

Obstacle-avoiding B-spline Path planning generation strategy for G2-continuous non-holonomic robot

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(G2 連続非ホロノミックロボットに対する障害物回避のための B スプラインを用いた経路計画の生成戦略)

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論 文 内 容 の 要 旨

Path planning is a crucial part of robots' motion generation. It set a route that accords with robot's moving constraints without considering the temporal factors. Two main aspects of path planning are obstacle avoidance and fitting the robot's moving constraints. This research proposes a path-planning approach is in robotic control area, especially with applied geometrics. The approach generates a curvature continuous trajectory in collision-free corridor for obstacle avoidance.

Two main algorithms are included in this approach, the collision-free corridor generation algorithm and the curvature continuous b-spline trajectory generation algorithm. Collision-free corridor is generated with the combination of arc constraints and line segments. It acts as the boundary for trajectory generating.

Then, the b-spline trajectory is composed by the Clothoid splines, arcs and line segments. To reduce the computation cost of the Clothoid splines, the computation procedure is simplified by assuming the starting curvature and angle of spline to be zero. By analyzing the simplified spline segments, a certain ratio is found between the spline endpoint's tangent angle and the tangent value from the spline end point to its starting point. Then, a piecewise b-spline can be built with little computation cost.

The strategy in this paper solves out a curvature-continuous obstacle-avoidable trajectory with obstacle-based time complexity. The obstacle-based time complexity is usually less than configuration-based complexity. And the curvature of the trajectory generation is easy to control and compute.