

How FIFA is using SAOT for offside d

How does FIFA's brand new Semi-Automated Offside Technology work? Is this tool accurate and reliable? Are on-field decisions going to be completely automated? Can the data generated by this technology be used for other purposes other than making on-field resolutions?

EXPLAINER

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The story so far:

In the opening match of the FIFA World Cup 2022 between host Qatar and Ecuador, just three minutes' of action had passed before the first goal of the tournament was ruled out for offside. Ecuador forward Enner Valencia's headed strike was disallowed because the lower half of his right leg was in an offside position. While such close calls being settled with the help of Video Assistant Referee (VAR) technology is largely commonplace in modern-day football, what surprised fans was the speed with which it was adjudicated. One three-dimensional animation of the incident was displayed for a fleeting second or two before play restarted. FIFA's brand new Semi-Automated Offside Technology (SAOT) was responsible for the quick decision.

What is SAOT?

There are two parts to the technology – a sensor inside the match ball (Adidas's Al Rihla) that is held using suspension technology, and existing tracking tools that are part of the VAR system as we know. Kinexon, a German company that specialises in providing sensor networks and computing solutions, has designed a small in-ball device which gives precise positional data and also detects ball movement in a three-dimensional space. Every time the ball is hit, data is sent in real time (at a whopping 500 frames per second) to a network of antennae



Acute precision: Ecuador's Enner Valencia heads the ball to score a goal against Qatar which was later disallowed for an offside at the 2022 World Cup. AFP

match officials. This replaces the manual effort taken in poring over replays for minutes on end.

Is there no human intervention?

FIFA has made it clear that SAOT is only a confirmatory tool. Speaking ahead of the World Cup, referees chief Pierluigi Collina underlined that the final decision "always belongs to the match official – on the VAR,

player was in an offside position and did not touch the ball but was deemed offside for being in the goalkeeper's line of sight and thus actively involved.

How accurate is the SAOT data?

According to FiveThirtyEight, ABC News's statistical analysis portal, the data transmission rate from the ball (500 frames per second or 500Hz) makes the process pret-

2021 FIFA Arab Cup in Qatar and the 2021 FIFA Club World Cup in Abu Dhabi.

Is the data only used for officiating?

Experts believe offside decision-making is just the starting point and the wealth of tracking data will soon be used by coaches for tactical analyses and gauging individual athlete performances. The metrics can also be useful for scouting good

nae installed around the playing field. Additionally, there are 12 Hawk-Eye cameras set up around the turf that shadow both the ball and the players, with as many as 29 separate points in the human body tracked. The coming together of the ball sensor and the Hawk-Eye cameras is in effect SAOT, which FIFA says allows for decisions that are highly accurate and quick. These two data sets are run through artificial intelligence software which generates automated alerts about offsides to the

the video assistant referee, on the field of play, to the referee.” In addition, the differentiation that exists between normal offside – where a player is flagged because of active involvement irrespective of whether he touches the ball – and ‘passive offside’ – where a player will not be flagged despite being in an offside position if he does not touch the ball – is expected to retain some subjectivity. A case in point was the goal scored by Ecuador against the Netherlands that was eventually disallowed; the

ty accurate. The time between two frames is two milliseconds (1/500), which is 10 times better than a standard 50Hz video that is commonly used in High Definition monitors. Further, to synchronise the data from the ball sensor and Hawk-Eye, a Precision Time Protocol clock is used. This, Nicolas Evans, the head of football research and standards for FIFA Technology Innovation, says, gets down the precision to up to one-millionth of a second. FIFA tested the whole technology at both the

players, similar to what Second Spectrum tracking does in the NBA. Hawk-Eye, in fact, has been in use in tennis since 2006. Though it was first employed to decide close line calls, the positional information is a treasure trove for players and coaches looking for data on ball trajectories, movement, distances covered and the pace of the court among others. SAOT is expected to aid such statistical thinking and data mining in football, in line with what is increasingly the Moneyball era of sports.