CISC 322 Assignment 1

Conceptual Architecture of Apollo

Group 19

Presentation Youtube Link:
https://youtu.be/QQG8C7Ifkdg

Presentation Google Drive Link:
https://drive.google.com/file/d/1DWS4cxvLMdtVFgQfE4lZg04747eR1_9N/view?usp=sharing

CISC 322 Assignment 1

Conceptual Architecture of Apollo

Group 19

Group members

Runfeng Qian (group leader), Runze Lin, Wonton Zhou, Haoyun Yang, Ziheng Yang, Junyu Yan

Slides prepared by: Runze Lin
Slides presented by: Runze Lin, Wonton Zhou, Haoyun Yang
Report:

1. Abstract: Wonton Zhou
2. Introduction: Wonton Zhou, Ziheng Yang
3. Derivation Process: Wonton Zhou
4. Conceptual Architecture: Runze Lin, Haoyun Yang(graph)
5. Subsystem: Wonton Zhou, Runze Lin, Junyu Yan
6. Use case: Runfeng Qian
7. Concurrency: Runze Lin
8. Graph: Runfeng Qian
9. Development view: Runze Lin
10. System evolution: Ziheng Yang
11. Glossary: Wonton Zhou, Runfeng Qian, Runze Lin
12. Conclusion, lesson learned: Wonton Zhou
13. Proof read and mistake checking: Runfeng Qian, Runze Lin
14. Website modification: Ziheng Yang, Junyu Yan

Intro

- autonomous driving vehicle
- Baidu Apollo program
- revolutionary open source software platform

Sub-Systems

- Map Engine
- Localization
- Perception
- Prediction
- Planning
- Control
- HMI

Map Engine

- obtain all kinds of Map data
- information about road conditions

Localization

This module provides localization services.

- The RTK (Real Time Kinematic) based method which incorporates GPS and IMU (Inertial Measurement Unit) information
- The multi-sensor fusion method which incorporates GPS, IMU, and LiDAR information.

Perception

- multiple cameras, radars (front and rear) and LiDARs
- location, velocity and orientation of obstacles on the road

Prediction

- study and predict the behavior of all the obstacles detected by the perception module
- Input:
  - Obstacles information
  - Localization information
  - Planning trajectory of the previous computing cycle from the planning module
- Output: Obstacles annotated with predicted trajectories and their priorities.

Planning

- Plotting a feasible space-time trajectory for autonomous driving vehicles
- Input: Localization, Perception, Prediction, HD Map (in modules/map/data), routing, task_manager.
- Output: A collision-free and comfortable trajectory for control module to execute.

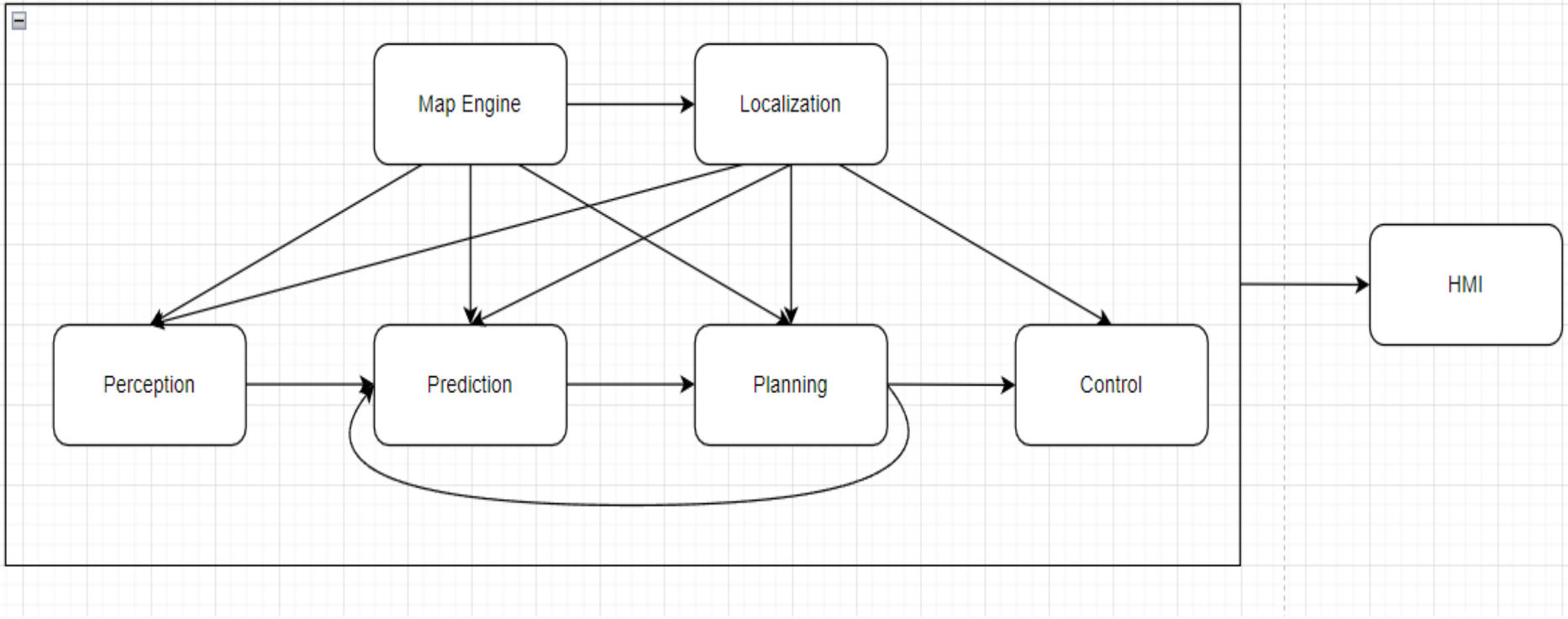
Control

- generate a comfortable driving experience.
- Input:
  - Planning trajectory
  - Car status
  - Localization
- Output: Control commands to the chassis.

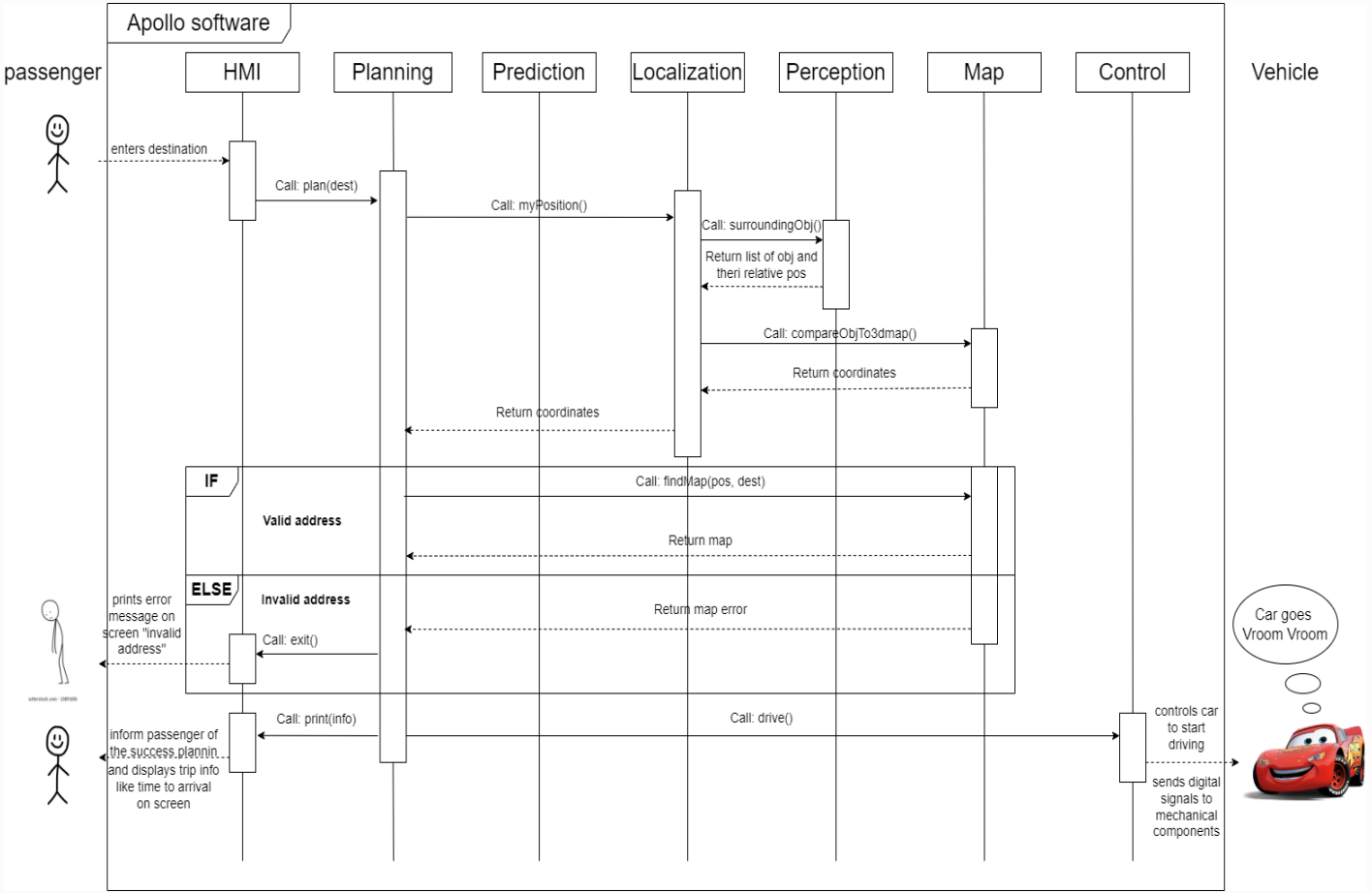
HMI

- Human-computer interaction interface
- Visualize vehicle driving status, test modules, provide debugging tools, and facilitate real-time driver control of vehicle movement

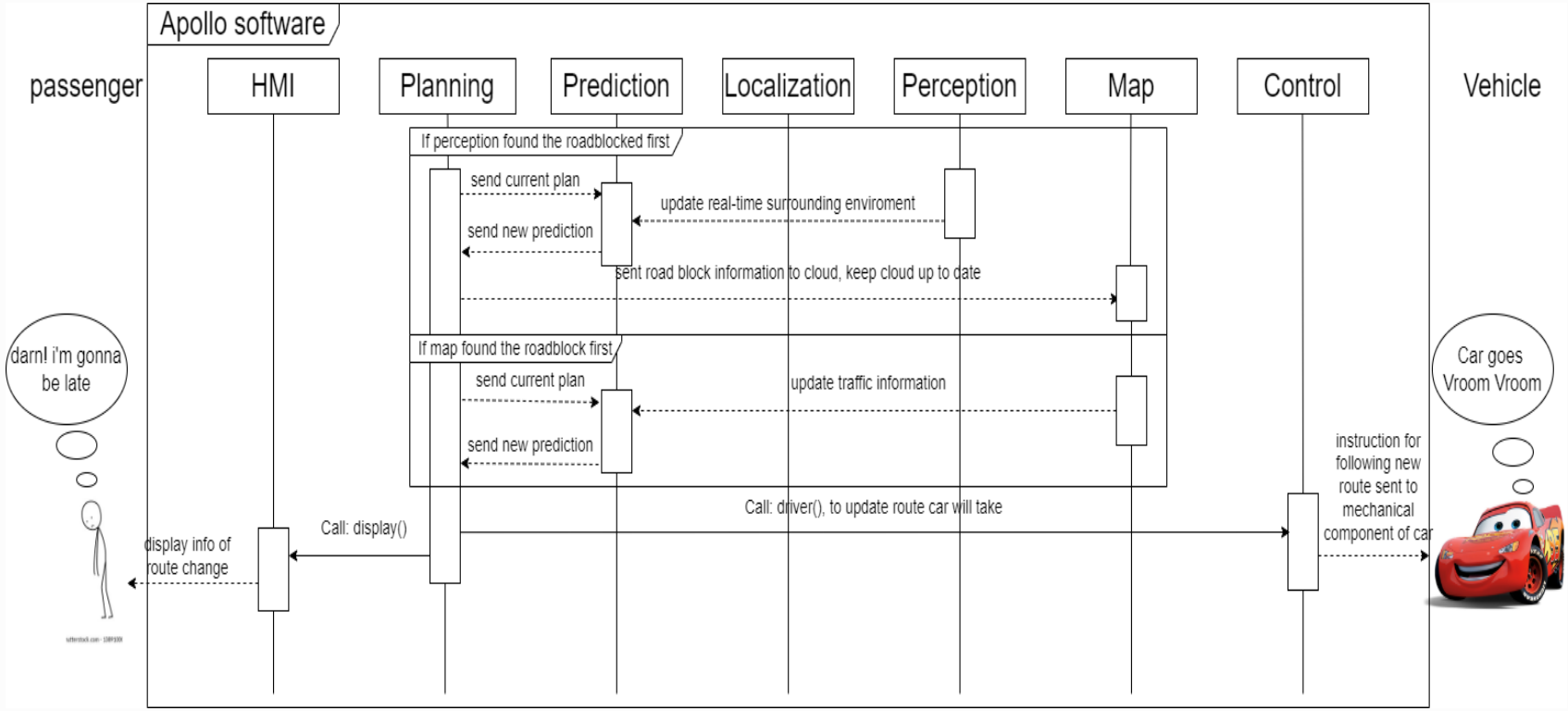
Conceptual Architecture



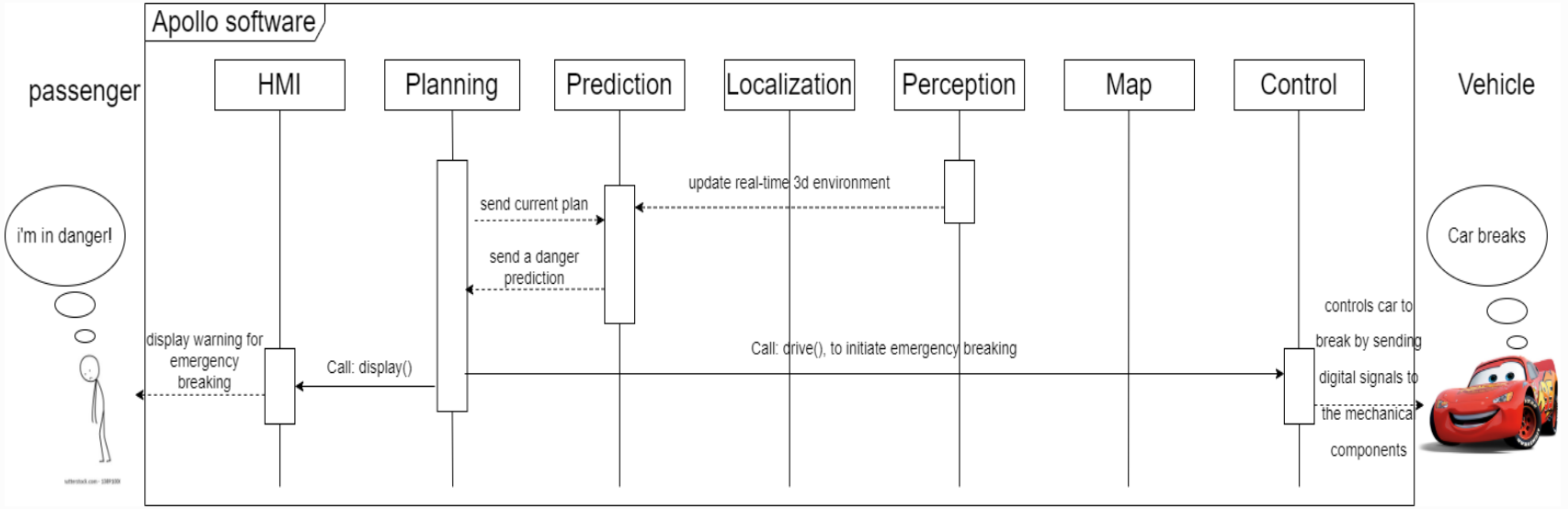
Use Case 1: User enters desired destination, Apollo program plans route accordingly.



Use Case 2: Apollo system encountered a closed road, proceed to recalculate route.



Use Case 3: Apollo system encounters human activity on road ahead, takes precaution to ensure safety.



Concurrency & Conclusion


Thank you