Player Analysis Technology Approval report

Zenniz

Test code: PAT-24-035

Serial no: n/a

Software versions:
Ubuntu 18.04.60 LTS
Zenniz app is available for Android and iOS.

Firmware version: 1.0.19 (02/05/24)

Issue date: 03/03/2025

Objective: To test and evaluate Zenniz according to Rule 31 of the 2025 Rules of Tennis.

Result: Approved

SUMMARY

Video and audio data is combined using a series of microphones and cameras to track the position of the ball and players across the court through play. 3D ball position and 2D player position data are recorded, which can be used for line calling and performance analysis. A central unit mounted to the side of one net post houses LED screens on either side to communicate data to players including match score and service speed (when not in competitive match mode). A touch screen at the top of the central unit is used to define system mode and communicate data.

Player data is stored securely in a cloud database and can be accessed via personal login to the Zenniz app. In competitive matches, data displayed on the touchscreen is limited to match score and line calling decisions, and the side LED panels limited so no coaching information is displayed. This is controlled through tournament rulesets, which cannot be unlocked by players during the match. Data sent to the Zenniz app is also controlled through rulesets.

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

COMPONENT	NO COACHING	COACHING
Microphones	Permitted	Permitted
Touchscreen display (in competitive match mode)	Permitted	Permitted
Smartphone app	Not permitted	Permitted

MAIN COMPONENTS

The main components of the system are described in Table 1 and depicted in Figure 1.

Table 1: Components of the Zenniz System.

COMPONENT	FUNCTION(S)
Microphones	Track ball position from on court event locations.
Integrated cameras (central unit)	Track ball and player position.
Internet protocol (IP) broadcast cameras	Track ball and player position and collect video of play for streaming.
LED display (central unit)	Communicate data.
Touchscreen display (central unit)	Start/stop data capture, transmit, communicate, store and process data.
Auxiliary device (smartphone)	Log into system, transmit and communicate data.
Zenniz server	Store and transmit data.

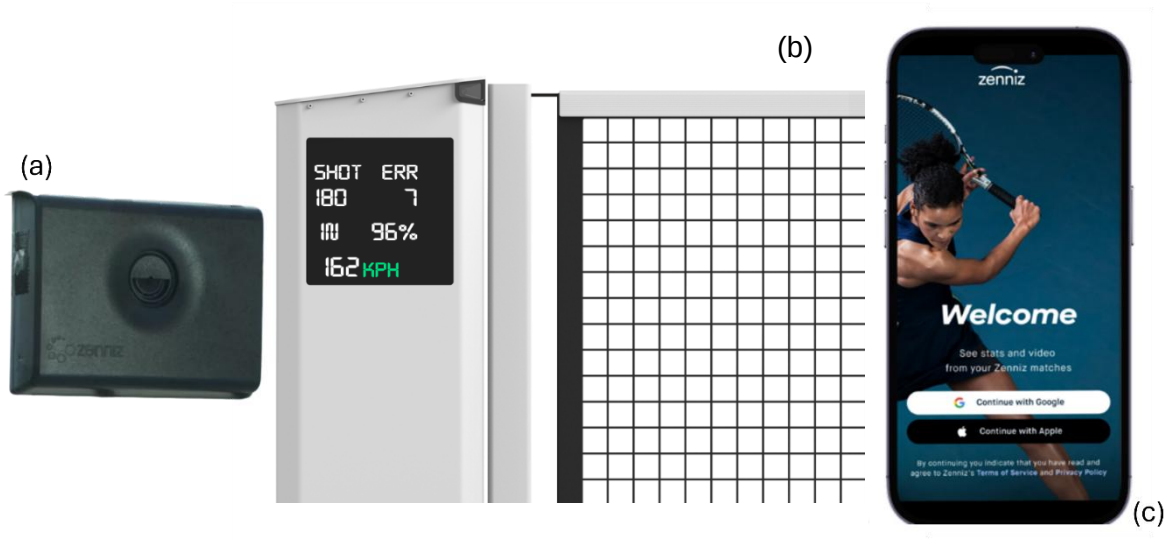

Figure 1 - Components of the Zenniz System: a) microphone, b) central unit, c) app on auxiliary device.

DATA CAPTURE AND PROCESSING

Ball position is triangulated by 30 microphones on two audio cables mounted around the court perimeter. Two integrated cameras on the central unit have a field of view of half the court each, and in combination with two cameras at either end of the court, allow for ball and player position to be calculated. The end-court cameras are also used for video replays after matches, or for livestreaming events.

The data measured by the Zenniz system is as follows:

- Stroke speeds
- Bounces
- Stroke locations
- Net hits
- Match statistics
- Match information

During competitive play, tournament mode can be applied remotely, limiting the game modes available for selection on the central console. Rulesets can be defined prior to the tournament by the tournament director either by selecting an existing ruleset or editing a ruleset to display/restrict information available.

COMMENTS

Transmission of data between the microphones and the touchscreen display (central unit) is wired, limiting its susceptibility to hacking. There are firewalls protecting communications and remote access is only possible with secret passcodes. Match data and analytics is transmitted to a cloud server through a wired network connection. All information is encrypted for transmission.

DATA COMMUNICATION

Data is communicated through the central unit and through the Zenniz app, used on an auxiliary device (e.g. a smartphone). The central unit has two types of screens: the touchscreen on the top surface, and the LED panels at either side, facing each side of the court. The panels can display real-time shot information customised to the game mode and ruleset selected.

Players log in to the system by scanning a QR code on a smartphone with one of the integrated cameras in the central unit. The touchscreen can then be used to select match play or training drills, with specific drills and gamification processes designed for service or groundstroke practice. The LED panels display the targets and success of drills. In match play, data will only be shared to the user profile logged into the app once the match has been completed, limiting any information being used for coaching purposes in-play. For replay data from the end-court cameras to be accessed, both players must agree to share access when they log in.

Tournament rulesets allow an administrator to determine the level of data that can be communicated to players during matches. This involves data displayed on the touchscreen of the central unit, the LED side panels and the smartphone app (or Zenniz.com). A tournament ruleset restricting coaching data to players on court must be active during competitive play.

When not in competitive match mode, information can be accessed through the smartphone app or the web dashboard. This data includes:

- Shot placement maps
- Match statistics
- Reliability statistics
- Speed statistics
- Additional minor statistics (net clearance, average shot depth)
- Access to video and video filtering (e.g. displaying rellies ending in dropshot winners

COMMENTS

Coaching information is disabled in competitive match play through either the touchscreen on the central unit or the side LED panels. Therefore, this mode must be applied by the match administrator when coaching is prohibited be selecting an appropriate ruleset upon creating the tournament.

Coaching information can be sent to the Zenniz server (and be available on zenniz.com) prior to the end of the match. Therefore, players must not have access to internet-enabled devices, e.g. smartphone or laptop, when coaching is prohibited.

ADDITIONAL INFORMATION

Client:
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Date received: 25/07/2024

Contact: Eero Kuusi

Report prepared by: Tom Hewson
Report authorised by: David Cole
Revision number: 0

Please note:
Approval does not attempt to, nor does it in fact, establish the accuracy or reliability of data or fidelity of its transmission, including (but not limited to) the provision of 'in'/'out' decisions for the purposes of line-calling.