Scene-aware and Social-aware Motion Prediction for Autonomous Driving

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Technical University of Munich

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Agenda

Introduction

Autonomous Driving Promise

- Efficiency and Safety

Challenges in Motion Prediction

- Multimodality
- Scene Dependence
- Social Acceptability

Crucial Understanding

- Human-Driven Behavior Key

Limitations of Current AI Tools

- Control Perspective Absent
- Intent Interpretation Challenge

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Scenarios we filtered the dataset with:

- Lane merging

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Video demo of the scenarios

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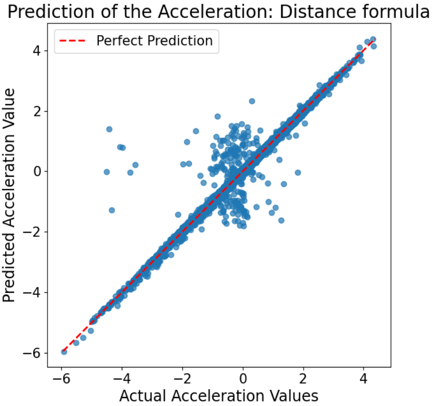

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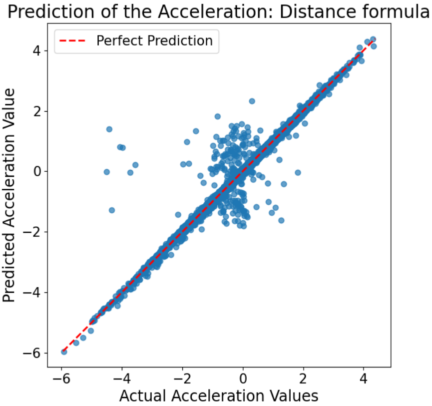
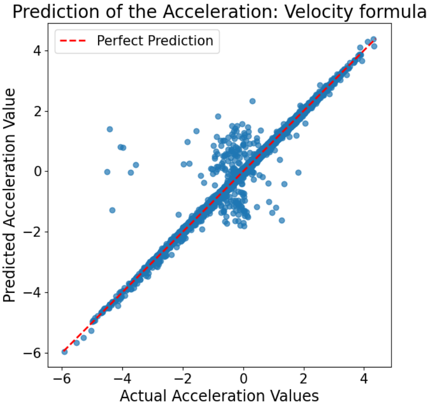
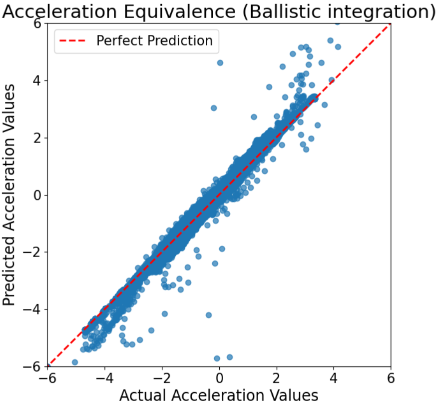




Results: Comparison to the old acceleration model



MSE: 3.0786e+02

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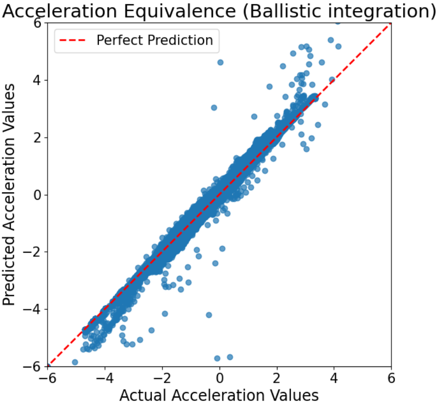

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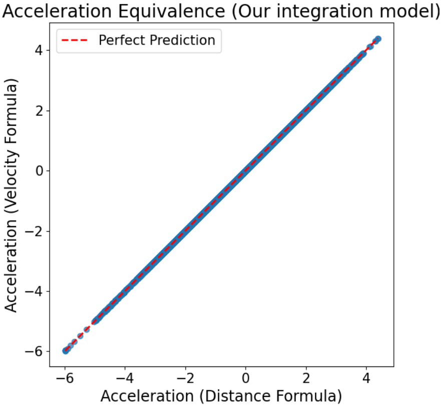

MSE: 1.9220e-09

Results: Integration Method

Rearranging the formula to the distance and velocity gives us these results:

Video demo of predicted car

Results

Summary:

- Successfully implemented the filtering mechanism

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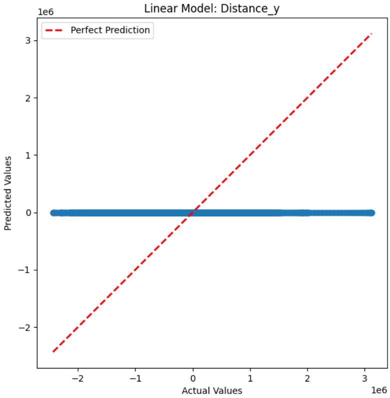
- Able to filter out X different scenarios in Y datasets
- Found a better integration method where the accelerations match
- Able to visualize the integration method and modulate the movement of a car

Acceleration Modification in the Y-axis



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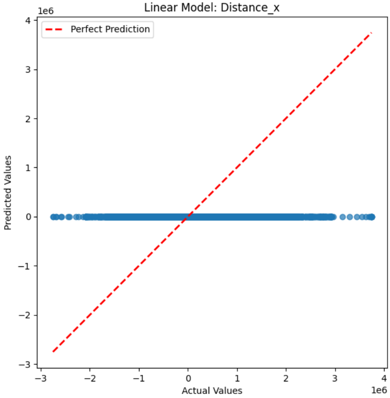

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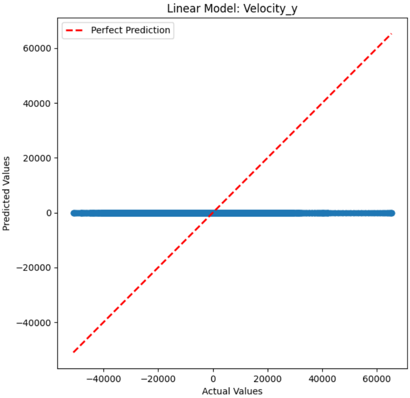

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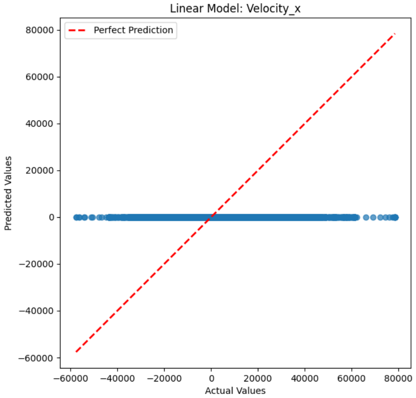
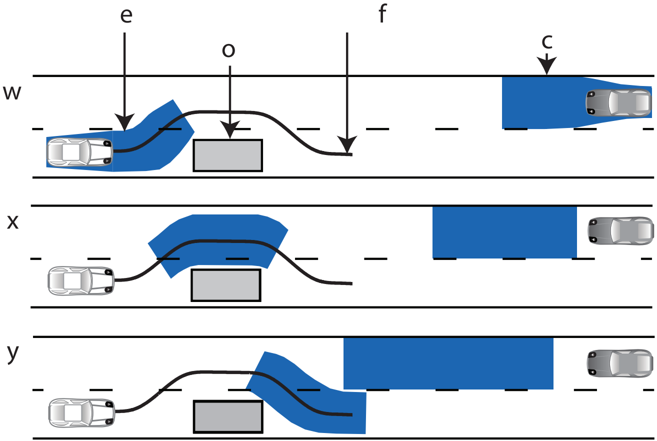


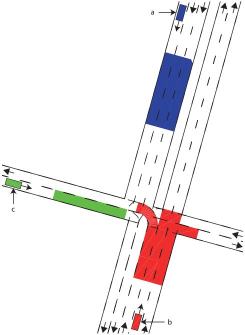
Motivation for Set-Based Prediction [1]



[1] M. Althoff and S. Magdici, "Set-based prediction of traffic participants on arbitrary road networks," IEEE Transactions on Intelligent Vehicles, vol. 1, no. 2, pp. 187–202, 2016.

SPOT

SPOT: A tool for set-based prediction of traffic participants [2]



Initial configuration and $\mathcal{O}(t)$ for $t \in [1.5\,\mathrm{s}, 2.0\,\mathrm{s}]$

[2] M. Koschi and M. Althoff, "SPOT: A tool for set-based prediction of traffic participants," in Proc. of the IEEE Intelligent Vehicles Symposium, pp. 1679–1686, 2017.

Conclusions

- Item
- Item
- Item

beginframe

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endframe

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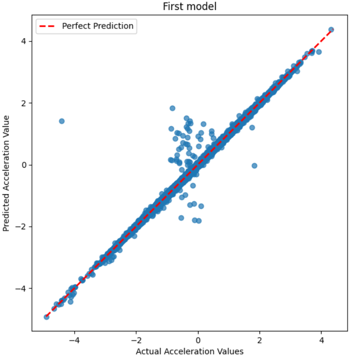

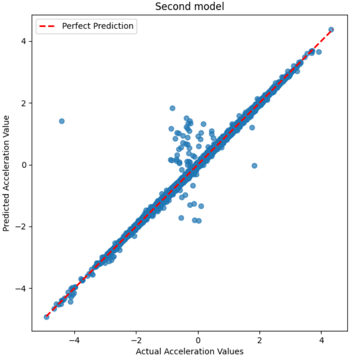

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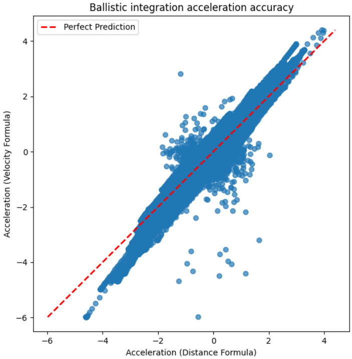
Accuracy of the prediction for the acceleration using the Ballistic Integration method (MSE): 4.3249e-02



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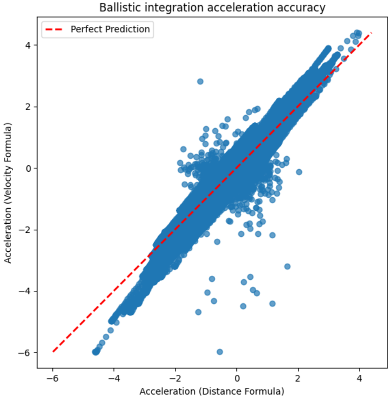

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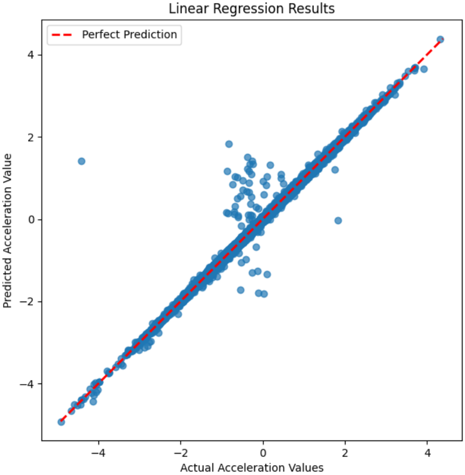

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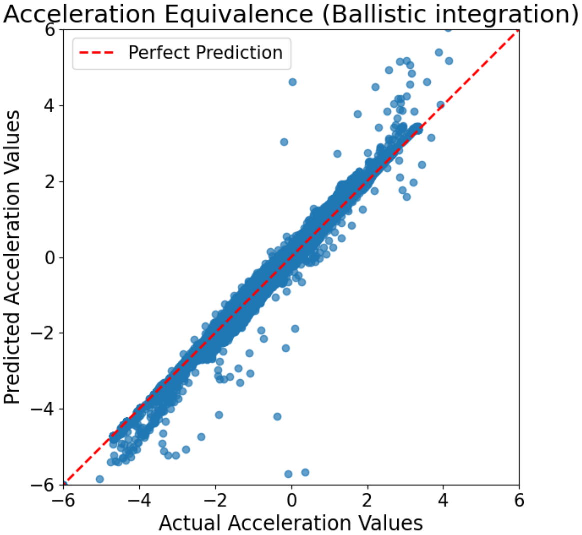

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- Test the integration model with the neural network for performance (task for the next team)

Questions?