Player Analysis Technology Approval report

KITRIS KIT BIA

Test code: PAT-14-011

Serial no: 0000070625
Hardware part no: KITBIA7303

Software version(s):
KIT device (OTP): v8
KITRIS Tennis HUB: v2.4
KITRIS Server Application: v1.0

Firmware version: v11

Issue date: 22 April 2015

Objective: To test and evaluate KITRIS KIT BIA Player Analysis Technology according to Rule 31 of the 2014 Rules of Tennis.

Result: Approved

SUMMARY

A wrist-worn device ("KIT") is used to capture data using voice recognition and/or detection of wrist/arm motion (using electronic sensors).

The user is able to record and access point information (i.e. the score) using the KIT device, which is not considered to constitute coaching information.

The user is able to record coaching information such as 'complementary information', e.g. winning shots, audio memos and shot type (forehand/backhand), but this information cannot be accessed on the KIT device.

Access to coaching information requires connection of the KIT device to an auxiliary device, e.g. a laptop, and connection of the auxiliary device to the internet.

Restrictions on the access by a player to KITRIS components during periods when coaching is and is not allowed are as follows:

COMPONENT	NO COACHING	COACHING
KIT device	Permitted	Permitted
Auxiliary device (e.g. laptop)	Not permitted	Permitted

MAIN COMPONENTS

The main components of the system are described in table 1 and depicted in figure 1.

COMPONENT	FUNCTION(S)
Wrist-worn (“KIT”) device	Capture and store data
Auxiliary device, e.g. laptop	Transmit, store and communicate data
KITRIS Tennis HUB software	Transmit and process data
KITRIS server (Webclient application)	Process and store data

Table 1. Description of the components of the KITRIS KIT BIA system.

Figure 1. Components of the KITRIS KIT BIA system (from left to right): KIT device; auxiliary device (laptop); internet access to KITRIS server (router).

DATA CAPTURE

The KIT device is worn on the playing or non-playing wrist and used to capture point information (i.e. the score), optional ‘complementary information’, e.g. winning shots, audio memos and motion of the wrist/arm. The device houses a microphone, inertial sensors (triaxial accelerometer and triaxial gyroscope), vibration motor, OLED display and LED light. The mass of the device is 33 g (excluding the strap).

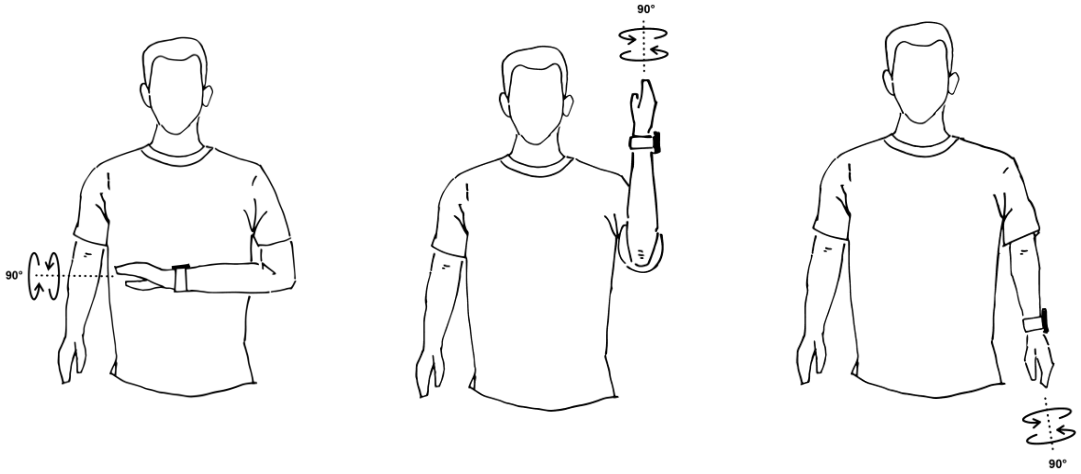

Figure 2. Point information input/activation gestures (from left to right): activation gesture (prior to voice command); ‘point won’ gesture; ‘post lost’ gesture.

Point information is entered either by specific voice commands or wrist/arm gestures (see figure 2). Even when the voice recognition method is selected to enter point information, wrist/arm gestures can be used to activate the device (in preparation for a voice command).

Alternatively, voice recognition can be activated by pressing the 'OK' button: the middle button on the right-hand side of the KIT device (see figure 1).

Confirmation of point information input is given by:
1. A brief (approximately 1 second) indication of who won the point displayed on the screen of the device; and
2. (Optionally) vibration of the device: two short pulses for a point won by the user; single long pulse for a point won by the opponent; and
3. (Optionally) illumination of the bicolour LED: green for a point won by the user (see figure 3); red for a point won by the opponent.

Figure 3. LED confirmation of point input (green light signifies point won by the user).

When point information is not being entered, the score is displayed on the device in the standard tennis format (in addition to the device time, as set by the user).

Complementary information can only be entered immediately after point information input. The list of voice commands and corresponding complementary information is given in table 2.

VOICE COMMAND	COMPLEMENTARY INFORMATION
"Winner"	Rally won or lost on a winner
"Unforced"	Rally won or lost on an unforced error

Table 2. Voice commands for complementary information entry.

The process of confirming complementary information is the same as for point information.

Audio memos can be recorded at any time, by selecting the function from the 'MATCH' (or 'TRAINING') menu displayed on the device.

There are three options to edit point information in the 'MATCH' menu:
1. Undo point (delete the previous point entry).
2. Replay point (logs that the point was replayed).
3. Record memo.

Repeated 'undoing of the point' effectively counts back the score. Complementary information and audio memos cannot be edited, or replayed, on the device.

Previous (ended) matches cannot be viewed on the KIT device and are available on an auxiliary device only.

Inertial sensor data are recorded from the beginning of a session (in both 'match' and 'training' modes). In addition to enabling gesture recognition, the inertial data are used to determine shot type (forehand/backhand). These data cannot be viewed on the KIT device and are available on an auxiliary device only.

Sessions can be 'tagged' when using the device in training mode.

The session type is selected from one of the following options in the 'Tag' menu:
1. Free Training
2. Half Court
3. Base Line
4. Net
5. Serve
6. Return
7. Point Playing

The device then displays the total training time and the time elapsed for the selected tag, e.g. 'serve'. Data captured during a tagged session (e.g. audio memos, inertial sensor data) are assigned to the tag. These data cannot be viewed on the KIT device.

The KIT device does not have wireless connectivity. It can only transmit data via USB connection.

COMMENTS

The user is able to record and access point information (i.e. the score) using the KIT device, which is not considered to constitute coaching information.

The user is able to record coaching information such as complementary information, e.g. winning shots, audio memos and shot type (forehand/backhand), but this information cannot be accessed on the KIT device.

The fact that the KIT device does not have wireless connectivity is important because it has the capacity to provide visual and tactile (vibrational) feedback to the player. That is to say, even if data captured on the device was not considered coaching information, coaching information could potentially be communicated using the device if it had wireless connectivity.

DATA PROCESSING AND COMMUNICATION

In order to gain access to complementary information and tagged session data, the user must upload the data to the KITRIS server. This is done by:

1. Transferring the data file(s) from the KIT device to an auxiliary device, e.g. laptop, via a USB cable (see figure 4).
2. Uploading the data file(s) from the auxiliary device to the KITRIS server via an internet connection.

Figure 4. USB connection of the KIT device (to an auxiliary device).

The auxiliary device must have KITRIS Tennis HUB (proprietary software) installed to be able to receive the files.

Audio memos can be played when importing data (using KITRIS Tennis HUB) and additional match information, e.g. opponent name, appended to the imported data.

KITRIS Tennis HUB can be used to review the match score, additional match information and audio memos. Complementary information, e.g. frequency of winners, and tagged session data are only available via the KITRIS server user-interface (Webclient application).

The user must set-up a personal account with login and password to upload (and access) the KITRIS server. The transmission of data between the auxiliary device and KITRIS server is performed via a secure internet channel (https).

KITRIS Webclient displays match statistics generated from point and complementary information. It also includes frequency of strokes and identification of forehands/backhands (derived from the inertial sensor data).

COMMENTS

Transmission of data from the KIT device to the auxiliary device (e.g. laptop) is via a wired connection, meaning that a potential hacker would need to obtain the KIT device or the auxiliary device to gain access to the data.

Access to coaching information requires connection of the KIT device to an auxiliary device and connection of the auxiliary device to the internet.

Transmission of data from the auxiliary device to the KITRIS server, and subsequent access to the data on the KITRIS server, is conducted using a secure internet channel and requires a password-protected user account.

ADDITIONAL INFORMATION

Client:
KITRIS AG
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8635 Dürnten
Switzerland

Date received: 10 November 2014

Report prepared by: Jamie Capel-Davies
Report authorised by: Stuart Miller
Revision number: 1

Please note:
Approval does not attempt to, nor does it in fact, establish the accuracy or reliability of data or fidelity of its transmission.