

An Intuitive User Interface for Visual Sports Coaching

Damien Connaghan
CLARITY: Centre for Sensor
Web Technologies
Dublin City University
Dublin 9, Ireland
connagha@eeng.dcu.ie

Noel E. O'Connor
CLARITY: Centre for Sensor
Web Technologies
Dublin City University
Dublin 9, Ireland
oconnorn@eeng.dcu.ie

ABSTRACT

This paper describes a dynamic multi-video user interface for sports coaching. It is intended that sports coaches could use this split screen to minimise and maximise multiple video streams of an athlete on one side of the split screen, while playing an additional video source on the other side of the split screen, such as a clip from a professional athlete. This split screen approach allows users to contrast movements in the athletes videos, with that of a professional. Users can also avail of the ability to use video overlays, text input and can also use screen capture technology to record the application display, so that an athlete can review a coaching session at later date.

1. INTRODUCTION

There is an increasing use of digital media in application areas such as sports fitness and sports coaching. As a result of developments in multimedia technologies, the prospect of broad and ubiquitous use of multimedia provides the perfect foundation to propel sports training techniques and ultimately, this can be the difference between winning and losing. Embracing technology need not be a financially expensive exercise, as the low-cost camera infrastructure in Tennis Ireland has proven [2], but harnessing the knowledge gathered and providing the framework for sports coaches to convey meaningful information to an athlete is paramount to success.

The split screen interface we have designed provides the ideal framework for sports coaches to teach a sports athlete. The system allows coaches to browse through captured videos which are displayed on the left side of the screen divider. The system also has the ability to playback additional videos on the right side of the screen divider, which coaches can use for the purpose of comparison with their own athlete.

2. SPORTS COACHING SPLIT SCREEN

The Sports Coaching Split Screen has been bred out of requirements from tennis coaches in Tennis Ireland [3], who collaborate with our research group. Previous work with the tennis coaches has resulted in a variety of systems which make the daily coaching operations easier, such as the TennisSense system [2].

Given that we have previously installed a system for capturing multiple video streams at one of the courts in Tennis Ireland, coaches have been amassing a large volume of video data, which they use for training athletes. A requirement was made however, that a more user friendly interface be developed which can allow the coach to primarily playback the captured videos, with the option to draw and write text over the videos to help convey feedback to an athlete. It was required that all actions on the application could be recorded so that it can be reviewed by the athlete at a later date.

Recognising Ben Shneiderman's [4] principle of 'diversity of users', which takes into account such factors as differences in users' experience, we note that the Sports Coaching Split Screen can be used offline or online by coaches and athletes alike.

3. USER INTERACTION

The following sections describe the various controls on the interface and how the user may interact with them.

3.1 Video Selection using Date Picker

To select a captured video from a specific date, the user can select the relevant date from the date picker, located top-left on Figure 1. When a specific day is selected, the user can then select which camera angles they wish to view as described in Section 3.4.

Users may browse through all captured videos for the selected day in the tabbed panel. There are two approaches to navigating the captured videos in the tabbed panel, Full Recordings (Section 3.2) and Tagged Events (Section 3.3). In order to select the relevant navigation choice the user must decide if he/she wishes to view the full session recordings or if they would like to select tagged events within the full recording.

3.2 Full Recordings

Each recording from a specified day will have one entry in the Full Recordings tab, represented by the time the recording began. A user may simply double click on the selected item to play.

3.3 Tagged Events

In previous work, we developed a court side mobile application. This application provides users with the functionality to start and stop a recording and perhaps more importantly, to tag interesting events whilst recording. Users can define interesting events prior to recording, such as a "double fault". Then when the event occurs the user simply hits the relevant event button to capture the time the event occurred. This data is then read into the Tagged Events tab on Sports Coaching Split Screen. Events are grouped by event name and listed by the time the event occurs in the recording. To select an event the user can double click on the event.



Figure 1: Sports Coaching Split Screen

3.4 Multi-Camera Selection

The Sports Coaching Split Screen has an option of selecting a maximum of two cameras, when used with the TennisSense infrastructure [3], there are eight cameras positioned around the court. After consulting with sports coaches in Tennis Ireland [3], we identified that simultaneously playing more than two cameras whilst coaching was unnecessary. It should also be noted that displaying multiple video streams simultaneously can result in a degradation in application performance, so it is important to use video streams sparingly.

3.5 Playback Functions

There are two sliders below the navigation tab which control the playback of all training videos currently playing. The first slider allows coaches to scroll through the video to a desired time and the second slider controls the playback speed, which when slid to the left fully, will pause the training videos. Likewise the sliders in the professional video panel controls the professional videos, which are positioned right of the video divider.

3.6 Video Overlay and Divider

The video divider allows the coach to minimise or maximise a video by dragging the divider left or right. The coach can also draw over the videos while they are playing to aid illustration.

3.7 Text capture

A text box is used to input text. Given that an athlete may watch a previous screen capture (Section 3.8) of the Sports Coaching Screen Splitter sessions before a competition game in a crowded court or pitch using a laptop, text provides the perfect medium to convey additional information as it is possible that the athlete might not hear any audio in a crowded and noisy arena.

3.8 Recording with Screen Capture

Using existing screen capture technology [1] a user can record every visible screen movement which occurs within the application. The recordings can be played back using standard media players and are easily transported to another computer.

4. CONCLUSIONS

The Sports Coach Split-Screen provides a user friendly method for coaches to train athletes and uses advanced multimedia techniques to help visualise actions and points of interest. Although this is the first version of the system we are already planning new features which will enhance the application. One such addition is an additional button on the application, which will activate the screen capture recordings. Currently this is only possible by using an external screen capture application.

5. ADDITIONAL AUTHORS

6. REFERENCES

- [1] M. E. Encoder. <http://www.microsoft.com/expression/>.
- [2] D. C. et. al. A sensing platform for physiological and contextual feedback to tennis athletes. In *BSN*, pages 224 – 229, 2009.
- [3] T. Ireland. <http://www.tennisireland.ie>.
- [4] B. Shneiderman and C. Plaisant. *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Pearson Addison-Wesley, Upper Saddle River, NJ, 5. edition, 2009.