Model Free Reinforcement Learning

Application to Area Coverage Optimization

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Outline

- Concept of Area Coverage Algorithm
- Problem Setup
- Accomplishments
- Comments and Observations

Area Coverage Algorithm

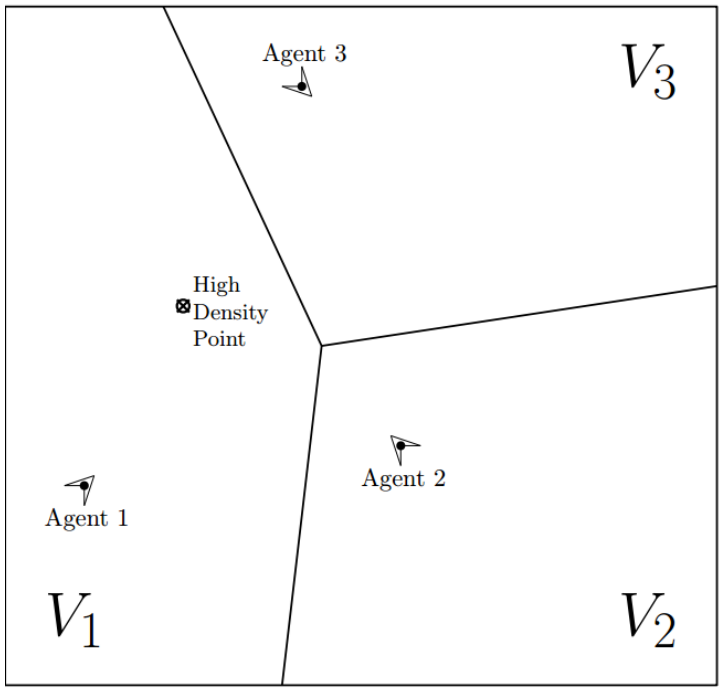

Figure: Voroni regions

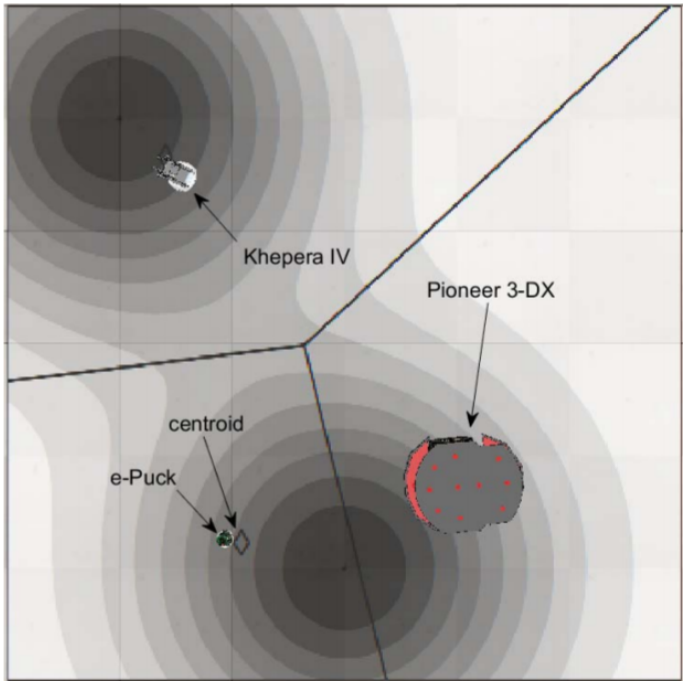

Figure: V-rep simulation

Problem Setup

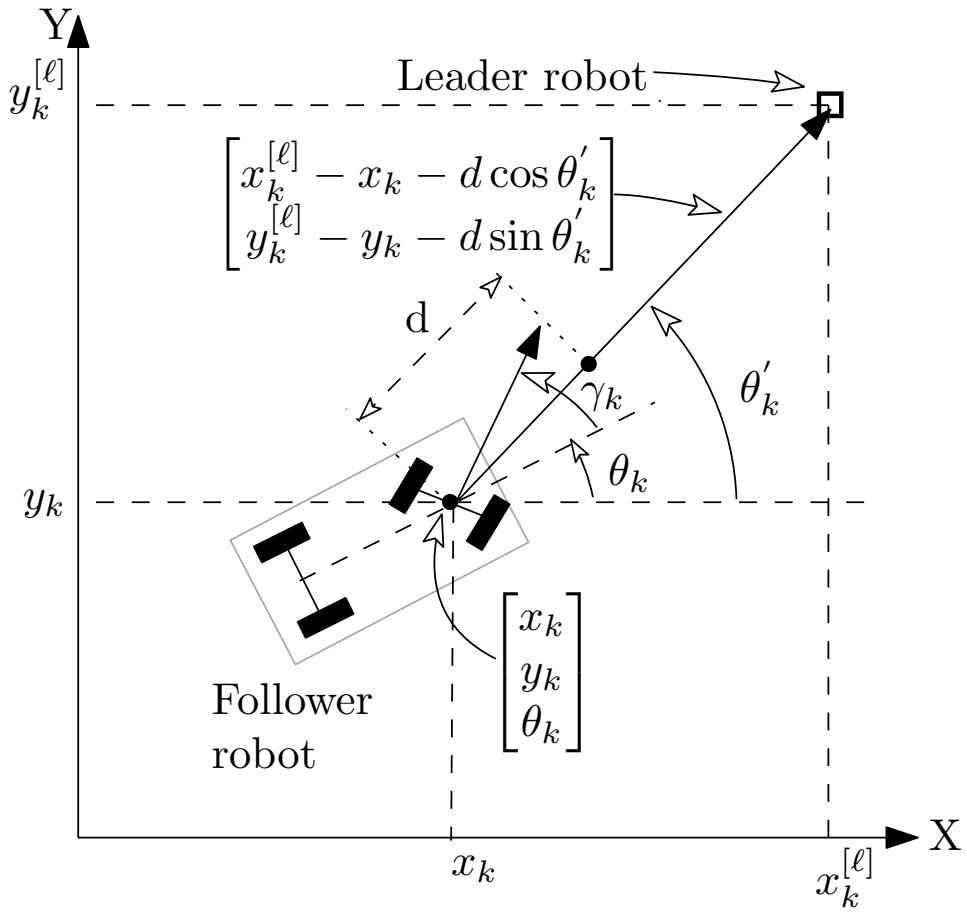

Figure: Problem Setup

NN Archetiture

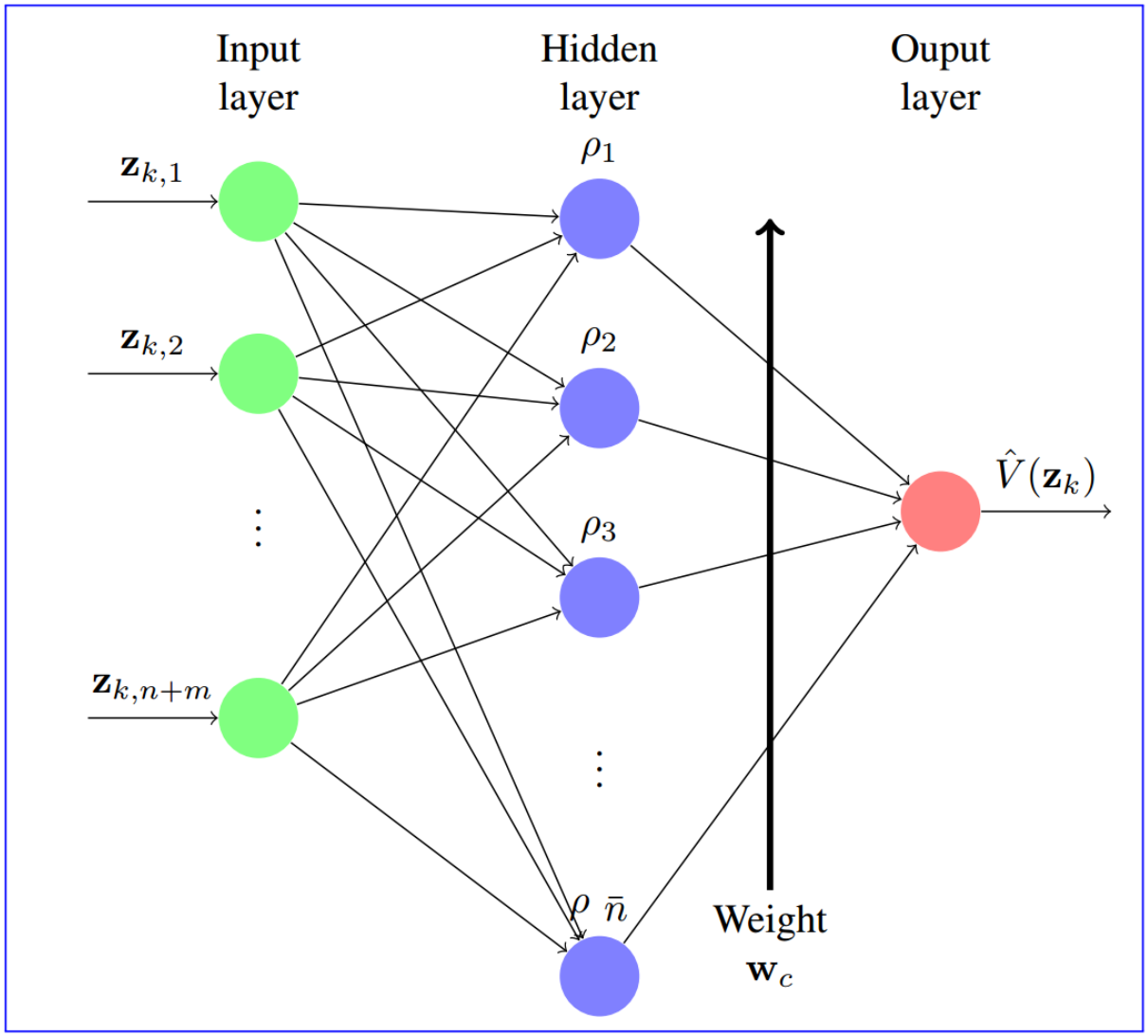

Figure: Neural Network Architecture

Accomplishments

Accomplishments

- Merge the leader follower model free reinforcment learning as a function in the area coverage algorithm.
- Simulate the results in matlab.
- Integrate matlab with CoppeliaSim and perform the simulation.

Comments and Observations

Policy Estimation

It was found that the current way of estimating the ploicy based on the wights **sometimes** lead to divergence.

$$\mathbf{u}_k^* = -\mathbf{P}_{uu}^{-1}\mathbf{P}_{ue} * \mathbf{e}_k$$

Comments and Observations

Gradient Descent

The learning process done through gradient descent approach is really slow and takes huge amount of time due to very small order of the activation functions.

Comments and Observations

Monitoring the policy

We need to come up with a way to monitor the policy and determine wether it's a better policy or not,

Questions?