Ahmedabad University

CSE-523 Machine Learning

Weekly Report-6

Project Title: Use fuzzy logic to find the direction of motion of a vehicle.

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Summary:

After successfully classifying the direction, finding the theta through vector analysis, and exploring fuzzy logic, we implemented it in the previous code. We visualized the resultant vectors with fuzzy logic results overlaid on an image.

Activities:

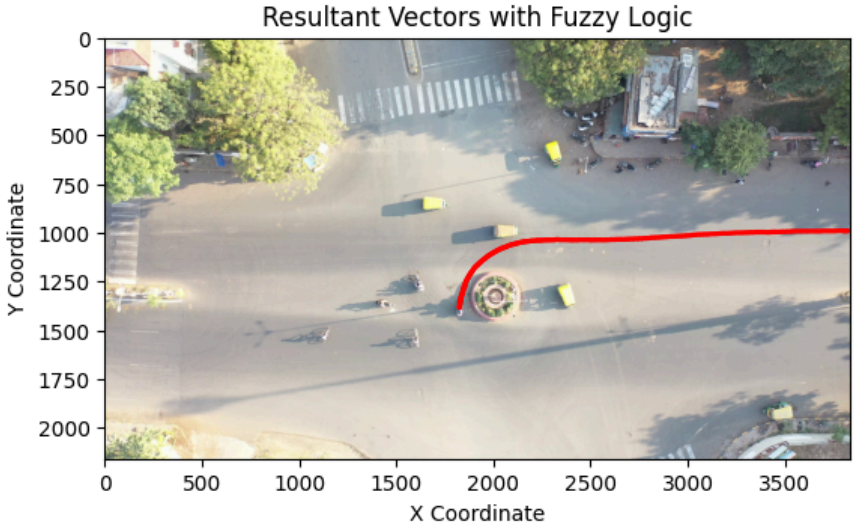
Meeting:

- We brainstormed again to make improvements in our fuzzy logic understanding.
- We discussed how fuzzy logic can be implemented more accurately, taking care of the current scenario.

Fuzzy Logic:

- We developed algorithms to calculate angles between consecutive points in the object's trajectory and applied fuzzy rules to determine the direction based on these angles. This involved defining membership functions for different angle ranges and combining them using fuzzy OR operation.
- We visualized the results by plotting resultant vectors on the image and fuzzy logic-based direction indicators. This visualization provides a comprehensive understanding of the object's movement patterns and facilitates analysis of its directional tendencies.

- With the improvement of the fuzzy logic implementation, here are the plots that visualize the track prediction of an object for the given time frames:



Challenges Faced:

While implementing fuzzy logic for direction determination, we encountered the following challenges:

- Fine-tuning Membership Functions: Achieving optimal performance required fine-tuning the parameters of the membership functions to capture the relationship between angles and directions accurately

- Handling Critical Scenarios: We successfully implemented the fuzzy logic in the code. However, some of the critical scenarios required more robust handling. Our code could predict the direction of a moving object almost accurately but with minor errors. Hence, these essential edge cases need to be handled more accurately with the least minimum errors.

Next Steps:

- We are focusing on further improvising the fuzzy logic implementation so that the logic is more robust to real-life critical scenarios and efficient enough throughout.

Conclusion:

By the end of the week, we were able to make significant progress and achieve the goal that we set. We aim to improve the prediction of our fuzzy logic idea and make it more efficient in handling critical scenarios, providing more insightful analysis and improving its overall effectiveness.