

# Optimal Decision Making for Multi-agent Path Planning Problem



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I certify that this research work titled “*Optimal Decision Making for Multi-agent Path Planning Problem*” is my own work. The work has not been presented elsewhere for assessment. The material that has been used from other sources it has been properly acknowledged / referred.

Signature of Student

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## **Language Correctness Certificate**

This thesis has been read by an English expert and is free of typing, syntax, semantic, grammatical and spelling mistakes. Thesis is also according to the format given by the university.

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accomplishment*

## Abstract

Intelligent mobile robotic agents demand optimal motion planners with minimum query time. Most contemporary algorithms lack one of these two required aspects. We propose a cellular automata (CA) based efficient path planning scheme that generates optimal paths in minimum time. A Cellular automata is evolved over the entire environment and subsequently used for shortest path determination. This approach generates a parent-child relationship for each cell in order to minimize the search time. Analysis and simulation results have proven it to be a robust and a complete path planning scheme is robust and time efficient both in static and dynamic environments.

In the second part of the thesis, we discuss an estimation problem of players in a Robocup Small Size League based environment. RoboCup Small Size League provides with an interesting platform for research on Multi-agent Intelligent Systems in an adversarial environment, where the problems range from motion planning of robots to optimum decision making. An important aspect in robot soccer is to define the strategies that a team should follow in order to successfully execute a game of soccer. One approach to do this is to use the existing games to infer the behaviors shown by the robots of a certain team. Specifically, the behaviors shown by a certain robot during a game can be inferred and analyzed and may be even learnt to execute the game play during a game. We used a regression based approach to create models for certain robots based on the locations of the players in the field, using the data from the games of Robocup 2013.

**Key Words:** *Motion Planning, Robotics, Cellular Automata, Linear Regression, Data, Robocup*