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Using Intelligent Vehicle Control Rules to
Improve AMHS Performance in Highly
Dynamic Manufacturing Environments

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USING INTELLIGENT VEHICLE CONTROL RULES TO IMPROVE AMHS
PERFORMANCE IN HIGHLY DYNAMIC MANUFACTURING
ENVIRONMENTS

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2008

*To my parents,
inspired,
and inspiring.*

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
ABSTRACT	x
CHAPTER	
I. INTRODUCTION	1
Background	1
Problem Statement	3
Research Purpose and Scope	5
Proposed Procedure	6
Organization of Thesis	7
II. LITERATURE REVIEW	8
Dispatching rules	8
Centralized Dispatching Rules	9
Responding to Dynamic Environments	10
Decentralized Dispatching Rules	11
Smart Vehicles	12
Traffic Management (Norman, 2002)	14

III. PROPOSED INTELLIGENT VEHICLE CONTROL RULE (IVCR).....	16
AMHS Description	16
AMHS Simulation on AutoMod.....	19
Experimental Environment.....	20
Experimental Setup.....	21
Rules	21
IV. EXPERIMENTATION	29
Design and Analysis of Experiment	29
Results.....	30
V. CONCLUSION AND FUTURE RESEARCH.....	40
REFERENCES	43
VITA.....	46

LIST OF TABLES

Table	Page
1. Experimental Factors	30
2. Experimental Cases.....	31
3. Summary of Results in the Case of Number of Moves = 1 and Lot Priority Ratio = 20-80	32
4. Summary of Results in the Case of Number of Moves = 2 and Lot Priority Ratio = 20-80	33
5. Summary of Results in the Case of Number of Moves = 1 and Lot Priority Ratio = 10-90	33
6. Summary of Results in the Case of Number of Moves = 2 and Lot Priority Ratio = 10-90	34
7. ANOVA for Hot Lot Throughput.....	35
8. ANOVA for Regular Lot Throughput	35
9. ANOVA for Hot Lot Delivery Time	36
10. ANOVA for Regular Lot Delivery Time.....	37
11. Wafer Fabs Requirement	42

LIST OF FIGURES

Figure	Page
1. Typical Wafer Fab Layout with the AMHS	18
2. AMHS Interbay System.....	20
3. Workstation-initiated Rule.....	25
4. Vehicle-initiated Rule	25
5. Deliver Algorithm.....	25
6. Retrieve Algorithm	26
7. Move Algorithm.....	27
8. Hot Lot Delivery Times of 3 Rules (95% Confidence Interval).....	38
9. Hot Lot Delivery Times of 2 Rules (95% Confidence Interval).....	38
10. Regular Lot Delivery Times of 3 Rules (95% Confidence Interval)	39
11. Regular Lot Delivery Times of 2 Rules (95% Confidence Interval).....	39

ABSTRACT

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Automated Material Handling System (AMHS) is crucial for a 300-mm manufacturing fab as to reduce ergonomic related problems, wafer contamination, and wafer damage. The main purpose of the AMHS is to optimize the fabrication process by reducing the manufacturing cycle time, and increasing equipment utilization. Researchers have experimented with dispatching rules in order to optimize the wafers delivery in the AMHS. However, many proposed dispatching rules cannot anticipate dynamic, and

frequent changes in the environment (i.e., vehicle breakdown, tool breakdown, changing demand, etc). Therefore, implementation of Intelligent Vehicle Control Rule (IVCR) can be a solution in solving this problem. The purpose of this thesis is to develop an IVCR useful in the design of vehicle-based AMHS that show statistically superior wafer delivery time (DT), retrieve time (RT), transport time (TT), and throughput than the static dispatching rules under tool breakdown, vehicle breakdown, number of moves, and load priority. The first contribution of this thesis is to simulate and compare all experimented rules (i.e. First-Encounter-First-Served [FEFS], modified Norman's algorithm [MODNORMAN], and IVCR) at different levels of detail. The second contribution is to explain the superiority of IVCR against other rules. A method for analyzing its performance and the influence of experimental factors are measured using the Design and Analysis of Experiments.