

CONTENTS

HALAMAN PENGESAHAN	ii
PREFACE	iii
CONTENTS	vii
LIST OF FIGURES	x
LIST OF TABLES	xii
Abstract	xiii
<i>Intisari</i>	xiv
I INTRODUCTION	1
1.1 Research Motivation	1
1.2 Problem Statement	4
1.3 Thesis Organization	5
II ROBOT PATH PLANNING	6
2.1 Classification of Path Planning	6
2.2 The State of The Art in Robot Path Planning	9
2.3 Formation Control State of Art	10
III ARRIVAL TIME FIELD	13
3.1 Intuitive Introduction to Arrival Time Field	13
3.2 Mathematical Formulation	14
3.3 Fast Marching Method	15

IV PATH PLANNING STRATEGY	16
4.1 Arrival Time Field for Robot Path Planning	16
4.2 Gradient Descent Method for Backtracking Optimum Path	17
4.3 Path Planning Algorithm	18
4.3.1 Arrival Time Field with Uniform speed	19
4.3.2 Arrival Time Field with speed Function	19
4.3.3 Arrival Time Field with Safe-distance Thresholded Speed Function	20
4.4 Numerical Experiment	22
4.4.1 Normal Terrain	22
4.4.2 Narrow Passage	28
4.4.3 Labyrinth	31
4.4.4 Arbitrary Shape Obstacle	36
4.4.5 Simulation on Quadrotor UAV	39
V FORMATION CONTROL STRATEGY	41
5.1 Introduction to Formation Control	41
5.2 Multi-agent System	42
5.2.1 General Formation Control Strategy	42
5.2.2 Formation Control via Potential Field	44
5.3 Proposed Formation Control Strategy	48
5.3.1 Hybrid Leader Follower and Behavioral Approach	48
5.4 Numerical Experiment	53
5.4.1 Simulation on Quadrotor UAV	53
VI CONCLUSIONS AND FUTURE WORKS	55
6.1 Conclusions	55

6.2 Future Works	56
REFERENCES	57