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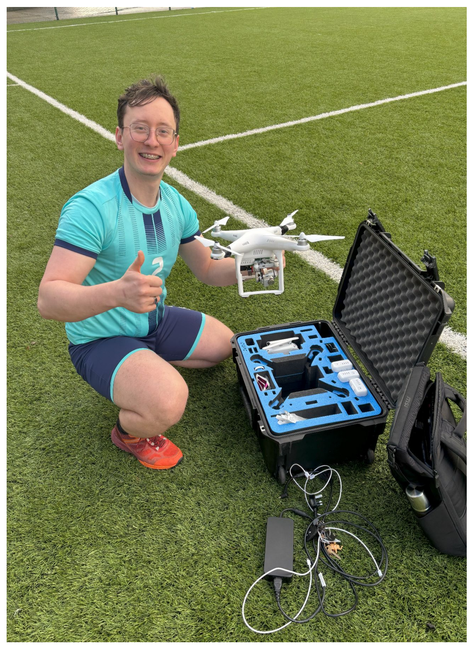
Move Safe Analytics: Injury preventing system powered by drone in field sports.

Ivan Lapickij [1] ***, Guilherme Daniel Gomes*** [2]

[1] 4th Year Student, in Software Design

[2] Supervisor, Department of Computer and Software Engineering, Technological University of The Shannon: Midlands Midwest

Abstract: Field sports represent a billion-dollar industry where performance tracking and statistics drive winning strategies. However, there is a significant gap in technology designed to protect the most valuable assets—players—from injury. Move Safe Analytics (MSA) utilizes AI-powered drones to monitor players in real time, analyze game data, and provide live feedback during matches and training sessions. This research primarily focuses on gathering data on collision frequency and duration. These metrics are crucial for preventing injuries by enabling teams to minimize hazards or manage acceptable risks, based on a combination of academic studies, data from MSA, and expert judgment.



Introduction:

Recent analyses of injury trends in elite football highlight both progress and ongoing challenges in player safety. For instance, during the 2014 FIFA World Cup, 104 injuries were recorded, with 63.4% attributed to player-to-player contact. Although the overall incidence of injuries declined by 37% from 2002 to 2014, experts emphasize the need for a more detailed examination of injury mechanisms to further enhance prevention strategies.

The Move Safe Analytics (MSA) application is committed to reducing injury risks by using advanced AI-powered drone technology to monitor player interactions in real time.

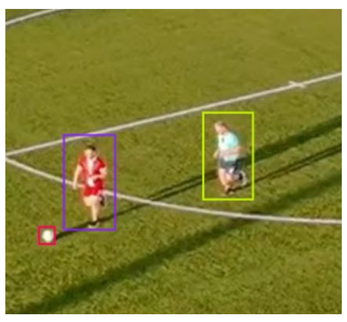
By accurately capturing the timing and duration of collisions between players, MSA provides coaches and experts with critical data to analyze and interpret collision dynamics.

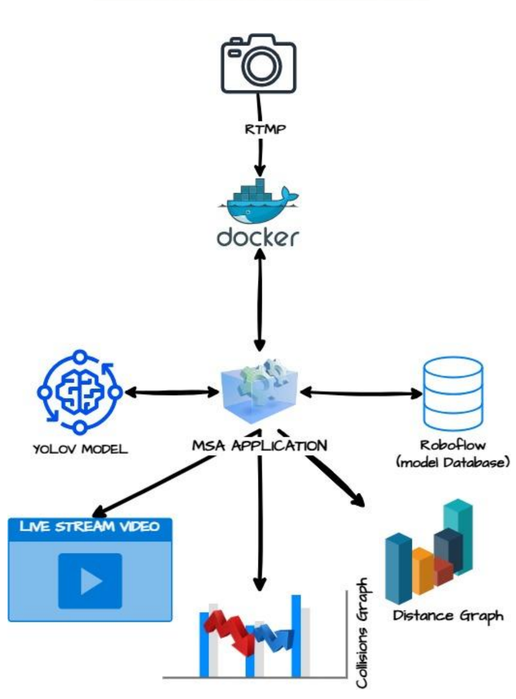
This insight supports informed decision-making and the development of targeted strategies aimed at minimizing injury risks in competitive sports.

Methodology:

In the development of Move Safe Analytics (MSA), Docker was utilized to establish a robust server environment that supports the real-time messaging protocol (RTMP) for streaming drone footage. The core application was built using Python, chosen for its popularity and ease of integration with machine learning tools, which facilitated the development of both the frontend and backend.

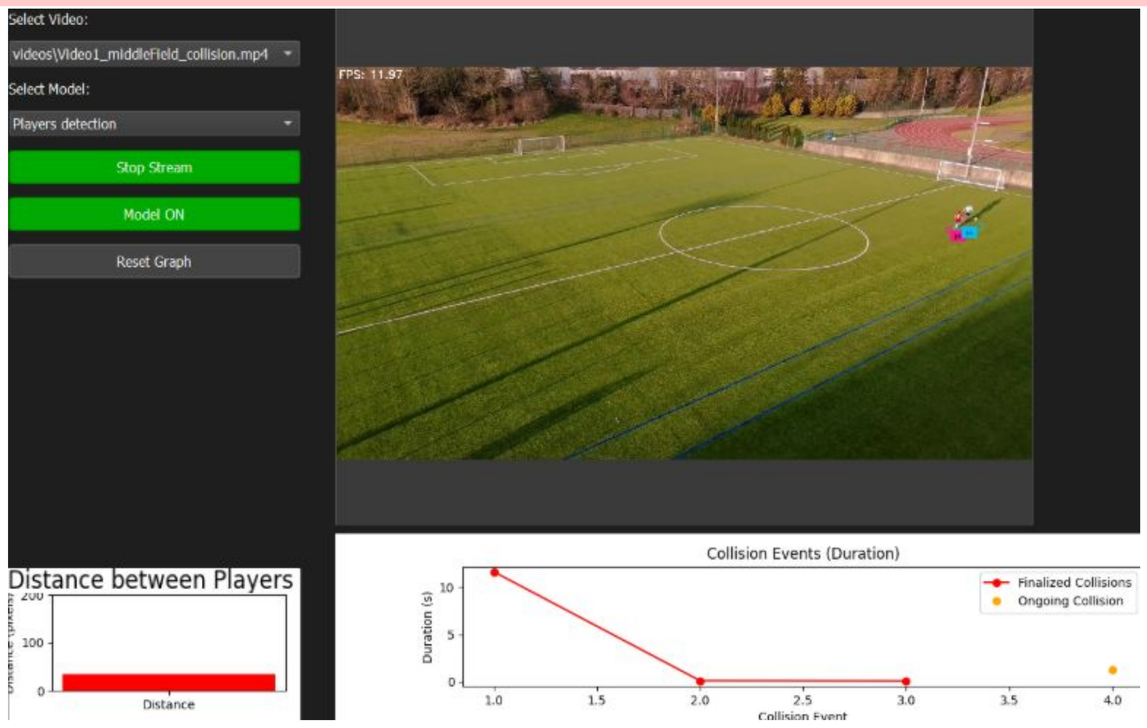
For object detection and tracking, custom video data was employed to train models that are managed and hosted on the Roboflow platform. To track player movements, the application calculates the center of each player's bounding box derived from the detection model. This positional data is then used to compute the Euclidean distance between players, enabling the system to assess proximity and detect potential collisions.





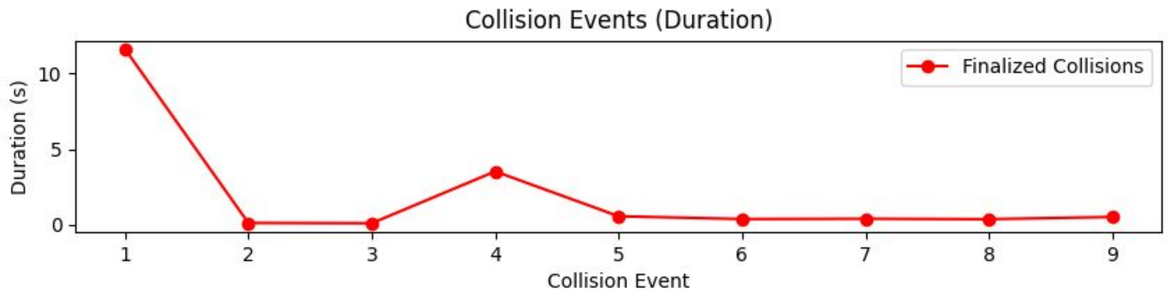
Results and Discussion:

- ★ "Object detection & tracking" Machine Learning model was trained and recognises players with precision of 85.5% which is pretty high.
- ★ Transmission of DJI NEO drone live streaming through RTMP protocol to Docker server.
- ★ Display of streaming in application.
- ★ Display of distance graph between players.
- ★ Collision graph showing potential players collision duration and frequency.



Conclusion:

Application that is intended to prevent injuries is integrated with newest technology such as DJI NEO AI-powered drone & Docker server. Shows that it is able to track potential collision duration and frequency using drone footage. MSA is providing data that can help teams make safer decisions and support research in injury prevention.



Future Work:

MSA have a lot of potential where further implementations could involve speed & pose tracking using "Homography" and other Yolov "Pose" model. Particularly knee bending angle while running to direct correct movement or discover hidden trauma. Aswell application results could be complimented adding smartwatch to track other metrics during match like heartbeat and temperature of body.

Acknowledgments

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