Semi-Automated Offside Technology(SAOT)

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In news—FIFA is using SAOT for offside decisions in the ongoing edition of the Football world cup.

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

- FIFA has made it clear that SAOT is only a confirmatory tool.

- SAOT is expected to aid such statistical thinking and data mining in football, in line with what is

increasingly the Moneyball era of sports.

Semi-automated offside technology

A new system to detect the position of the ball and all 22 players should enhance Video Assistant Refereeing at the World Cup

KICK POINT PRECISION
Automatically detects when and where ball is kicked

Connected Ball Technology:
Suspension System holds and stabilises inertial measurement unit (IMU) motion sensor

IMU transmits inertia data of ball – kick-point, location, direction – at 500Hz, 500 times per second

IMU
Video
0   100   200   300   400   500
Conventional VAR: 50 frames per second

PLAYER POSITIONS
Artificial Intelligence
Assigns and tracks up to 29 data points for each player

Defender: Furthest data point defines offside line

Logged
Extremities relevant to offside calls

OFFSIDE LINE

Data point projects beyond offside line

System tracks when ball is received by player in offside position when ball was kicked

12 cameras in roof track positions of ball and all players 50 times/second ①

OFFSIDE ③
Alert triggered and validated in Video Operation Room

Decision communicated to referee ④