2.2.3 Clarke and Wright Algorithm 14
2.2.4 Holmes and Parker Algorithm 16
A. Initialization 17
B. Iteration 18

CHAPTER III RESEARCH METHDOLOGY 23

3.1 Research Object 23
3.2 Model Development 23
3.2.1 Description 23
3.3 Model Analysis 27
3.3.1 Distance Matrix 27
3.3.2 Demand Conversion and Vehicle Capacity 27
3.3.3 Vehicle Variable Cost and Fixed Cost 30
3.4 Data Requirement 31
3.5 Data Processing and Analysis 31
3.6 Research Result 32
3.7 Tool 32
3.8 Problem Solving Framework 32

CHAPTER IV DATA COLLECTING AND PROCESSING 34

4.1 Data Collecting 34
4.1.1 Company Profile 34
4.1.2 Newspaper Dimension 35
4.1.3 Vehicle Profile 36
4.1.4 Customer Profile 37
4.1.5 Current Route 38
4.1.6 Fuel Prices 38

4.2 Mathematical Model Building of Heterogeneous
Fixed Fleet Vehicle Routing Problem 38
4.2.1 Demand Conversion 39
4.2.2 Distance Matrix 40
4.2.3 Vehicle Capacity 43
4.2.4 Vehicle Variable Cost 44
4.2.5 Vehicle Fixed Cost 45
4.2.6 Mathematical Formulation of Heterogeneous Fixed Fleet
Vehicle Routing Problem 46
4.2.7 Current Route Cost 50
4.3 Total Cost Minimization of Heterogeneous Fixed Fleet
Vehicle Routing Problem Using Holmes and Parker Algorithm 51
4.3.1 Initialization 51
4.3.2 Iteration 54
A. Initial Solution 54
B. First Suppression 58
C. Second Suppression 62
D. Third Suppression 66
E. Fourth Suppression 70
F. Fifth Suppression 74
G. Sixth Suppression 78
H. Seventh Suppression 82
I. Eighth Suppression 86
J. Ninth Suppression 90
K. Tenth Suppression 94
L. Eleventh Suppression 98
M. Twelfth Suppression 102
N. Thirteenth Suppression 106
O. Fourteenth Suppression 110

P. Fifteenth Suppression 114

Q. Sixteenth Suppression 118

R. Seventeenth Suppression 122

S. Eighteenth Suppression 126

T. Nineteenth Suppression 130

4.4 Total Cost and Distance Difference 134

CHAPTER V DISCUSSION 136

5.1 Result Discussion 136

CHAPTER VI CONCLUSION AND SUGGESTION 139

6.1 Conclusion 139

6.2 Suggestion 140

REFERENCE

APPENDIX

UNIVERSITAS ISLAM INDONESIA

LIST OF TABLE

Table 4.1 Depot and Customer Profile	37
Table 4.2 Demand Conversion	39
Table 4.3 Distance Matrix	42
Table 4.4 Saving Matrix	53
Table 4.5 Iteration of Initial Solution	55
Table 4.6 Iteration of First Suppression	59
Table 4.7 Iteration of Second Suppression	63
Table 4.8 Iteration of Third Suppression	67
Table 4.9 Iteration of Fourth Suppression	71
Table 4.10 Iteration of Fifth Suppression	75
Table 4.11 Iteration of Sixth Suppression	79
Table 4.12 Iteration of Seventh Suppression	83
Table 4.13 Iteration of Eighth Suppression	87
Table 4.14 Iteration of Ninth Suppression	91
Table 4.15 Iteration of Tenth Suppression	95
Table 4.16 Iteration of Eleventh Suppression	99
Table 4.17 Iteration of Twelfth Suppression	103

Table 4.18 Iteration of Thirteenth Suppression 107

Table 4.19 Iteration of Fourteenth Suppression 111

Table 4.20 Iteration of Fifteenth Suppression 115

Table 4.21 Iteration of Sixteenth Suppression 119

Table 4.22 Iteration of Seventeenth Suppression 123

Table 4.23 Iteration of Eighteenth Suppression 127

Table 4.24 Iteration of Nineteenth Suppression 131

UNIVERSITAS ISLAM INDONESIA

LIST OF FIGURE

Figure 2.1 Directed Graphs (a) and Undirected Graphs (b) 10

Figure 2.2 Savings Concept 15

Figure 2.3 Tree Diagram 22

Figure 3.1 Dimension of Vehicle's Box to the Newspaper Dimension (First Version) 28

Figure 3.2 Dimension of Vehicle's Box to the Newspaper Dimension (Second Version) 29

Figure 3.3 Problem Solving Framework 33

Figure 4.1 Newspaper Dimension 36

Figure 4.2 Step 1 Measuring Distance Using Google Earth 40

Figure 4.3 Step 2 Measuring Distance Using Google Earth 41

Figure 4.4 Step 3 Measuring Distance Using Google Earth 41

Figure 4.5 Initial Solution's Tree Diagram 58

Figure 4.6 First Suppression's Tree Diagram 62

Figure 4.7 Second Suppression's Tree Diagram 66

Figure 4.8 Third Suppression's Tree Diagram 70

Figure 4.9 Fourth Suppression's Tree Diagram 74

Figure 4.10 Fifth Suppression's Tree Diagram 78

Figure 4.11 Sixth Suppression's Tree Diagram 82

Figure 4.12 Seventh Suppression's Tree Diagram 86

Figure 4.13 Eight Suppression's Tree Diagram 90

Figure 4.14 Ninth Suppression's Tree Diagram 94

Figure 4.15 Tenth Suppression's Tree Diagram 98

Figure 4.16 Eleventh Suppression's Tree Diagram 102

Figure 4.17 Twelfth Suppression's Tree Diagram 106

Figure 4.18 Thirteenth Suppression's Tree Diagram 110

Figure 4.19 Fourteenth Suppression's Tree Diagram 114

Figure 4.20 Fifteenth Suppression's Tree Diagram 118

Figure 4.21 Sixteenth Suppression's Tree Diagram 122

Figure 4.22 Seventeenth Suppression's Tree Diagram 126

Figure 4.23 Eighteenth Suppression's Tree Diagram 130

Figure 4.24 Nineteenth Suppression's Tree Diagram 134