Ahmedabad University

CSE-523 Machine Learning

Weekly Report-5

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

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Summary:

After being successfully able to classify the direction after finding the theta through vector analysis, we focused on learning the core concepts of fuzzy logic. After learning fuzzy logic and understanding its application, we finally implemented it on the previous code.

Activities:

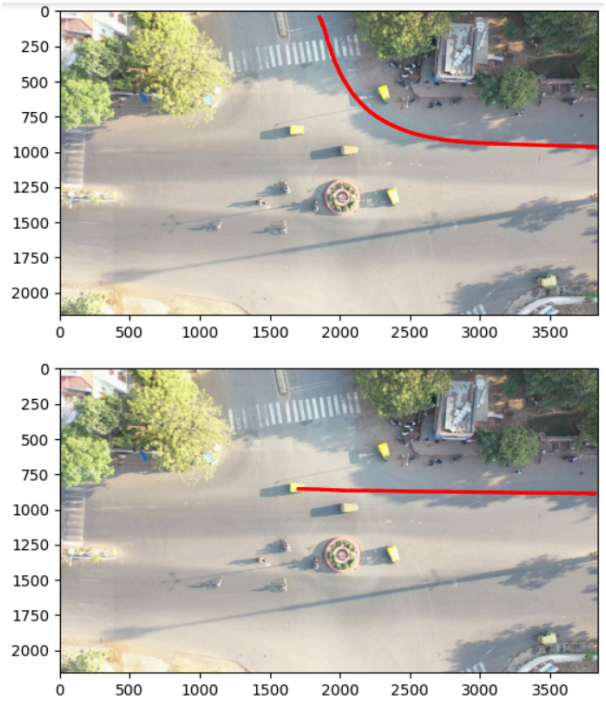
Meeting:

- We shared our understanding of what fuzzy logic is.
- We discussed the limitations of the current approach and how fuzzy logic can overcome it. Finally, we were able to find a way to implement fuzzy logic on the current.

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 along with fuzzy logic-based direction indicators. This visualization allows for a comprehensive understanding of the object's movement patterns and facilitates analysis of its directional tendencies.

- After applying fuzzy logic we got these visualisations that predict the track 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 accurately capture the relationship between angles and directions.

- Handling Edge Cases: Handling edge cases, such as angles close to the boundary between direction categories, required careful consideration to ensure accurate direction determination.

Next Steps:

- Testing and Validation: We will conduct rigorous testing and validation to assess the performance of the integrated system under various scenarios and conditions.

Conclusion:

By the end of the week, we were able to make significant progress and achieve the goal that we set. The successful integration of fuzzy logic leverages the capabilities of our predictions, providing more insightful analysis and improving its overall effectiveness. We look forward to further refining and optimizing the system in the upcoming weeks to deliver a robust and reliable solution.