Work Package for Week 1, 01/05/2020

Note: All details are open to discuss and adjust, even the format of this instruction file itself.

1. Related Links

1. Github repository for matlab scripts: https://github.com/LXYYY/iVip-MARL-Matlab.git
2. I also forked the matlab mobile robotics simulation toolbox for future modification and reference: https://github.com/LXYYY/mobile-robotics-simulation-toolbox.git
3. Reference sharing in https://github.com/LXYYY/iVip-MARL-References.git, considering github really slow these days, we may need a better place to manage references.
4. A programming guide for ethz-asl is also forked here for future reference (it's not used for now): https://github.com/LXYYY/programming_guidelines.git

2. Tasks

The tasks for this week is mainly to dig into the mobile robotics simulation (MRS) toolbox.

1. *For Yicheng*, Review the example code in the toobox, especially the map building, Simulink, and Visualizer parts.

   - How to build an occupancy map, and reset, get lidar data, etc.
   - Understand the structure of the Simulink model given in examples/navigation_rl/trainObstacleAvoidanceAgent.m.
   - If possible, how to modify the map and simulation to dynamic obstacles and multi robots circumstances.
   - If possible, how to build a map according to a environment configuration file, e.g. *.yaml/.txt* etc, as described in *Reference 3*.

2. *For Peixuan*, Review the literature in reinforcement learning.

   - The difference between DQN, DDPG and TD3, *Reference 4* may be helpful.
   - The design principle for the actor and critic networks, and their realtionship with policy gradient and reward function, etc, i.e. what is the input and output of the networks, given a specified target and reward function.

3. *For Xiangyu*, Explore the example code in MRS toolbox.

- How to implement obstacle avoidance and target position reaching simultaneously.
  - Assist other members, to make sure tasks finished in time.

Known Issures

- The training process of the example code is very time-consuming and cost a lot computation, we may need a server to run the training in cloud.

Reference

1. [Matlab MRS toolbox official link](#)
2. [Matlab DQN agent official document](#)
3. [Neural networks based reinforcement learning for mobile robots obstacle avoidance, M Duguleana, et al.](#)
4. [Unmanned Ground Vehicle Indoor Navigation Based on Deep Reinforcement Learning, NTU Dissertation, Yueci Deng](#)