3D Voxel Grid Based Path Planning for Robotic Manipulators using Matrix Multiplication Technique

Alternatives:
- Matrix Multiplication-Driven Repulsive Fields for 3D Voxel-Based Robotic Manipulator Path Planning
- Robotic Manipulator Path Planning Optimization Using Matrix-Derived Repulsive Fields Based on 3D Voxel Grid

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Abstract

1 Introduction

2 Background

1-2 PAGES

- method was inspired by Khatib APF (however, it evolved into a different method)
- different existing APF manipulator implementation articles
- VFH

3 Methodology

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3.1 Optimization Algorithm

- optimization algorithm
- robot kinematics (include the exact-reduced method)
- primary task of distance goal
- secondary task of repulsive field
- task slowdown option

- secondary task of manipulation measure

3.2 Task Constraints

-equations of occupied and empty space

3.3 Attractive Velocity

- attractive field calculation (normalization of attractive force)

3.4 Repulsive Velocity

- repulsive field calculation - matrix "convolution" method
- matrix size and shape selection
- PLOT: (ERK) kernel graphics
- PLOT: (ERK) linear kernel graphics
- PLOT: kernel field shape
- interpolation of the repulsive field

4 Implementation

5 Results

3 PAGES

- include execution times
- PLOT: kernel on robot graphics

6 Discussion

1 PAGE

- add the limitations of such method (already mentioned by Khatib)
- the limitations of local search
- number of parameters that need to be tuned (are there actually that many?)

7 Conclusion