CMSC477: Robotics Perception and Planning
Project 0: Robot SDK Setup and Usage

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Introduction:

In this project, you will set up the developing environment and run an apriltag tracking task to verify all functions of your robot.

Setup Guide:

- Install the programming environment and SDK:

- Install or check that your system has Python with version between 3.6.6 and 3.8.9., Please follow the guide here. If you use Linux and your base operating system has a higher version, we recommend using Anaconda, to create a virtual python environment with a supported version of python.
- For SDK installation, please refer to this page.
- We tested the SDK on Ubuntu, Windows, and Mac OS. If you encounter any problems please contact a TA during the lab.

- Connect your laptop to the robot using Wi-Fi direct connection using the provided USB Wifi adapters.

- Please follow the instructions here.
- Alternatively, you can setup a networking connection using the RAL lab router. But we believe the direct connection will work better for Project Zero.

- Run example Python Programs

- Download SDK
- Open the provided examples in “Robomaster-SDK/examples”.
- Camera: “python3 https://github.com/dji-sdk/RoboMaster-SDK/blob/master/examples/04_camera/01_video_with_display.py”
- Test movement **(move robot off of table!)** :
  Position Control: “python3 RoboMaster-SDK/examples/02_chassis/01_move.py”
  Speed Control: “python3 RoboMaster-SDK/examples/02_chassis/03_speed.py”
- Arm: “python3 RoboMaster-SDK/examples/10_robotic_arm/01_move.py”
- Gripper: “python3 RoboMaster-SDK/examples/11_gripper/01_open_close.py”

- Localize the robot with apriltags

- Install April tag library: `pip install pupil-apriltags`

- Run apriltag.py to detect the apriltag and get the relative localization between the robot and the apriltag

- Track the apriltags:
Till now, you have got the relative localization between the robot and the apriltag, and you also know how to move the robot, please write a program to make the robot track the moving apriltag. You should use the “speed” API in “RoboMaster-SDK/blob/master/examples/02_chassis/03_speed.py”

Grading:

- Successfully configure the development environment and connected to the robot: 10 points
- Successfully tested all parts: 30 points
- Successfully get the relative position through apriltags: 10 points
- Submit a video about apriltag tracking: 50 points
- Bonus: Write a closed-loop controller to make the tracking error close to 0 when the apriltag moves at a constant speed of ~0.5m/s: 20 points.

Submission Guidelines:

Please submit a video. The video should show your team's demonstration and any relevant animated visualizations. This project does not require a report, but subsequent projects will.

Collaboration Policy:

You can discuss the assignment with any number of people. But the report and code you turn in MUST be original to your team. Plagiarism is strictly prohibited. A plagiarism checker will be used to check your submission. Please make sure to cite any references from papers, websites, or any other student’s work you might have referred to.