MOTION PLANNING USING FUZZY POTENTIAL FIELD

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Description

The Aim of the project is to plan the path for autonomous robot motion in a dynamic system that may have dynamic obstacles as well as a dynamic target. Soft landing of robot on the target is also to be assured. The system is assumed to be fully observable with no uncertainties involved.

Related Work

Various path planning algorithms based on search, geometry such as visibility graphs, potential field and sampling have been developed. Most of the Potential field methods suffer from Local Minimum Problem and/or are also computationally expensive and/or do not consider moving target systems.Ge and Cui**[2]** presents an approach for highly dynamic systems with moving targets . However it requires very high computational capabilities. Tsourveloudis et al **[4]** uses fuzzy logic inference engine for real time navigation in a dynamic environment.

Approach

Potential field for a certain agent consists of two components, one due to the attractive force of the mobile target and the other due to the repulsive forces due to the local obstacles.
The attractive force between the agent and the target is dependent only on the relative position and the relative velocity between the two. Instead of evaluating a mathematical function with the two input variables we model the system using Mamdani Fuzzy Inference system**[1]** . Fuzzification of the each input variable is done using five triangular membership functions related with the magnitude and direction of the variable. A set of 20 rules is provided for evaluation.
The repulsive force between the agent and the obstacle is also dependent only on relative position and relative velocity only. TSK fuzzy inference system is preferred over Mamdani system**[1]**. Gaussian Bell shaped membership functions are used for TSK. The input membership function parameters for each variable and output parameters for each rule are tuned by ANFIS **[3]** .The supervised training dataset is obtained by simulating the potential field method proposed by Ge and Cui **[2].**

REFERENCES

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