1 Introduction

Since our team modify the car with Jetson Xavier NX and distance sensors so we have decided not using simulation for our project, the new car kit couldn't be delivered before report 1 so our team currently using our car for now. This month our team archived the following:

- We had a meeting and basically defined the project architecture we needed to build and assign tasks to each person.
- Processing road image to detect lane.
- Trying CNN method to detect bounding box for object detection.
- Define IMU and distance sensors.
- Setting up server for localization on map
- Building physical testing environment.
- Building an algorithm for lane tracking.

2 Planned activities:

Activity Description	Members in Charge	Type of Activity
Processing road image to detect lane	Lâm, Trâm, Khôi	Development
Trying CNN method for object detection	Khôi	Research
Define IMU and distance sensor	Minh, Khanh	Development
Setting up server for localization	Minh, Khanh	Development
Building physical testing environment	All Members	Environment Preparation
Building an algorithm for lane tracking	Lâm, Trâm	Research

3 Status of planned activities

- **Processing road image to detect lane**
- **Status**: ongoing 90%
- **Implementation**: Detect lane line using Canny Algorithm. Improved method was proposed by using noise reduction technique to detect lane line more smooth.
- **Difficulties**: No active solution for detecting horizontal line (intersection). Haven't handle intersection road.

- **Detect bounding box for object detection**
- **Status**: ongoing 90%
- **Implementation**: Detect object using HSV threshold.
- **Difficulties**: If background has too much noise or coincides with the sign, it may detects wrong.

- **Define IMU and distance sensor**

- **Status**: completed
- **Implementation**: Decided to use the IMU BNO055 and VL53L1X as our distance sensors. Then we read their datasheets, identify available APIs, and then modify them for compatibility with the Nucleo F411RE board.
- **Result**: We can read the necessary data and configure the sensors to various modes based on our usage requirements and external environmental conditions.

- **Setting up server for localization on map**
- **Status**: ongoing : 70%
- **Implementation**: Read document and the provided code of *Computer* and *Brain*. Learn how to use the MDEK1001 kit.
- **Result**:
    - Understand the flow of communication between server and brain.
    - Set up anchors and tags, then get their information (location, id, ...) using computer.
- **Difficulties**: It is hard to become familiar with the Twisted library and multiprocessing at first.

- **Building physical testing environment**
- **Status**: ongoing 70%
- **Implementation**: We have build a smaller version of the race track consist of crossroad, parking lot, dash line.
- **Difficulties**: The race track is large so we can only build a small map base on the main map, it is not cover all the challenges.

- **Building an algorithm for lane tracking**
- **Status**: ongoing 80%
- **Implementation**: We use algorithm we have developed in previous autonomous car projects to implement for this project.
- **Difficulties**: Delay in the code causing respond problem when car is in highspeed.

4 General status of the project

We can interact on control the car using the keyboard with our custom code.

5 Upcoming activities

In the next month we will do the following things:

- Finished tasks started in previous weeks:
- Lane detection.
- Algorithms for lane tracking.
- Setting up server for localization.
- Building physical testing environment.
- Create bounding box for object detection.
- Started new tasks:
- Camera handling.
- Define a way of parallel developing and testing.
- Implement control algorithms on physical robot to keep on lane and making curves.
- Define communication between packages.