

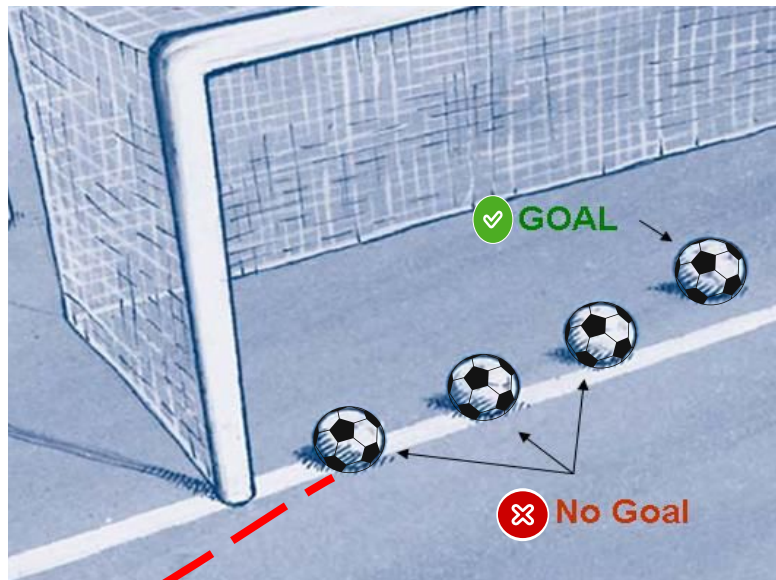
ScoreSense

Goal Line Detection using RFID



Teddy & Kendall

WHAT IS A VALID GOAL ?

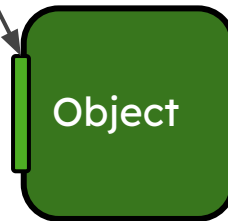


WHAT IS RFID?

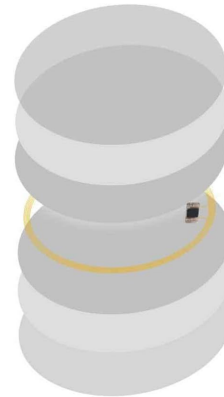
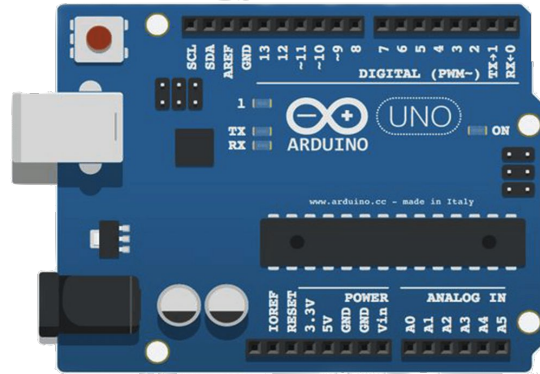


Radio Waves

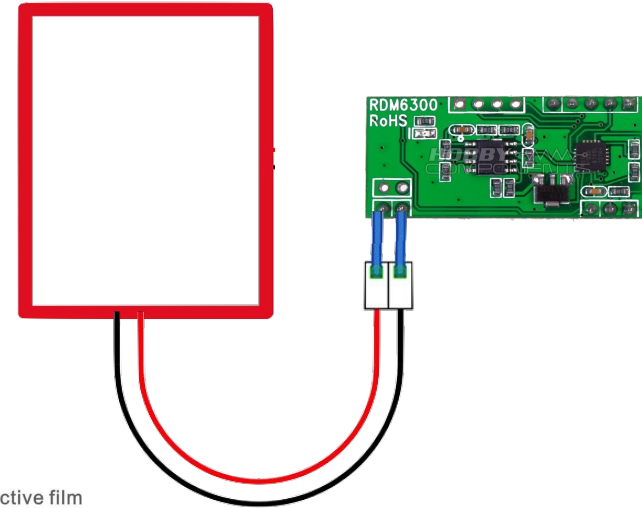
RFID Tag

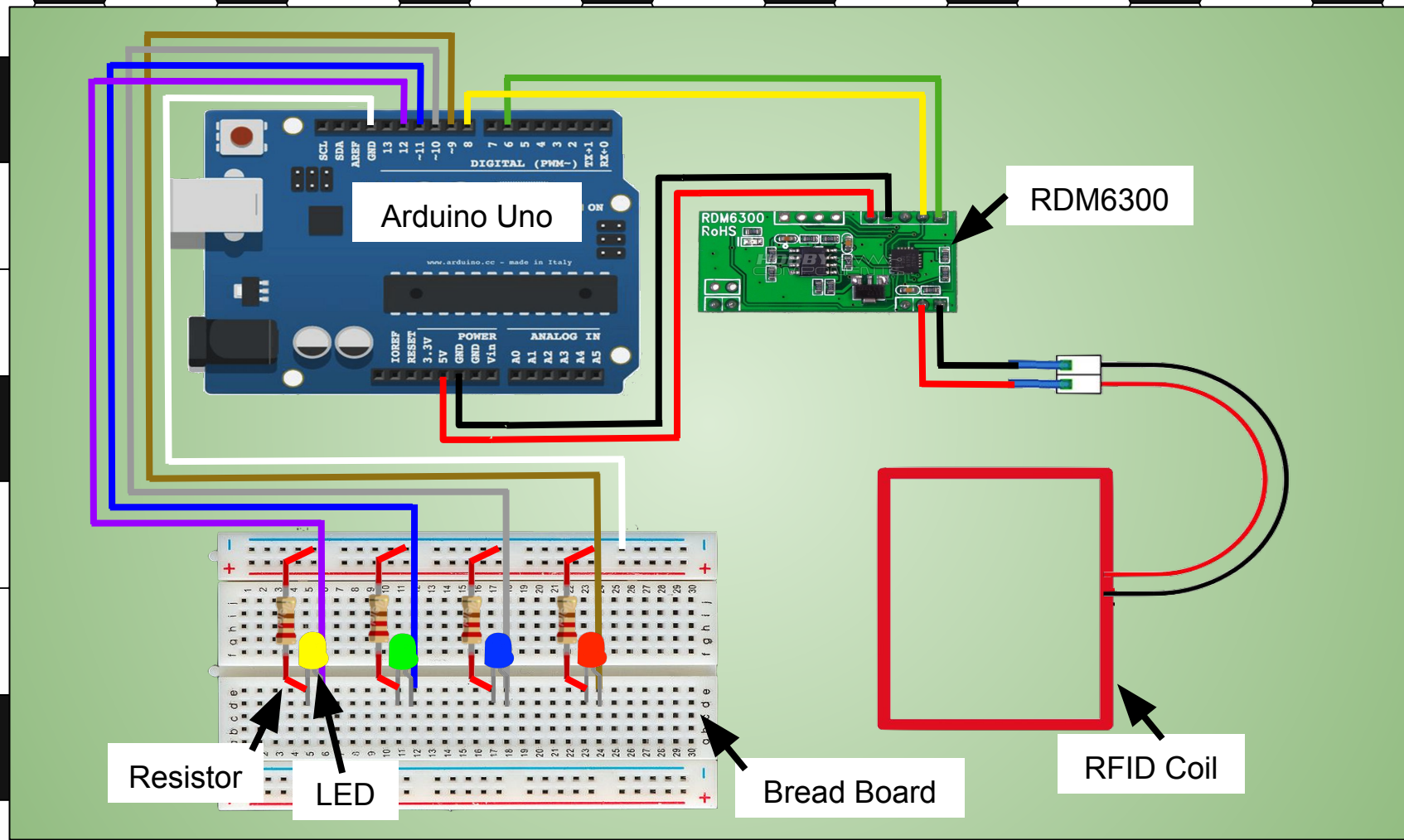


Materials:

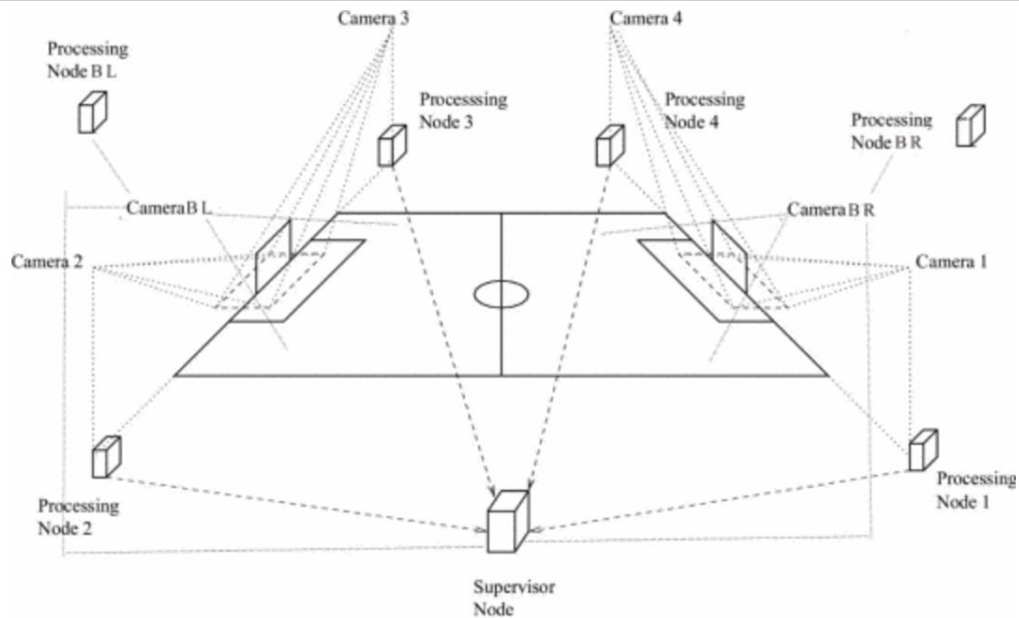


- Protective film
- PVC fabric
- PVC Layer inlay
- NTAG215 Chip and Antenna
- PVC Layer inlay
- PVC fabric
- Protective film





Current Technology





					
Spagnolo					
Ekin					
Cruciani					
D'Orazio					
Fraunhofer					
Anaconda					
ScoreSense					

WHAT ARE THE BENEFITS ?



Quicker Game
Time Calls



Less Human
Error



More Accurate
Statistics



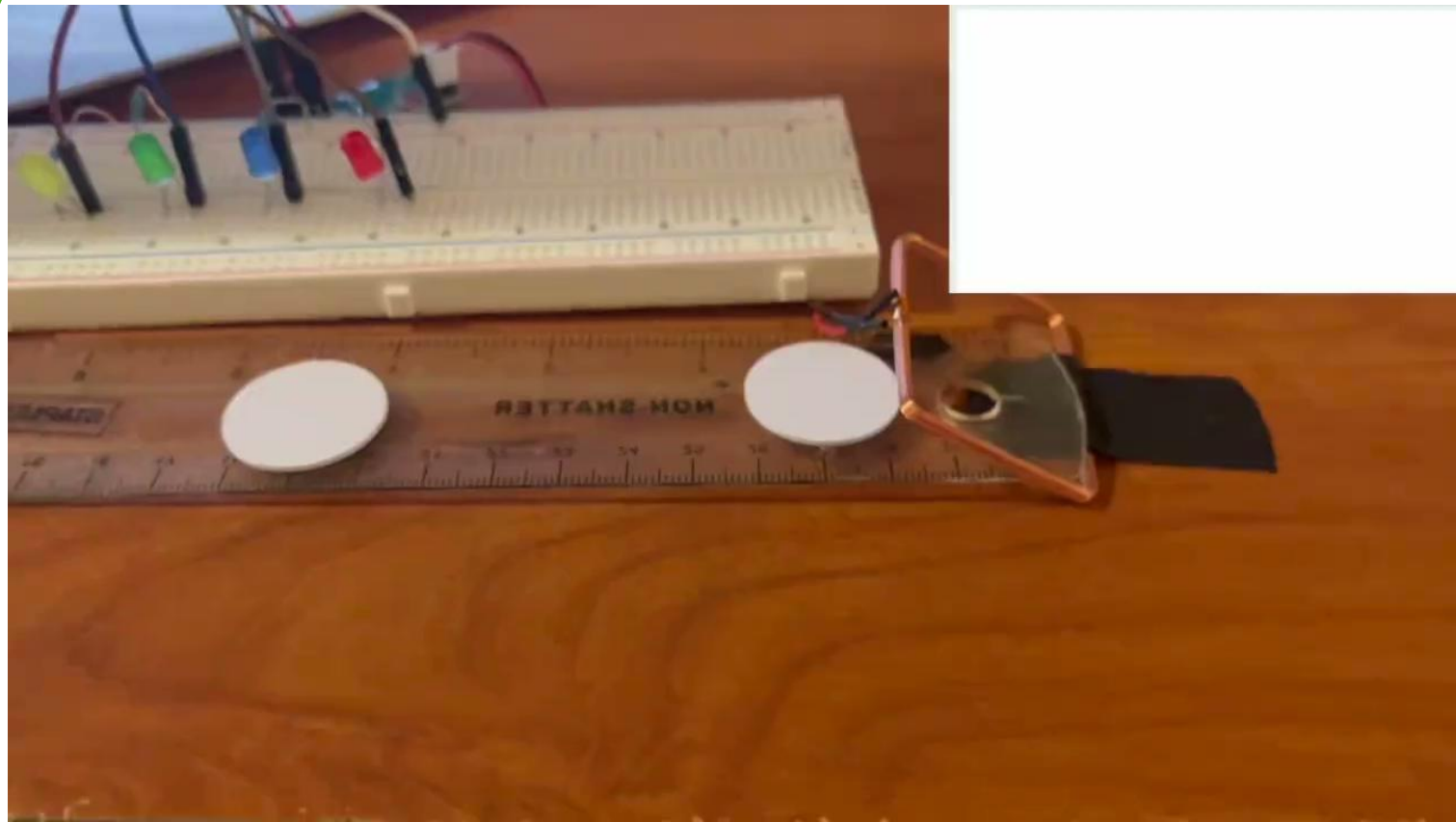
Better Viewer
Experience

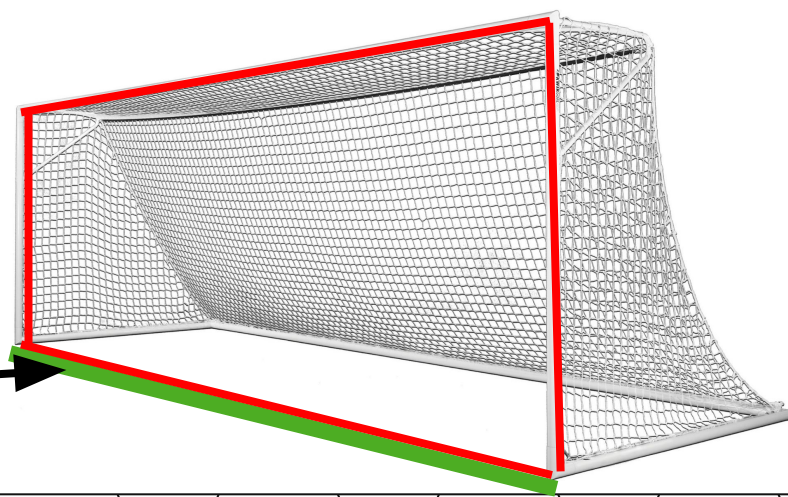


More Reliable
Scores



Less Fighting





Goal Line



EDGE CASES

Situations that may happen that have unique outcomes:

1. Ball partially crosses the goal line, and is then pushed through the goal
2. Ball partially crosses the goal line, and is then pulled back out of the goal



EDGE CASES: ALTERATIONS

ORIGINAL TESTING

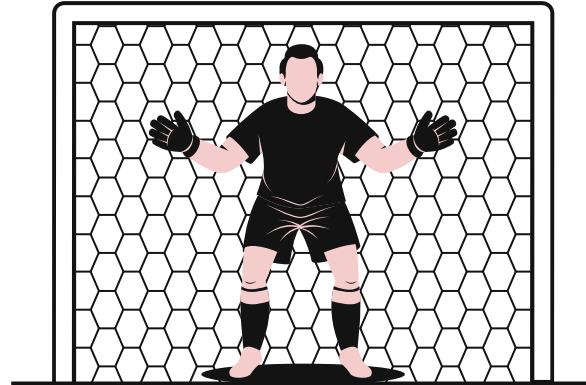
- No differentiation between tags
- Relied on count of tags

THE PROBLEM

- If ball stops on the line, will scan same tag multiple times
 - If ball partially crosses and rolls back, will scan tags multiple times
- Both result in incorrect goal calls

THE FIX

- Identify each tag individually
- As each unique tag crosses the reader, light up LED
- When all four LEDs light up, signal valid goal



EDGE CASES: OUTPUTS

1. Ball partially crosses the goal line, and is then pushed through the goal

TAG: 008EC793

TAG: 008EC793

TAG: 008EC793

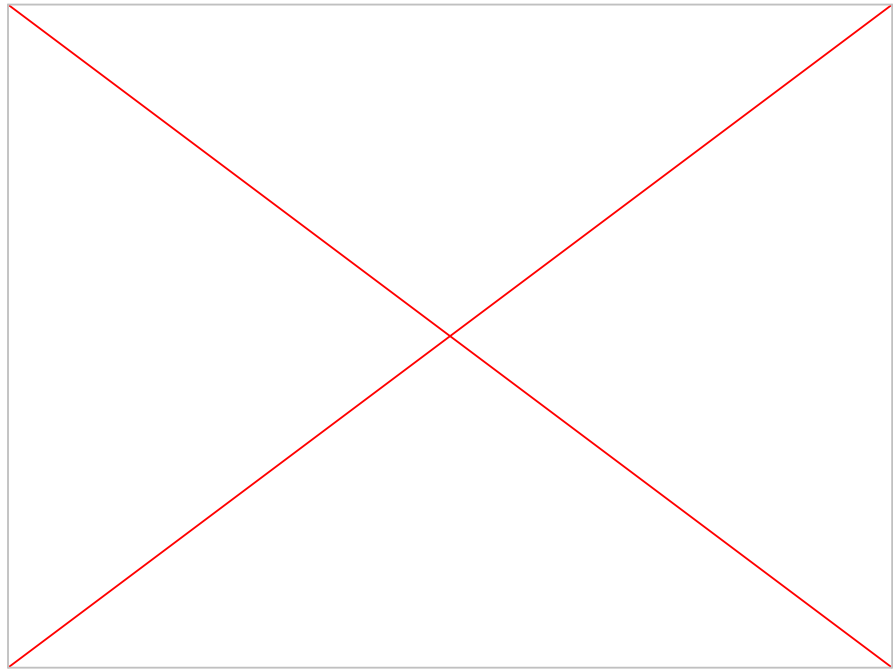
TAG: 008EC794

TAG: 008EC795

TAG: 008EC795|

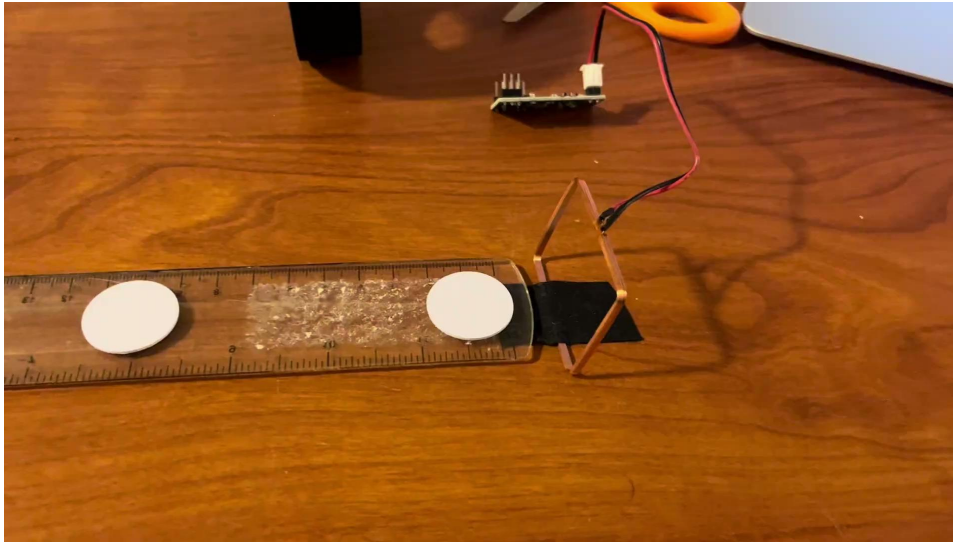
TAG: 008EC796

VALID GOAL!



EDGE CASES: OUTPUTS

2. Ball partially crosses the goal line, and is then pulled back out of the goal



TAG: 008EC793

TAG: 008EC794

TAG: 008EC795

TAG: 008EC795

TAG: 008EC794

TAG: 008EC793

FUTURE IMPLEMENTATION

WITHIN SOCCER:

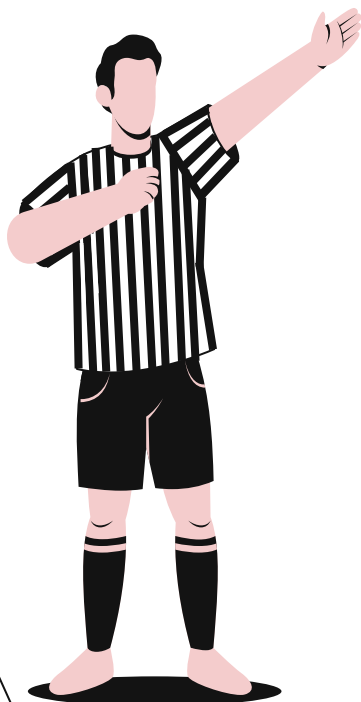
1. Whether the ball as stayed in bounds or not
2. Whether a player has stepped out of bounds



OTHER SPORTS:

1. Adapt to goal rules of other sports (touchdown in football, touching a base in baseball, etc)
2. Boundary tracking
3. Amateur leagues





Resources

- [1] Esther Lee Rosen, E. L. Y., Holzer, H. J., & Watson, T. (2016, July 28). *Sports, jobs, & taxes: Are new stadiums worth the cost?*. Brookings.
<https://www.brookings.edu/articles/sports-jobs-taxes-are-new-stadiums-worth-the-cost/>
- [2] *Publications/Laws*. U.S. Futsal. (n.d.). <https://www.futsal.org/publications/laws/>
- [3] McHaney, S. (2014, June 16). *Goal-line technology begins to clear controversial goals*. PBS.
<https://www.pbs.org/newshour/world/goalline-technology-begins-clear-controversial-goals>
- [4] Spagnolo, P., Leo, M., Mazzeo, M., Nitti, N., Stella, E., & Distante, A. (2013). *Non-invasive Soccer Line Technology: A Real Case Study*. IEEE Conference on Computer Vision and Pattern Recognition Workshops. 10.1109/CVPRW.2013.147.
- [5] Ekin, A., Tekalp, A. M., & Mehrotra, R. (July, 2003). *Automatic soccer video analysis and summarization*. IEEE Transactions on Image Processing. 12(7), 796-807. 10.1109/TIP.2003.812758.
- [6] Ghosh, S. et al., (2019). *Radio Frequency Identification Based Goal Line Technology for Quick Decision Making in a Football Match*. Devices for Integrated Circuit (DevIC). 441-445.
10.1109/DEVIC.2019.8783918
- [7] Leveridge, S. (2024, May 2). *Why La Liga doesn't have goal-line technology*. Forbes.
<https://www.forbes.com/sites/samleveridge/2024/04/22/why-doesnt-la-liga-have-goal-line-technology/>
- [8] *Radio Frequency Identification (RFID): What is it?: Homeland security*. U.S. Department of Homeland Security. (n.d.).
[https://www.dhs.gov/archive/radio-frequency-identification-rfid-what-it#:~:text=Radio%20Frequency%20Identification%20\(RFID\)%20technology,requiring%20a%20line%20of%20sight](https://www.dhs.gov/archive/radio-frequency-identification-rfid-what-it#:~:text=Radio%20Frequency%20Identification%20(RFID)%20technology,requiring%20a%20line%20of%20sight)