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Lince: multiplatform sport analysis software

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Abstract

The present paper describes a new multiplatform software application, LINCE, whose versatility makes it ideally suited to the analysis of sports performance. LINCE (see Figure 1) can be used to observe any episode of physical activity or sport since it has been constructed as a software package that automates the functions of: the design of observational systems, video recording, the calculation of data quality and the presentation of results which can be exported in various formats (THEME, GSEQ, EXCEL and SAS). The application overcomes some of the traditional problems faced in relation to the registration and computation of observational data in the field of physical activity and sports sciences.

Keywords: Computation; Observable behaviors; Sport observation

1. Observational methods applied to sporting contexts

Observational methods are scientific procedures that reveal the occurrence of perceivable behaviours, allowing them to be formally recorded and quantified (Anguera *et al*. 2001). They also enable analysis of the relationships between these behaviours, such as sequentiality, association and covariation. Research has shown that observational methods are the best way of revealing relationships and behaviours in relation to motor practices and the dynamics of play in team sports (Jonsson *et al*., 2006; Castañer *et al*., 2009; Fernández, Camerino, Anguera & Jonsson, 2009; Camerino *et al*., 2011).

More recently, sports performance has been considered as a dynamical system (Davids, Button & Bennett, 2008; Renshaw, Davids & Savelsbergh, 2010), and attempts have been made to apply concepts from dynamical systems theory to the study of emergent game structures and tactical patterns in team sport (McGarry, Anderson, Wallace, Hughes & Franks, 2002). If one accepts the argument that sport performance consists of a complex series of interrelationships between a vast array of performance variables, then simple frequency data can only ever provide a relatively superficial view of performance.

The present paper describes the new free software application LINCE v.1.1, which enables the observational recording and analysis of sport actions. LINCE has been designed to facilitate the systematic observation of sport and motor practices in any situation or habitual context in which behaviour is spontaneous.

2. Characteristics of LINCE

It is easy to use and integrates a wide range of necessary functions: coding, recording, calculation of data quality and the analysis of information in specific formats, thereby enabling it to be directly exported to several applications already used in observational data analysis.

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2.1. Installation in a single download: The download process provides all the features that are necessary for the software to function (Java virtual machine and a VLC media player that is compatible with most multimedia files).
2.2. Construction of observation instruments: LINCE allows an unlimited number of fixed, mixed and variable criteria. The latter can have as many levels of categories and sub-categories as the user wishes. All the different types of criteria can be modified without altering the data registers already created, and this means that changes and adjustments can be made when first applying the observation instrument (Anguera, 2003) (see Figure 1).

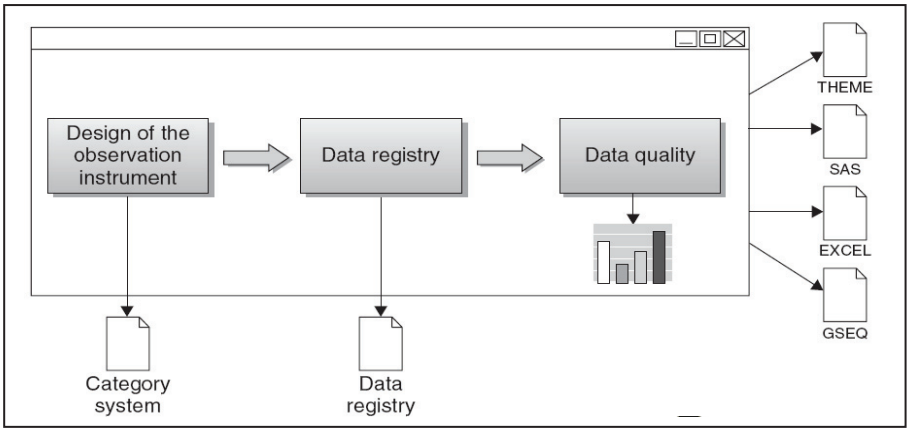

Figure 1. Diagram showing the different functions of Lince

2.3. Visualization of images: Practically any type of image (e.g. MPEG, DivX, XDiv, WMV, AVI, MOV, MP4 and FLV, and including current HD formats such as OGG and MKV) can be uploaded and played back to a precision of thousandths of a second. Playback can be controlled in various ways (on-screen controls, keyboard shortcuts or even the central and right-hand buttons of the mouse), thereby enabling it to be adapted to each user's way of working (see Figure 2).

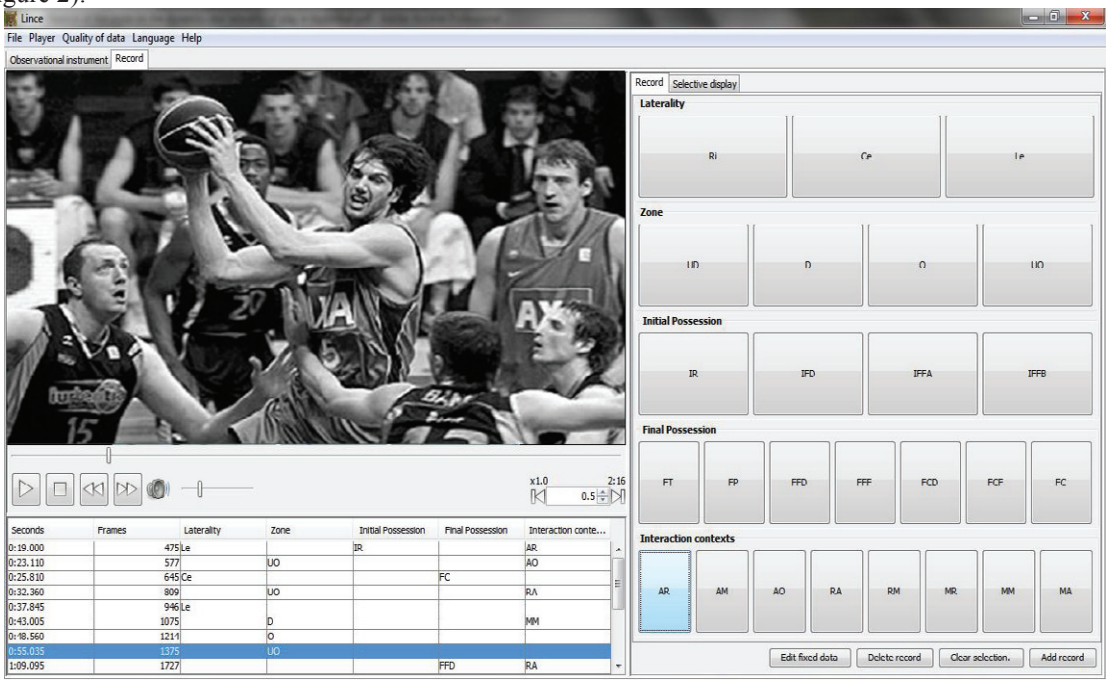

Figure 2. Example of the use of LINCE recording instrument. (Camerino *et al*. 2012)

with their time of occurrence and their duration in seconds or frames, thereby enabling the user to conduct diachronic studies involving a description of multi-event sequences.

2.5. Calculating data quality: LINCE can calculate Cohen's kappa coefficient (Cohen, 1968) for all or some of the criteria by comparing two registered data files, either for the same observer (intra-observer reliability) or for more than one observer (inter-observer reliability) (see Figure 4).

2.6. Versatility in the export of data: One of the key features of LINCE is that it can export data to other formats for subsequent treatment or analysis. Data can be exported not only to the specific formats of the programs most widely used to process observational results, but also to generic formats such as .csv, which can be opened with Microsoft EXCEL or with CALC from OpenOffice.

3. Requirements to install LINCE

The minimum system requirements needed to run this software package are 128 MB of RAM and 200 MB of free hard disk space. After downloading the LINCE installer (http://lom.observesport.com) the first step is to run the program by selecting .exe, before clicking on 'Next' to accept the license agreement.

Conclusion

Since LINCE is a new software program, work continues on increasing its functionalities, and hence any feedback in the form of requests, advice, suggestions or reports of program failure would be most welcome. As to its utility it is worth noting that both researchers and coaches have shown particular interest in analysing the range of actions that underlie the effective performance of team sports. This may be done with the aim of developing a deeper understanding of a sport's content and logic, or to create practical training situations that favour competitive efficiency. It is in this context that the LINCE software can help to obtain observational data regarding behavioural events in sport, thus contributing to a greater understanding of the complex and dynamic phenomena on which effective performance is based.

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