







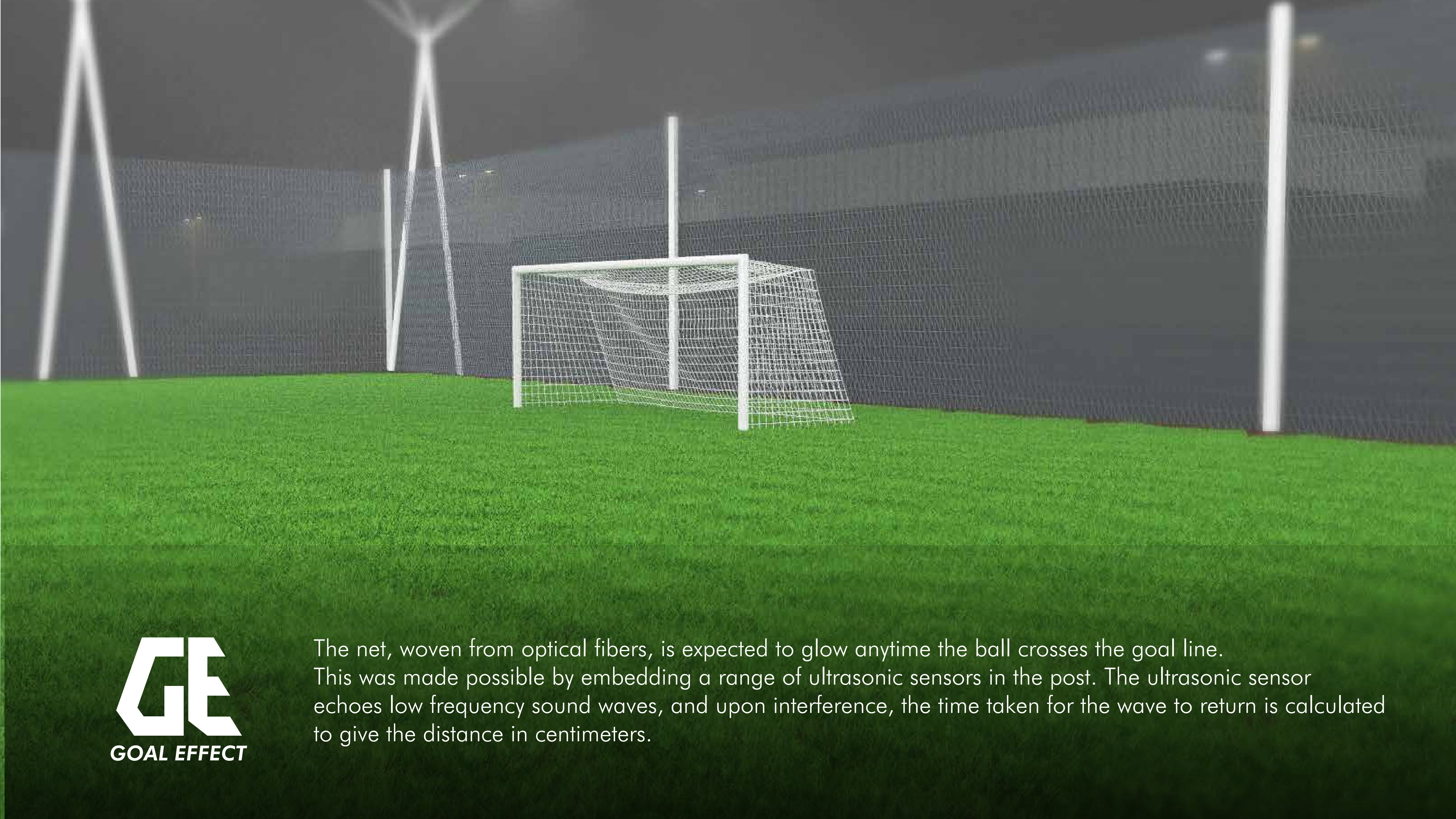
The purpose of this project is to develop a system in soccer which seeks to bring up a cheaper and more exciting technology, yet maintains or enhances fair play in the game. The goal is to make use of glowing nets and goal posts with their glowing intensities depending on the speed of the ball crossing the line and the power of the ball hitting the goalpost respectively.





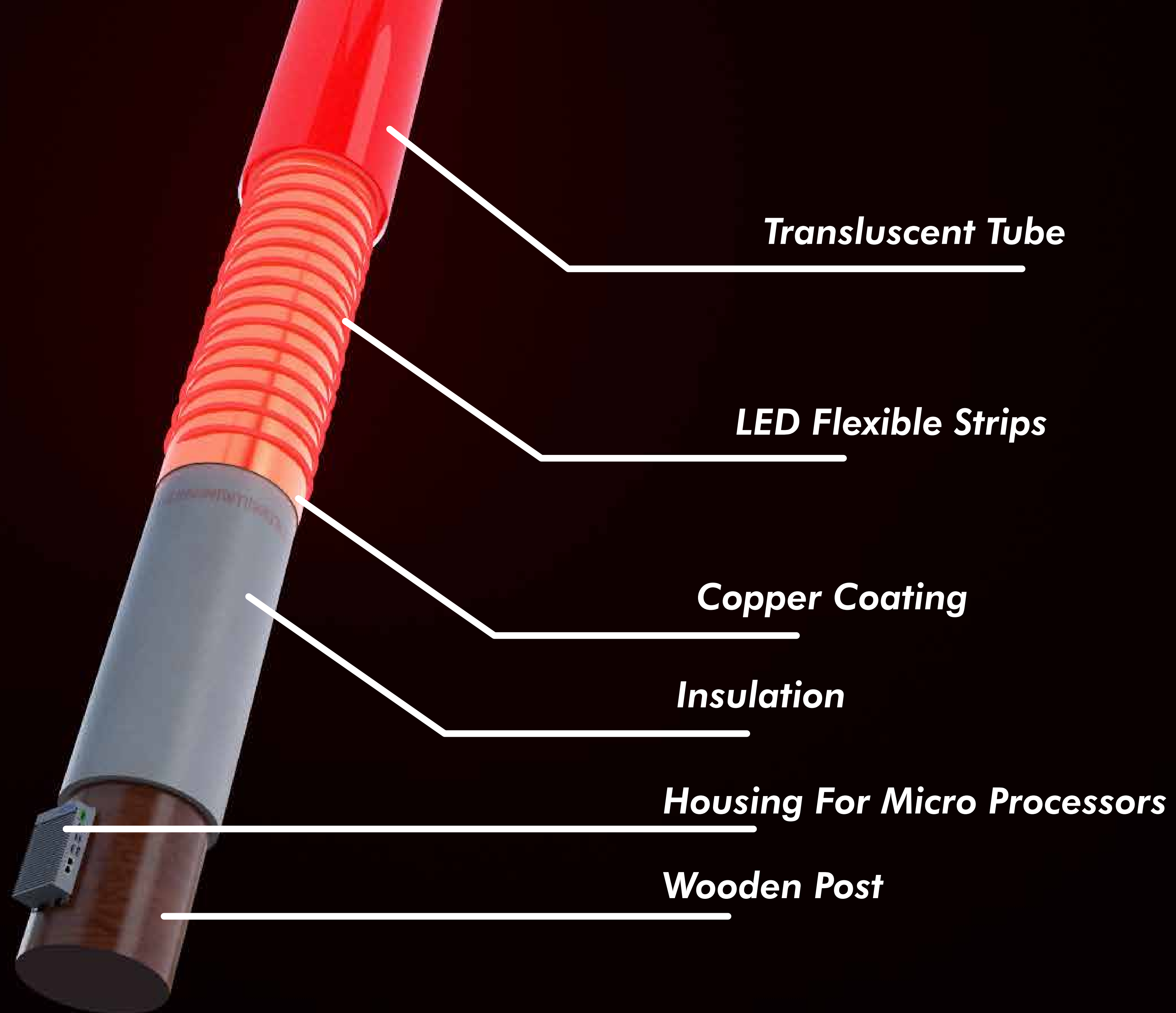
The net, woven from optical fibers, is expected to glow anytime the ball crosses the goal line. This was made possible by embedding a range of ultrasonic sensors in the post. The ultrasonic sensor echoes low frequency sound waves, and upon interference, the time taken for the wave to return is calculated to give the distance in centimeters.



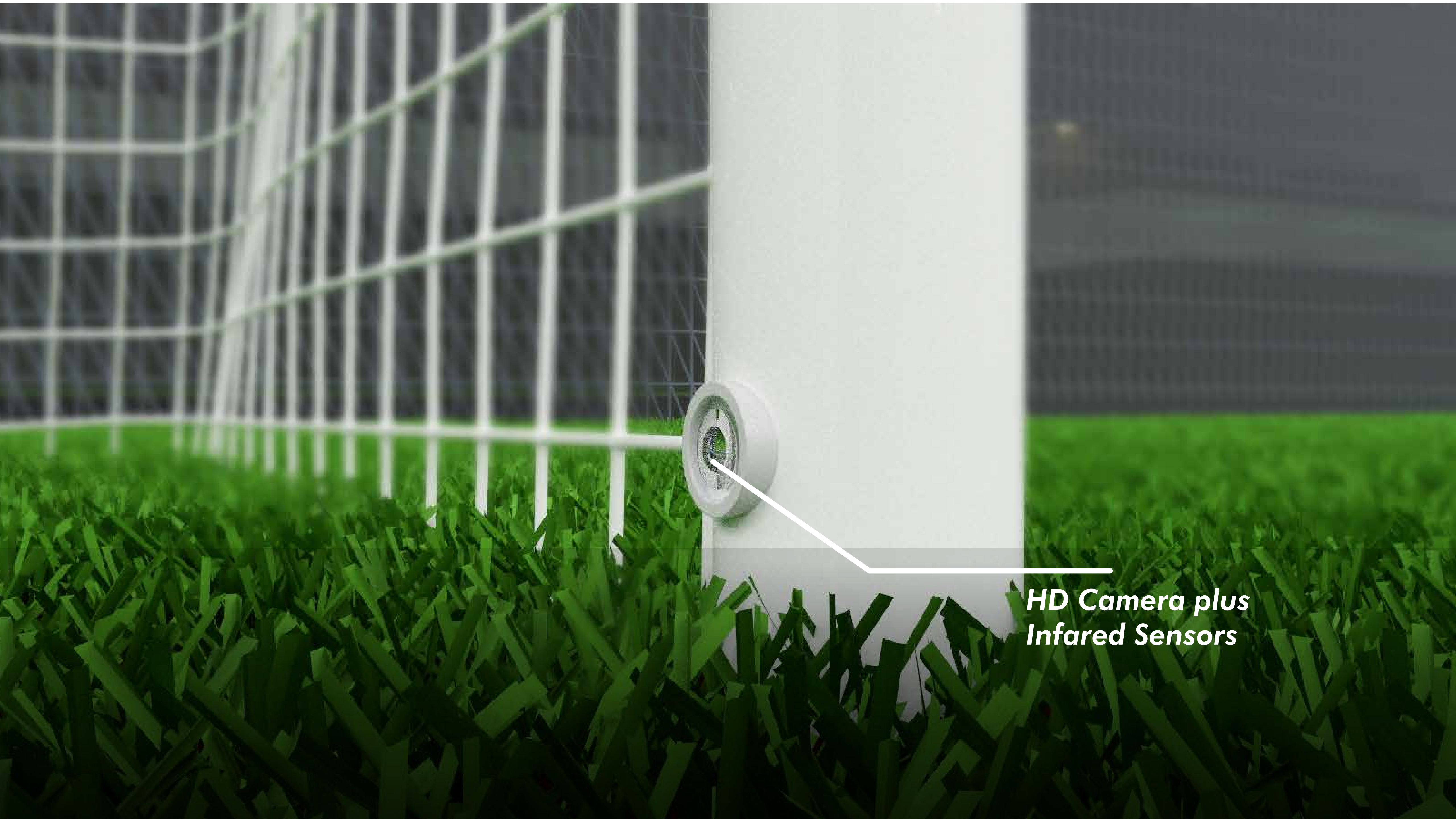


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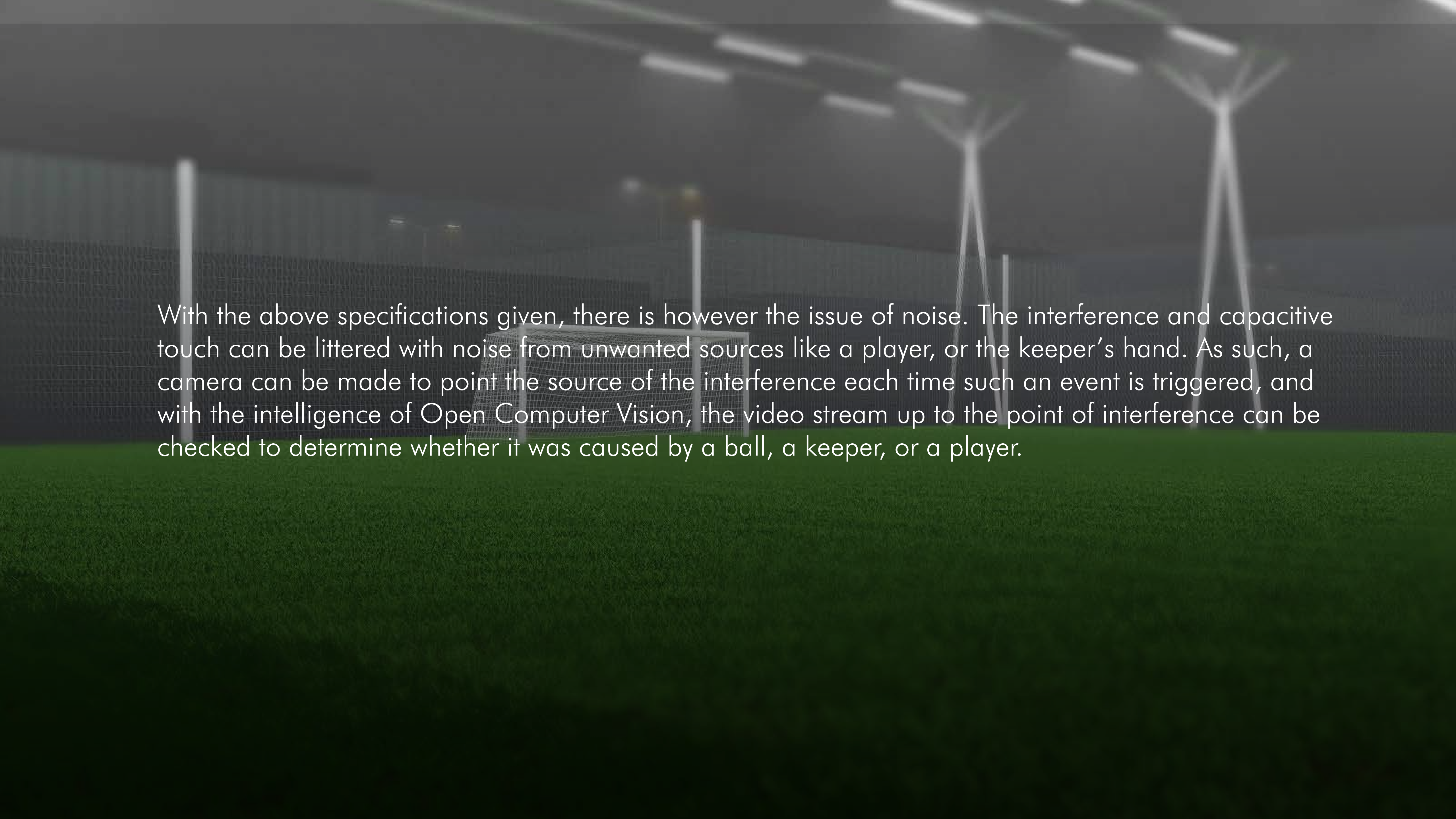








***HD Camera plus  
Infrared Sensors***

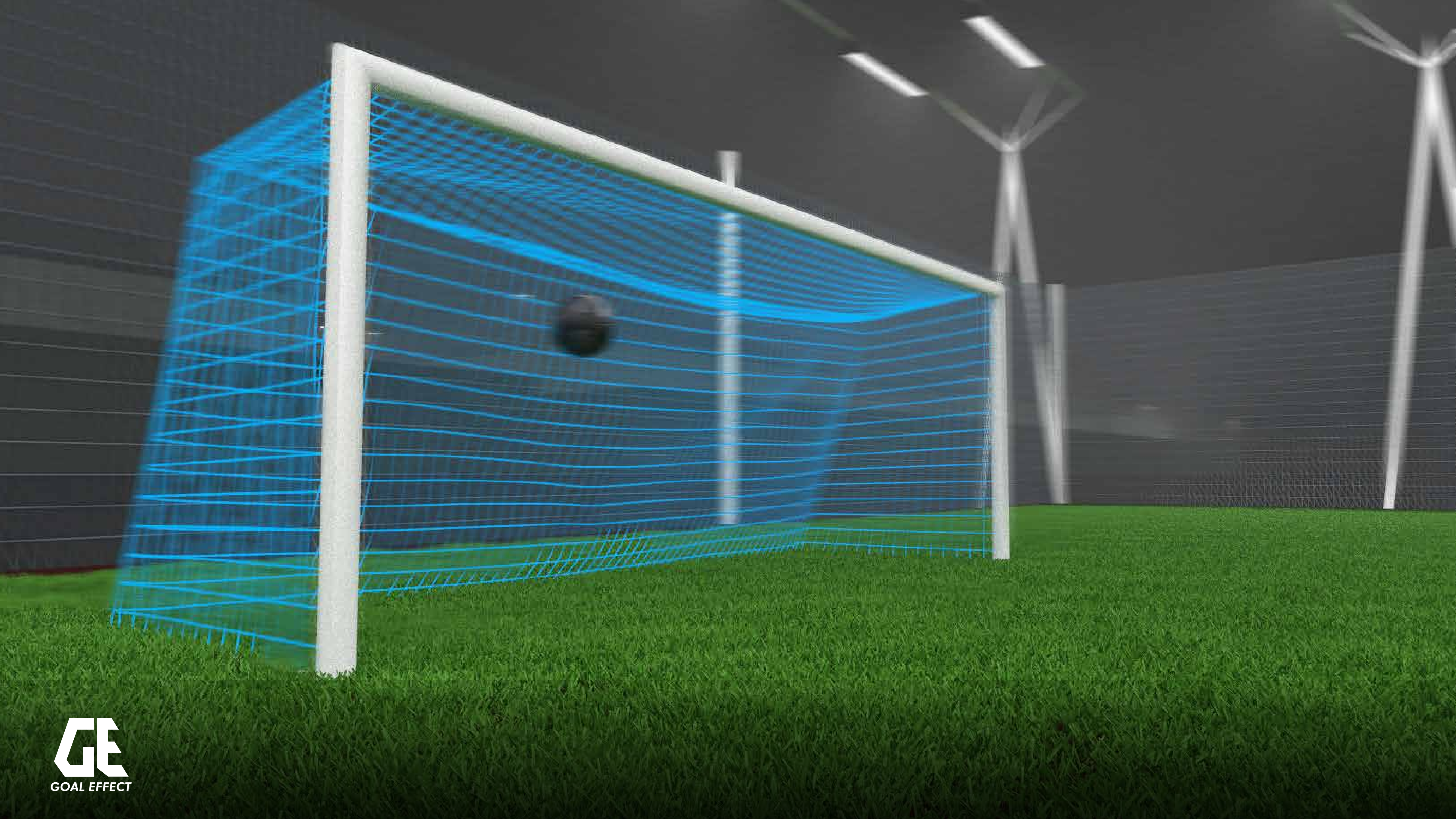


With the above specifications given, there is however the issue of noise. The interference and capacitive touch can be littered with noise from unwanted sources like a player, or the keeper's hand. As such, a camera can be made to point the source of the interference each time such an event is triggered, and with the intelligence of Open Computer Vision, the video stream up to the point of interference can be checked to determine whether it was caused by a ball, a keeper, or a player.

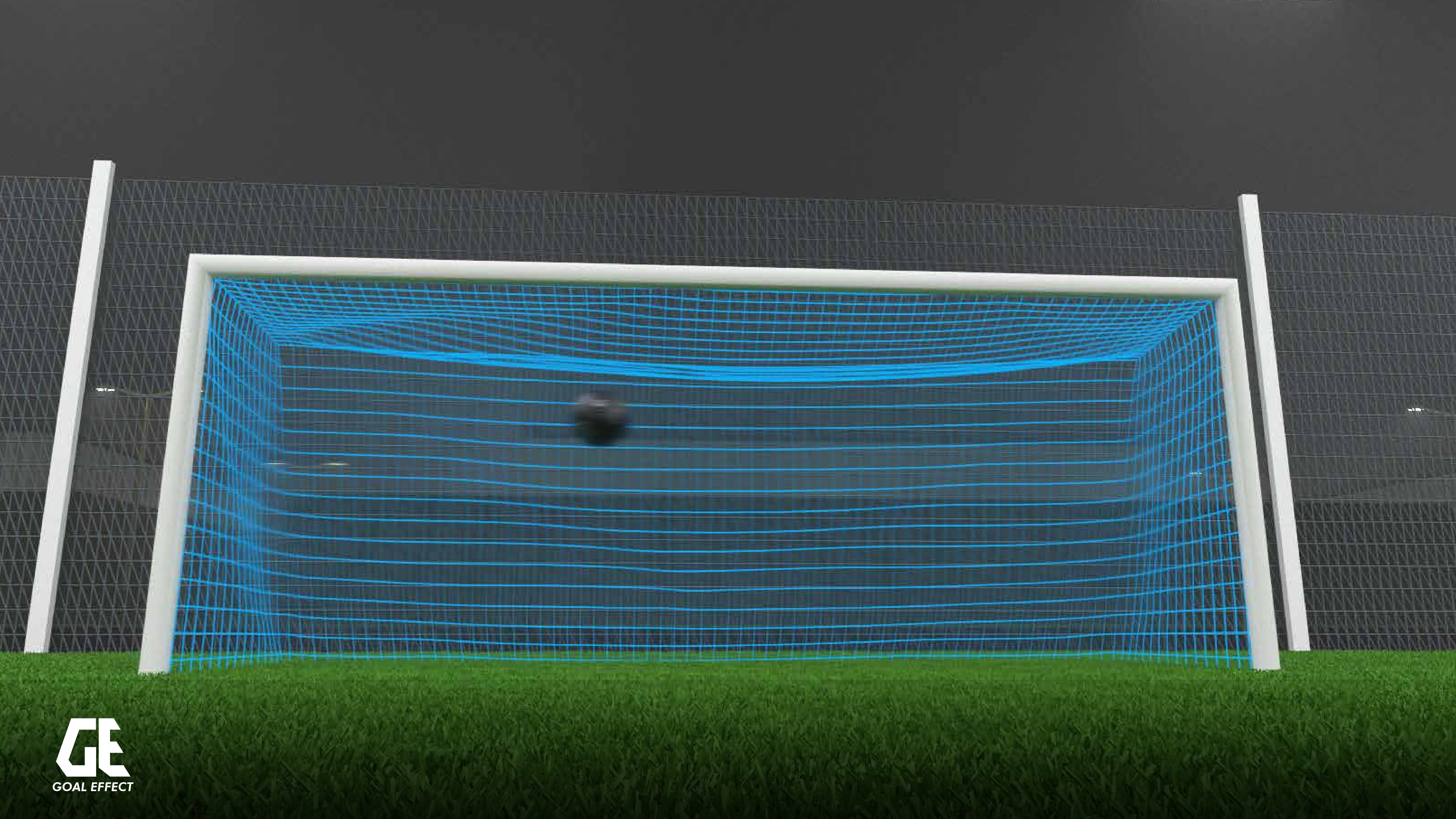
















## ACHIEVED OUTCOME

After designing the goal post with the copper plate and soldering the resistors to it, the intended outcome when the goal post was touched was successful after uploading the code unto the Arduino microcontroller. The lights on the nets also glowed whenever there was an interference in the range detected by the ultrasonic sensor.

It is assumed that different materials will give different capacitive values thereby making it difficult to determine whether touch was caused by ball or other objects. This can be easily fixed by calibrating for the type of material the ball is made of, and reading only values from this range as acceptable.

The detection of the object responsible for the interference using the camera module is solely dependent on 3 things:

- Resolution/Quality of camera
- Available computation/processing power
- Responsiveness to interference detection event



## ERGONOMIC CONSIDERATIONS & INCONSISTENCIES

- Capacitive touch is really prone to environmental noise. Rain, sweat, temperature or wind could cause interferences in baseline readings.
- Ultrasonic sensors have no way of determining if what crossed the line is a ball, human, hand, etc.
- Also, the post may be subject to high impact. Eliminating shock from the impact that can destroy the hardware components especially those attached to the goal post is to be considered.
- The raspberry Pi controller used for the Image processing lacks enough processing power to process videos at the rate needed for real-time decision.





**GE**  
GOAL EFFECT