filezilla – looking forward so much to working with it".
- "The course was simply spectacular, clear precise and innovative. It opened one window more to technology aimed at improving instruction and teaching of the laws of the game" (El curso sencillamente espectacular, claro preciso e innovador, nos abrió una ventana mas a la tecnología encaminada a mejorar la instrucción y la enseñanza de las reglas de juego).
- "The option of access to the web is very good, it is a shame that the access is only for one person" (La opción del acceso a la web es muy buena, lastima que solo sea para el acceso de una persona).
- "The highlight was undoubtedly the new multimedia material. Innovative, motivating, simple, facilitator of learning, the prize is in the richness of these programs and the facilities it provides" (Lo más destacado fue sin duda, el nuevo material multimedia. Innovador, motivante, sencillo, facilitador del aprendizaje, el premio está en la riqueza de estos programas y las facilidades que presta).
- "The new technological tool provided in the course, to edit our own DVD and video test, will be very valuable" (La nueva herramienta tecnológica brindada en el curso para, poder editar nuestros propios ¨DVD¨ y ¨Video Test¨, será muy valiosa).
- "The methodology and tools were very innovative" (La metodología y las herramientas fueron muy innovadoras).
- "The new tools presented, both from methodological and technological sides, were excellent" (Las nuevas herramientas expuestas, tanto en el área metodológica como tecnológica, fueron excelentes).

Users highlight the usefulness of the tool to encourage participation and share knowledge.

- "It is an ideal tool to develop the work with new generations of referees, desirous of knowledge new technologies (…) the most important part on this is that

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the technical instructors have to share the material with other instructors in the MA".

- "The technological tool has the advantage of awakening the interest of the participation of referees (…) The option to have teaching materials in the web using a personal password, is a good opportunity to revise and to be updated with the different visual information given by FIFA" (La opción de contar con material didáctico desde la web usando un código personal, es una buena oportunidad de revision y de estar actualizado con la diferente información visual dada por FIFA).

IV. Conclusion

In this paper, the user acceptance of the CloudLab video database has been tested. The video platform has 3,135 clips, 1,835 users and it has been used in 744 refereeing assistant courses organized by FIFA and its confederations. Among the conclusions reached about the use of the video database, the very positive feedback regarding the usefulness, innovation and quality must be highlighted.

Regarding usability, users have assessed the database as a valuable, simple and easy to use teaching and learning tool. With regard to innovation, the most valued feature was the possibility to facilitate collaborative learning. Finally, with respect to quality, it was described as spectacular and highly innovative. Given this positive feedback in user experiences, it is proposed to transfer this experience to other sports where the videos are used for analysis activities.

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