ETH
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Autonomous Systems Lab
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Bachelor Thesis

Path Generation for a Mobile Drawing Robot

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Abstract

The BeachBot is a mobile, autonomous drawing robot for large scale sand art. Its primary purpose is the entertainment of beachgoers. The goal of this thesis was to develop and evaluate algorithms to automatically generate suitable trajectories to draw arbitrary images on the canvas. Main challenges have been to find a trajectory that reduces the drawing time and to make watching the drawing process appealing.

Chapter 1

Introduction

1.1 The BeachBot Project

Chapter 2

Requirements and Inspiration

Chapter 3

Path planning algorithms

3.0.1 Algorithm overview

3.0.2 Image structure

3.0.3 Polygon filling

Related work

Straight Skeleton Filling

Back and Forth Filling

3.0.4 Path Generarion

Traveling Salesman Problem

Adaptation of Traveling Salesman Problem for the Algorithm

3.0.5 Smooth line connections

Beziér Splines

Spiro Splines

3.1 Implementation

3.1.1 Input

3.1.2 SVG Parser

3.1.3 Tree Container

3.1.4 Preprocessing

3.1.5 Implementation of the Algorithms

3.1.6 Postprocessing

3.1.7 User Interface

Chapter 4

Conclusion