

# CONTENTS

<b>Introduction</b>	<b>1</b>
<b>1 AND/OR Constrained Scheduling</b>	<b>9</b>
1.1 Preliminaries	9
1.1.1 Basic Notation	10
1.1.2 The Three Field Classification Scheme	16
1.2 AND/OR-Networks	17
1.2.1 Feasibility	17
1.2.2 The Earliest Start Schedule	19
1.2.3 Directed Hypergraphs and Related Work	23
<b>2 Criticality in AND/OR-Networks</b>	<b>27</b>
2.1 Critical Jobs in Project Networks	27
2.2 Critical Jobs in AND/OR-Networks	28
2.3 Structural Properties of Critical Jobs and Sets	32
2.3.1 Clutters and Blocking Clutters	32
2.3.2 Systems of Critical Sets	33
2.3.3 The Max-Flow-Min-Cut Property of Critical Sets	36
2.3.4 Invariants of Critical Sets	42
2.4 The Complexity of Finding Critical Jobs and Sets	57
2.4.1 The Complexity of Constructing Critical Sets	57
2.4.2 The Complexity of Identifying Critical Jobs	59
2.4.3 Criticality and Monotone Boolean Functions	65
2.5 Criticality in Specially Structured AND/OR-Networks	71
2.6 A Quantifying Analysis of Critical Sets	79
2.6.1 Changing the Makespan	79
2.6.2 The Linear Time-Cost Trade-off Problem	81
<b>3 Scheduling with AND/OR Precedence and Machine Constraints</b>	<b>87</b>
3.1 List Scheduling	88
3.2 The Makespan	90
3.2.1 Scheduling on Identical Parallel Machines	91
3.3 The Total Weighted Completion Time	95
3.3.1 Scheduling on One Machine	95

---

3.3.2	Scheduling on Identical Parallel Machines . . . . .	110
<b>4</b>	<b>Local Search</b>	<b>113</b>
4.1	Introduction to Local Search . . . . .	113
4.2	A Canonical Neighbourhood for AND/OR-Networks . . . . .	117
4.3	Properties of the Solution Space . . . . .	118
4.4	Local Search and Longest Paths . . . . .	121
	<b>Bibliography</b>	<b>127</b>
	<b>Symbol Index</b>	<b>135</b>
	<b>Index</b>	<b>139</b>
	<b>Zusammenfassung</b>	<b>143</b>
	<b>Curriculum Vitae</b>	<b>145</b>