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LINCE: new software to integrate registers and analysis on behavior observation

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Abstract

The technological advances have made possible the development of multiple computer applications that can register behaviour in real-time. For example, the visualization of images using software such as SOF-CODER (Jonsson *et al.*, 2006) or MOTS (Castellano, Alday & Perea, 2008) has, over the last six years, brought greater precision and versatility to observe behaviors. **T**he present paper describes a new multiplatform software application, LINCE, whose versatility makes it ideally suited to observed behavioural analysis, i.e. in sport performance (Camerino et al. 2011; Castañer et al., 2009).

Keywords: Multiplataform software appication;BehaviorObservational analysis

1. Description of LINCE

LINCE is a software application that overcomes all the deficiencies of existing observational programs, i.e. the need for repetitive actions, limitations in the video formats used, and the difficulty of obtaining program licences. To achieve the ambitious objective of overcoming these deficiencies the first key characteristic of LINCE is that it is free, with both the application and its code being openly released. Furthermore, the documentation generated during development of the application is available under a Creative Commons BY-NC-SA licence. The application has been developed in Java so as to make it compatible with existing operating. LINCE (see Figure 1) can be used to observe any episode of behavior 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).
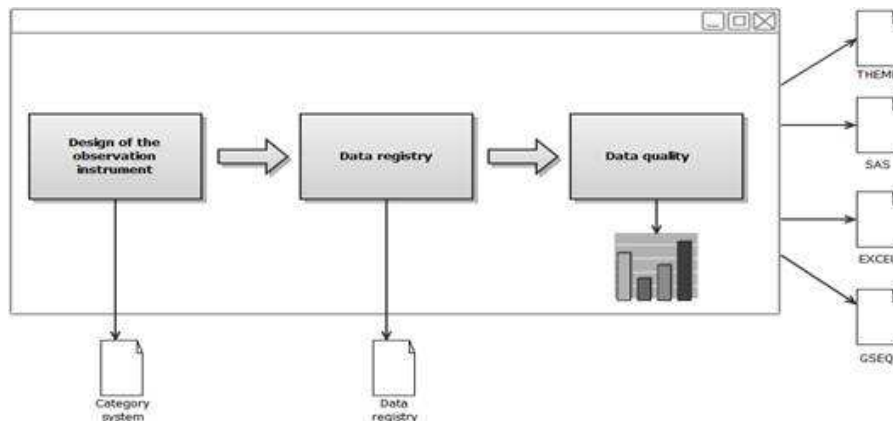

Figure 1. Diagram showing the different functions of LINCE.

1.1. Functionalities of LINCE

LINCE offers seven fundamental functionalities:

The application overcomes some of the traditional problems faced in relation to the registration and computation of observational data.

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).

Construction of observation instruments: LINCE allows an unlimited number of fixed, mixed and variable criteria. All 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).

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,

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. The program interface, showing an example from the observation of children's behavior.

Controlling the registration of data: The registered events, which can be modified, are shown simultaneously 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.

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 to generic formats such as .csv, which can be opened with Microsoft EXCEL or with CALC from OpenOffice. (see figure 3).

Figure 3. Screen showing the EXCEL format.

2. 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://www.observesport.com) the first step is to run the program by selecting .exe, before clicking on 'Next' to accept the licence agreement.

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