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Appendix A.1: Sequence Diagram for implemented Multi Agent System

In the Figure A.1 it shows the sequence diagram for the implemented Multi Agent System. It shows the sequence of each operation among each component by using the arrows.
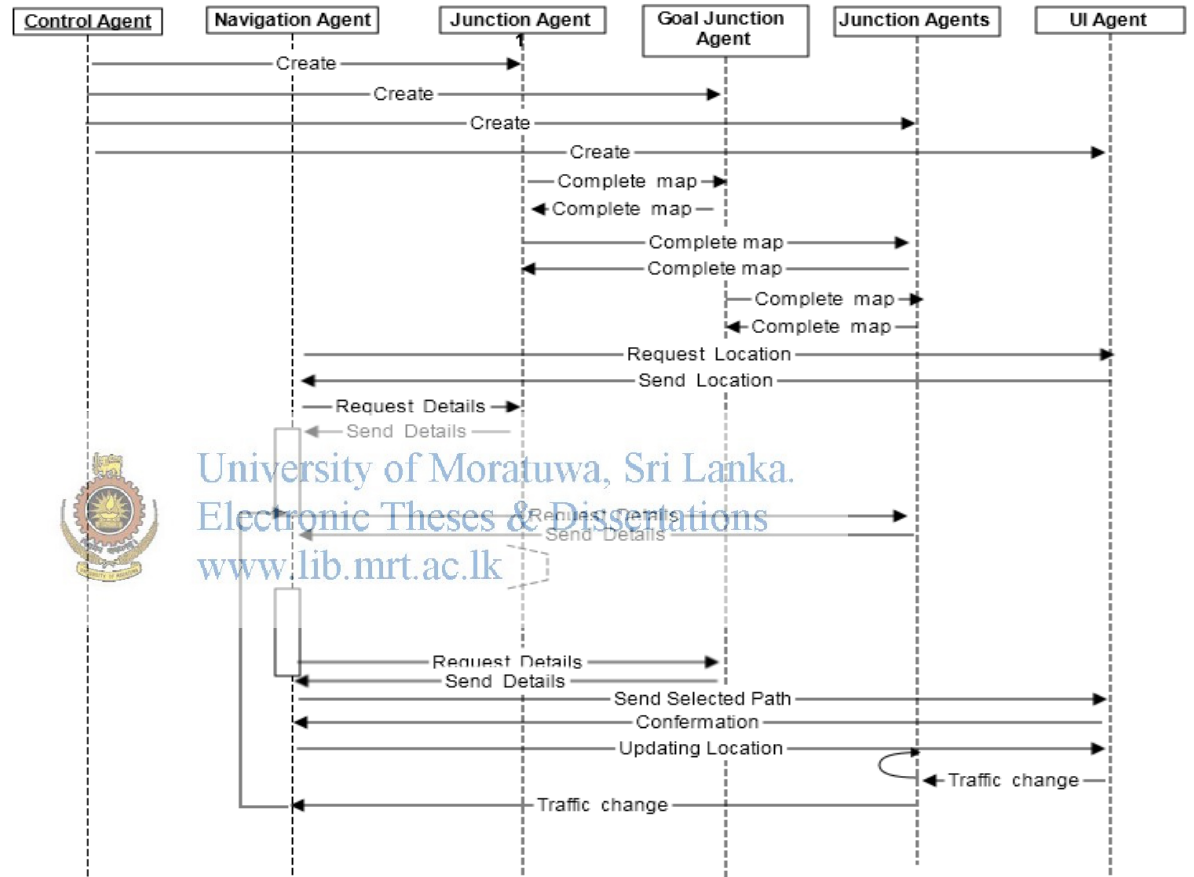
FigureA.1: Sequence Diagram

Appendix A.2: Class Diagram for implemented Multi Agent System

In the Figure A.2 it shows the class diagram for implemented system. Agent class is the super class which is located in JADE toolkit.
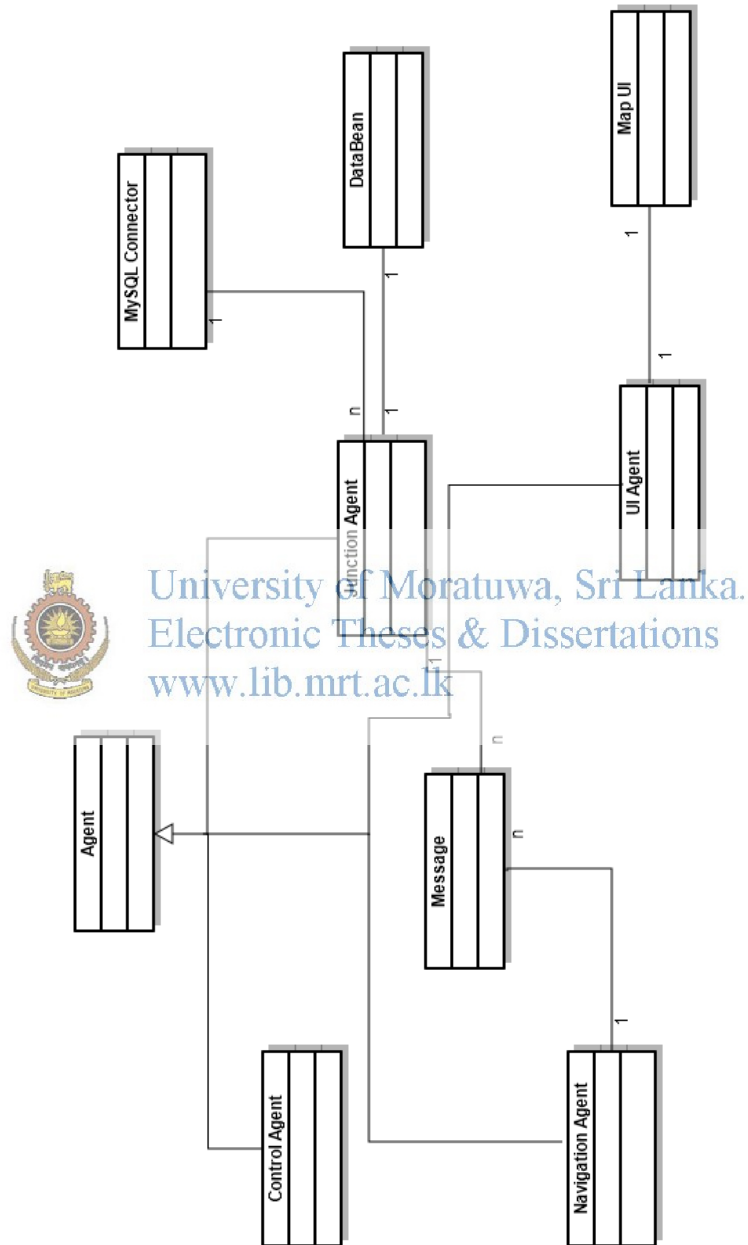
Figure A.2: Class Diagram

Appendix A.3: Class Diagram for implemented Multi Agent System

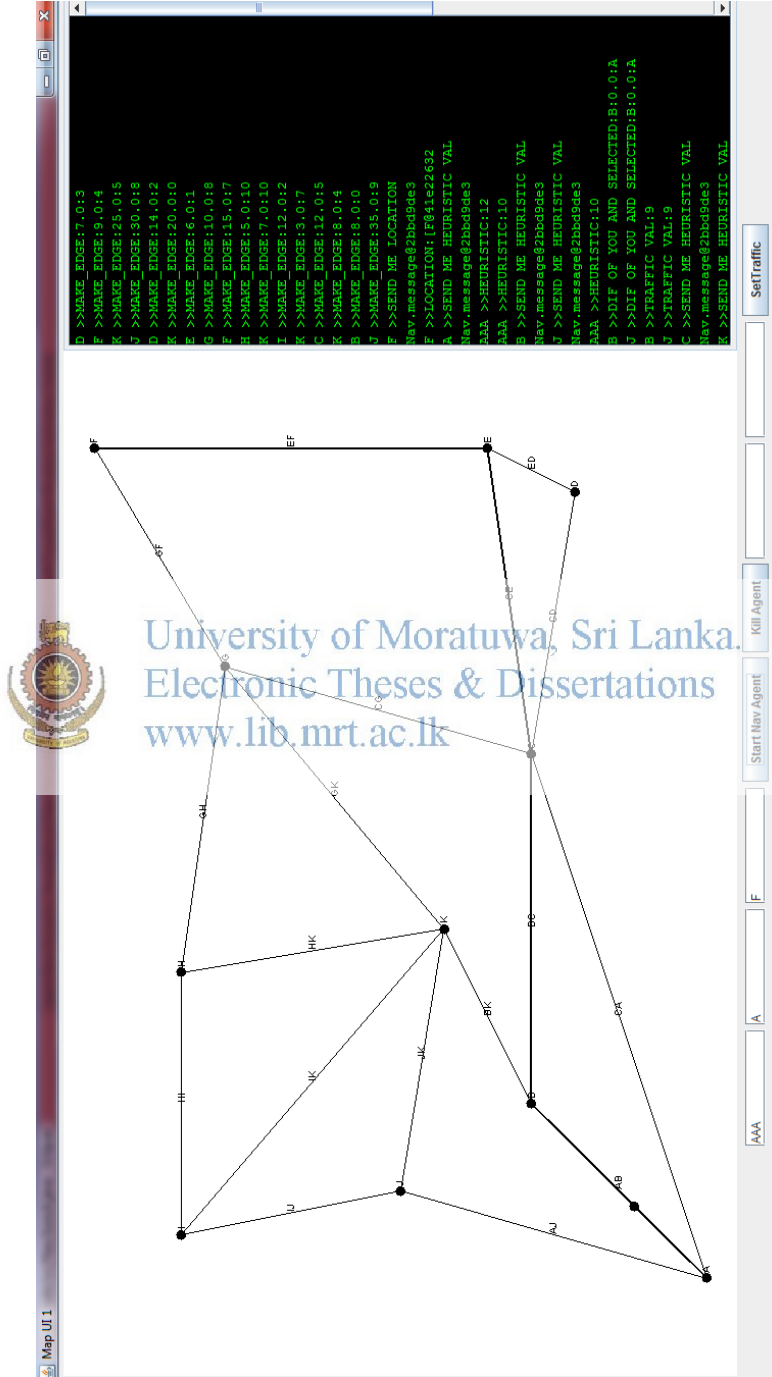In the Figure A.3 it shows the use interface of implemented system.

Figure A.3: User interface

Appendix A.4.1: Message board for Navigation A position to F Position.

```
1.   NavA To F-SEND ME LOCATION
2.   F To NavA-LOCATION-X:15.0-Y:20.0
3.   NavA To A-SEND ME HEURISTIC VAL X:15.0 Y:20.0
4.   A To NavA-HEURISTIC-23.600847
5.   NavA To B-SEND ME HEURISTIC VAL X:15.0 Y:20.0
6.   NavA To C-SEND ME HEURISTIC VAL X:15.0 Y:20.0
7.   NavA To L-SEND ME HEURISTIC VAL X:15.0 Y:20.0
8.   NavA To J-SEND ME HEURISTIC VAL X:15.0 Y:20.0
9.   B To NavA-HEURISTIC-18.027756
10.  C To NavA-HEURISTIC-12.206555
11.  L To NavA-HEURISTIC-16.40122
12.  J To NavA-HEURISTIC-18.384777
13.  NavA To B-DIF OF YOU AND SELECTED:C:5.8212004:A:SAT:18:59
14.  NavA To C-DIF OF YOU AND SELECTED:C:0.0:A:SAT:18:59
15.  NavA To L-DIF OF YOU AND SELECTED:C:4.194665:A:SAT:17:59
16.  NavA To J-DIF OF YOU AND SELECTED:C:6.1782217:A:SAT:18:59
17.  J To NavA-TRAFFIC VAL-9.0
18.  L To NavA-TRAFFIC VAL-11.0
19.  B To NavA-TRAFFIC VAL-9.0
20.  C To NavA-TRAFFIC VAL-25.0
21.  NavA To K-SEND ME HEURISTIC VAL X:15.0 Y:20.0
22.  K To NavA-HEURISTIC-13.601471
23.  NavA To K-DIF OF YOU AND SELECTED:K:0.0:B:SAT:17:59
24.  K To NavA-TRAFFIC VAL-4.0
25.  NavA To G-SEND ME HEURISTIC VAL X:15.0 Y:20.0
26.  NavA To I-SEND ME HEURISTIC VAL X:15.0 Y:20.0
27.  NavA To H-SEND ME HEURISTIC VAL X:15.0 Y:20.0
28.  G To NavA-HEURISTIC-5.8309517
29.  I To NavA-HEURISTIC-18.110771
30.  H To NavA-HEURISTIC-12.165525
31.  NavA To G-DIF OF YOU AND SELECTED:G:0.0:K:SAT:18:59
32.  NavA To I-DIF OF YOU AND SELECTED:G:12.2798195:K:SAT:18:59
33.  NavA To H-DIF OF YOU AND SELECTED:G:6.3345737:K:SAT:17:59
34.  G To NavA-TRAFFIC VAL-4.0
35.  I To NavA-TRAFFIC VAL-0.0
36.  H To NavA-TRAFFIC VAL-7.0
37.  NavA To A-ALERT ON U:2
38.  NavA To B-ALERT ON U:2
39.  NavA To K-ALERT ON U:2
40.  A To L-ALERT ON U:NavA:1
41.  K To I-ALERT ON U:NavA:1
42.  A To J-ALERT ON U:NavA:1
43.  A To B-ALERT ON U:NavA:1
44.  K To J-ALERT ON U:NavA:1
45.  Selected Path: A > B > K > G > F
46.  B To A-ALERT ON U:NavA:1
47.  K To G-ALERT ON U:NavA:1
48.  A To C-ALERT ON U:NavA:1
49.  K To B-ALERT ON U:NavA:1
50.  K To H-ALERT ON U:NavA:1
51.  NavA To F-ALERT ON U:2
52.  B To K-ALERT ON U:NavA:1
53.  F To E-ALERT ON U:NavA:1
54.  F To R-ALERT ON U:NavA:1
55.  F To H-ALERT ON U:NavA:1
56.  B To C-ALERT ON U:NavA:1
57.  NavA To G-ALERT ON U:2
58.  G To F-ALERT ON U:NavA:1
59.  G To H-ALERT ON U:NavA:1
60.  G To C-ALERT ON U:NavA:1
61.  G To K-ALERT ON U:NavA:1
62.  F To G-ALERT ON U:NavA:1
63.  UiA -CURRENT LOCATION:B
64.  UiA To G-TRAFFIC:K:20
```

```
60.  G To NavA-TRAFFIC:K:20
61.  G To K-TRAFFIC:G:20
62.  NavA To G-TRAFFIC:OK
63.  NavA To B-SEND ME HEURISTIC VAL X:15.0 Y:20.0
64.  B To NavA-HEURISTIC-18.027756
65.  NavA To C-SEND ME HEURISTIC VAL X:15.0 Y:20.0
66.  NavA To K-SEND ME HEURISTIC VAL X:15.0 Y:20.0
67.  NavA To A-SEND ME HEURISTIC VAL X:15.0 Y:20.0
68.  C To NavA-HEURISTIC-12.206555
69.  A To NavA-HEURISTIC-23.600847
70.  K To NavA-HEURISTIC-13.601471
71.  NavA To C-DIF OF YOU AND SELECTED:C:0.0:B:SAT:17:59
72.  NavA To K-DIF OF YOU AND
     SELECTED:C:1.3949156:B:SAT:17:59
73.  NavA To A-DIF OF YOU AND
     SELECTED:C:11.394292:B:SAT:18:59
74.  C To NavA-TRAFFIC VAL-4.0
75.  K To NavA-TRAFFIC VAL-4.0
76.  A To NavA-TRAFFIC VAL-0.0
77.  NavA To D-SEND ME HEURISTIC VAL X:15.0 Y:20.0
78.  NavA To E-SEND ME HEURISTIC VAL X:15.0 Y:20.0
79.  NavA To N-SEND ME HEURISTIC VAL X:15.0 Y:20.0
80.  N To NavA-HEURISTIC-13.892444
81.  NavA To G-SEND ME HEURISTIC VAL X:15.0 Y:20.0
82.  D To NavA-HEURISTIC-11.045361
83.  E To NavA-HEURISTIC-9.0
84.  G To NavA-HEURISTIC-5.8309517
85.  NavA To N-DIF OF YOU AND SELECTED:G:8.061492:C:SAT:17:59
86.  NavA To E-DIF OF YOU AND
     SELECTED:G:3.1690483:C:SAT:18:59
87.  NavA To D-DIF OF YOU AND SELECTED:G:5.214409:C:SAT:18:59
88.  NavA To G-DIF OF YOU AND SELECTED:G:0.0:C:SAT:18:59
89.  N To NavA-TRAFFIC VAL-20.0
90.  E To NavA-TRAFFIC VAL-25.0
91.  D To NavA-TRAFFIC VAL-25.0
92.  G To NavA-TRAFFIC VAL-25.0
93.  NavA To G-ALERT ON U:2
94.  Selected Path: B > C > G > F
95.  NavA To C-ALERT ON U:2
96.  NavA To F-ALERT ON U:2
97.  G To H-ALERT ON U:NavA:1
98.  NavA To B-ALERT ON U:2
99.  C To D-ALERT ON U:NavA:1
100. C To E-ALERT ON U:NavA:1
101. C To N-ALERT ON U:NavA:1
102. C To A-ALERT ON U:NavA:1
103. G To K-ALERT ON U:NavA:1
104. F To R-ALERT ON U:NavA:1
105. G To C-ALERT ON U:NavA:1
106. C To G-ALERT ON U:NavA:1
107. G To F-ALERT ON U:NavA:1
108. F To H-ALERT ON U:NavA:1
109. F To E-ALERT ON U:NavA:1
110. B To A-ALERT ON U:NavA:1
111. C To B-ALERT ON U:NavA:1
112. B To C-ALERT ON U:NavA:1
113. F To G-ALERT ON U:NavA:1
114. B To K-ALERT ON U:NavA:1
115. UiA -CURRENT LOCATION:C
116. UiA -CURRENT LOCATION:G
117. UiA -CURRENT LOCATION:F
118. UiA -CURRENT LOCATION:G
```

- Explanation

Line number 1 produce that navigation agent requesting location form goal agent F. next line shows the answer of the F agent X and Y position of the destination. Line number 3 elaborate requesting heuristic value of current junction agent. Line number 4 shows answer of the current agent with heuristic value.

Line number 5 to 8 express requesting of heuristic values form current Agent. Next four line express answers of adjacent junction agents with their calculated heuristic values. Line number 13 to 16 shows multicast message to last level responded junction agents. That message includes selected node from heuristic calculation advantageous value than message receiving agent, reaching time, and date. From traffic value if it is considerable advantage than selected junction that agent send reply to Navigation agent. If one agent sent message to navigation agent other receipts also send reply with traffic situation on the reaching time. Line number 21 shows requesting details form next selected junction agent. Till line number 36 it shows repeating calls for other agents.

Now navigation agent knows the goal agent and selected path Line number 37 to 39, 51 and 57 shows define sensitive area by using selected path. Last digit express how much deep consider as sensitive area form receivers. Line number 40 to 64 behalf of 54, 51 and 57 displays passing message to second level of sensitive area.

Line 45 shows selected path. Line 62 show update location message it update location to UI agent. When agents pass B location traffic is changing in traffic on GK line by 20.that message shows in line 64. Line number 60 and 61 shows updating near junction and navigation agent about situation changes. Line no 62 shows delivery report message form navigation agent. Now navigation agents' location is B next message shows starting to calculate path again. And it follows above explained messages to select next optimum path. Line number 115 to 118 shows location updating message.