Project Proposal - Applied Estimation

Thomas Georg Jantos - janots@kth.se - 960508 1570
Jannis Hoppe - jannish@kth.se - 941204 8358

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For our project we want to consider a robot for letter, package or tools delivery. This subject area has gotten quite some attention for drones in cities with high traffic or mobile robots for use in specific environments such as hospitals. Thus, we expect to find up-to-date research material. We want to consider the case of a campus environment, where the robot estimates its position and the current map with features such as trees. We plan on using a video dataset from Stanford University [1], with an environment like the one shown in figure 1. The video material has to be preprocessed as a first step. We could add a fictive robot to the environment moving e.g. from the bottom left to the top right corner "measuring" the distances to all the objects in its vicinity. We want to implement at least a well working SLAM method and then, if we have time, add models for the estimation of moving objects such as people, vehicles or cyclists.This way we could analyze what we have to do in order to make the studied algorithms work for (more realistic) dynamic environments. We will probably use a particle filter. An advantage of this project is, that we can work in distinct steps, in which complexity is stepwise added to the problem: first we implement the filter with a known map, then SLAM, then a dynamic environment (as well as possible in the given time).

Figure 1: Screenshot taken from the Stanford University dataset.

[1] http://cvgl.stanford.edu/projects/uav_data/

1. Notwendige Arbeitsschritte:
    - inhalte für literature research definieren
    - paper suchen (nicht so detailiert)
    - Frames einzeln bearbeiten mit Roboter path, path von unten links nach oben rechts
    - path as motion model definieren
    - Landmarks definieren und Koordinaten extrahieren
    - map erstellen
    - Lab code richtig verstehen
    - alle Eingangsdaten in form von dem lab bringen um code wiederzuverwenden
    - neue map mit normalem lab partikel filter zum laufen bringen
    - erstmal nur tracking betrachten
    - rausfinden wie man in matlab das video "hinterlegt" in einem plot
    - Fast Slam 1.0 implementieren + analysieren
    - Fast Slam 2.0 implementieren + analysieren
    - Bisschen Dynamik reinbringen
    - paper suchen (detailliert)