Localization:

Localization is an important aspect of computer vision that enables machines to understand and interact with the visual world around them. It refers to the process of identifying and localizing objects or features within an image or video. This can involve detecting the location and boundaries of objects, identifying specific features within the image, or tracking the movement of objects over time.

Object detection is a common technique used in localization. This involves using computer vision algorithms to identify and localize specific objects within an image or video. Object detection can be used for a variety of applications, such as identifying and tracking vehicles in traffic, detecting defects in manufactured products, or identifying and tracking individuals in security footage.

For the scope of the project, we have used YOLOv8 to detect players in the visible plane and then using Hough transform and some manual calculation we got the relative position of the players with respect to the field. The proposed model is to get the players relative co-ordinates in the field, their team status(home/away), player's position and his jersey number. Matching these features across multiple frames will help in determining their position and movement on the field.

It's worth noting that tracking players in a dynamic and fast-paced environment like a football game can be challenging, and we might need advanced techniques like Kalman filtering or particle filters to improve the accuracy of the player tracking. Also, one could try to get overhead view of the field instead of the bird eye view. However, the system's performance can be affected by factors such as occlusions and lighting conditions, and further research is needed to address these challenges.

Proposed system Flow:

Home Page: The home page should contain a welcome message and provide options for the user to upload the video footage of an American Football game that they want to analyze or select a previously uploaded video.

Video Upload: If the user selects the option to upload a video, they will be directed to a page where they can browse their computer or device to select the video file they want to upload.

Video Processing: After the video is uploaded, the application will begin processing the video footage by extracting frames at regular intervals and applying object detection and tracking algorithms to detect and track players in each frame.

Player Localization: The application will then convert the positions of the players detected and tracked by the object detection model, to 2D positions on a localized plane, which represents the American Football field.

Game Play Analysis: The user will then be able to view the player movements on the 2D localized plane by plotting the players' positions at each time step. The user can analyze the game play to identify patterns, such as player movements by their positions and jersey numbers which will help to analyze the tactical plays.

System Output:

1. Choosing the video of the game play:

Welcome to Game analyzer

Upload Game Video to begin game analysis

Video File:

[Choose File] 57586_000540_Endzone.mp4

[Submit]

2. This video will be processed and saved to the backend. By analyzing the video, the preprocessor will report the players relative co-ordinates in the field, their team status(home/away), player's position and his jersey number.

3. We can use the game analyzer page to enter the game name and the things that you want to track.

Welcome to Game analyzer

Enter the Game Name, positions or jersey number to begin game analysis

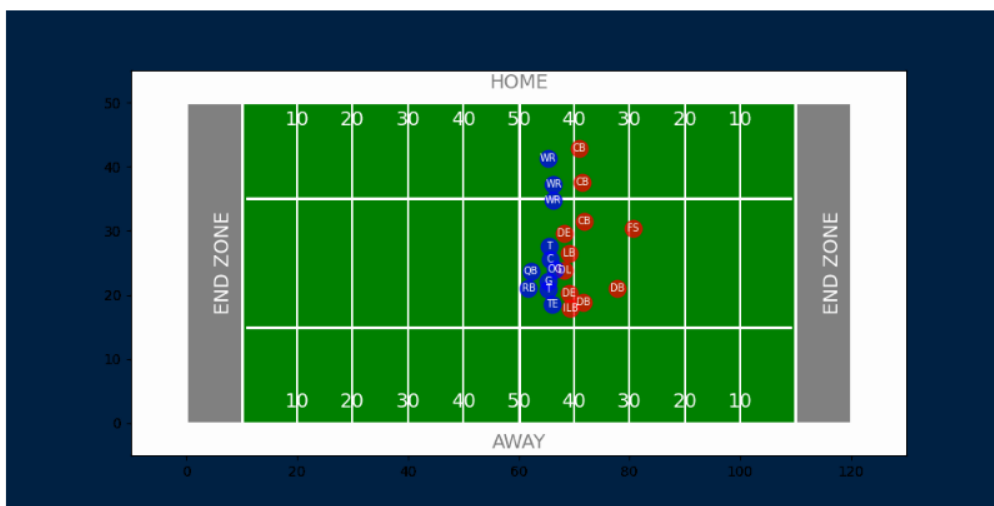Gameplay:

58173_003606

Position:

All

Jersey:

[Submit]

Results

Gameplay

58173_003606

Position

All

Jersey

None

Decoded Play

Welcome to Game analyzer

Enter the Game Name, positions or jersey number to begin game analysis

Gameplay:

58173_003606

Position:

Jersey:

All

Submit

Results

Gameplay

58173_003606

Position

None

Jersey

All

Decoded Play

Welcome to Game analyzer

Enter the Game Name, positions or jersey number to begin game analysis

Gameplay:

58173_003606
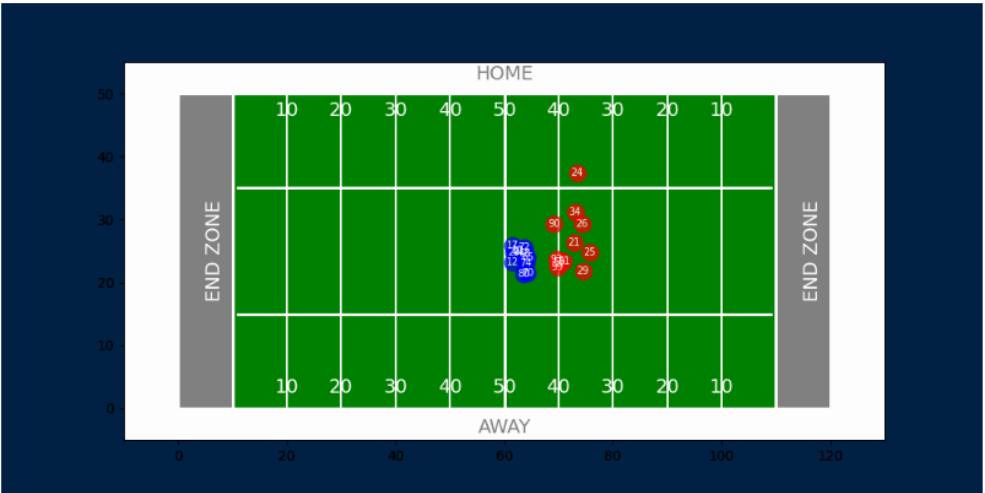
Position:
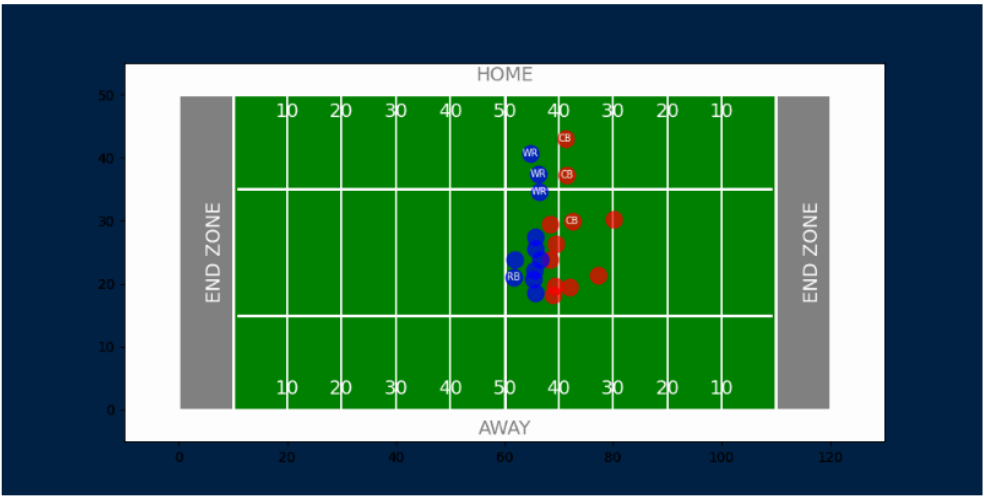
WR CB RB

Jersey:

Submit

Results

Gameplay

58173_003606

Position

['WR', 'CB', 'RB']

Jersey

None

Decoded Play

Welcome to Game analyzer

Enter the Game Name, positions or jersey number to begin game analysis

Gameplay:

58173_003606

Position:

Jersey:

12 24

Submit

Results

Gameplay

58173_003606

Position

None

Jersey

['12', '24']

Decoded Play