Project Work – Fall 2007

Static and Dynamic Collision Avoidance Concepts

In the future, a large number of vehicles roaming the Earth will be unmanned. Some of these vehicles will also be completely autonomous, i.e., operate on their own without human intervention. An essential requirement for autonomy is the ability to avoid collisions (with both static obstacles and dynamic objects).

Obstacle avoidance is a static collision avoidance feature closely linked to path planning: Given a map of obstacles, plan a collision-free path from point A to point B. The problem is usually solved through an offline optimization procedure. However, avoiding collisions with moving (dynamic) objects is a much harder problem, and typically cannot be solved through an (online) optimization procedure. Suggested approaches include so-called potential field methods.

Specifically, the project work will encompass the following tasks:

- Perform a thorough literature study of state-of-the-art collision avoidance concepts (for both static obstacles and dynamic objects).
- Comment, compare and contrast the main approaches in the literature.
- Suggest alternative strategies or modifications to existing ones.

The goal of the project work is to get a thorough overview of the research field, and to familiarize with main theoretical design and analysis tools. The project report must be written in English.

The project work should be continued through subsequent thesis work (during the spring of 2008), where the main goal is to suggest and investigate new collision avoidance concepts. Target systems include mobile robots and marine vessels. It might be possible to perform scale-model experiments to validate the proposed schemes. An important goal of the thesis work is to publish some of the results (e.g., at an international conference).

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