

# **SOFTWARE FRAMEWORK FOR MULTI AGENT SYSTEM DEVELOPMENT IN EMBEDDED SYSTEMS**

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Degree of Master of Science in Artificial Intelligence

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# Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organization.

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# Abstract

Multi agent systems and embedded systems both are consider as major fields in the recent research history. Both have shown the potential of developing intelligence solutions to the modern world needs. Several standards including FIPA and ACL followed by the developers and researchers when model the multi agent systems. JADE like frameworks play a major role in the field where user can design and develop multi agent system using prebuild components in the framework. Even though there are number of multi agent solutions which are run on top of the embedded systems there is no common framework to facilitate the multi agent system developments in the embedded environments. Intention is to introduce a common framework which is designed and developed to facilitate major multi agent behaviors to the researches in this field to make their work easy.

In order to archive this goal completely new software framework was design, developed and evaluated for the major embedded hardware platforms available in the market. This frame work can provide communication platform for the different type of communication channels and multi agent behaviors to the host software system in embedded platforms. Since framework is fully compatible with the FIPA standard and communication using standard communication language ACL users can easily use the framework. Solution was design in such a way that users can implement their own modules and plug in easily. In additional to that this modular design allows users to port the framework to new hardware platforms with minimal changes.

Evaluation of the framework was conducted by using several approaches. Completely new embedded solution was design and developed for the field of home garden watering in order to evaluate the features of the framework. Where different agent with different communication capabilities; demonstrate the usefulness of the framework. In addition to that several memory matrixes and performance matrixes were generated in order to evaluate the performance of the framework. Memory analysis shows that framework will consume 26.7% of the flash memory on average and can operate on minimum of 1KB static random access memory.

# Contents

<b>Chapter 1 Introduction.....</b>	<b>1</b>
1.1 Prolegomena.....	1
1.2 Background and Motivation.....	2
1.3 Problem in Brief.....	2
1.4 Aims and Objectives .....	3
1.5 Proposed Solution .....	3
1.6 Outline of the Thesis .....	4
1.7 Summary .....	5
<b>Chapter 2 MAS in Embedded Systems.....</b>	<b>6</b>
2.1 Introduction .....	6
2.2 Starting of a new era with the JADE.....	6
2.3 MAS in Embedded Systems.....	8
2.4 Discussion .....	10
2.5 Summary .....	11
<b>Chapter 3 Theoretical foundation.....</b>	<b>12</b>
3.1 Introduction .....	12
3.2 Embedded Systems / Platforms.....	12
3.3 Multi Agent Systems.....	18
3.3.1 Agent Communication.....	19
3.3.2 Agent Coordination .....	24
3.3.3 Agent Negotiation.....	25
3.4 Summary .....	25
<b>Chapter 4 Approach .....</b>	<b>26</b>
4.1 Introduction .....	26
4.2 Hypothesis.....	26
4.3 Input and Output.....	26
4.4 Process.....	27
4.5 Potential Users of the System.....	27
4.6 Features .....	28

4.7	Summary .....	28
<b>Chapter 5 Design.....</b>		<b>29</b>
5.1	Introduction .....	29
5.2	Top Level Design.....	29
5.2.1	Master-Slave Configuration .....	29
5.2.2	Peer-to-Peer Configuration.....	30
5.3	Framework Components .....	31
5.3.1	Platform Core .....	31
5.3.2	Framework Core.....	31
5.3.3	Agent Container.....	31
5.3.4	Message Dispatcher.....	32
5.3.5	Communication Mapper.....	32
5.3.6	Behavioral Engine .....	33
5.4	Summary .....	34
<b>Chapter 6 Implementation.....</b>		<b>35</b>
6.1	Introduction .....	35
6.2	Component Implementation.....	35
6.3	Platform Core.....	35
6.4	Framework Core.....	36
6.5	Agent Container .....	36
6.6	Message Dispatcher.....	38
6.7	Communication Mapper.....	39
6.8	Behavioral Engine .....	40
6.9	Summary .....	41
<b>Chapter 7 Evaluation.....</b>		<b>42</b>
7.1	Introduction .....	42
7.2	Multi-Agent based Home Garden Monitoring System .....	42
7.2.1	Hardware module design .....	43
7.2.2	Define process and behaviors .....	45
7.2.3	Evaluation results discussion and conclusion.....	46
7.3	Performance Matrices .....	47

7.4	Memory Analysis .....	49
7.5	Summary .....	50
<b>Chapter 8 Conclusion and Further work .....</b>		<b>51</b>
8.1	Introduction .....	51
8.2	Conclusion.....	51
8.3	Limitations and Further Works .....	52
8.4	Summary .....	52
<b>References .....</b>		<b>53</b>
<b>Appendices.....</b>		<b>55</b>
<b>Appendices A : Arduino Hardware Platform .....</b>		<b>55</b>
A.1	Introduction .....	55
A.2	Hardware Specifications .....	55
<b>Appendices B : Hardware Modules .....</b>		<b>58</b>
B.1	Introduction .....	58
B.2	RF Module.....	58
B.3	RTC Module.....	59
B.4	Wi-Fi Module.....	59
B.5	Bluetooth Module.....	60
B.6	DHT Module .....	60
B.7	OLED Display Module .....	61
B.8	Ethernet Shield .....	61
<b>Appendices C : Multi-Agent based Home Garden Monitoring System.....</b>		<b>62</b>
C.1	Introduction .....	62
C.2	Hardware Module Specifications .....	62
C.3	Module Connection Details.....	63
<b>Appendices D : Sample Codes .....</b>		<b>64</b>
D.1	Introduction .....	64
D.2	Agent Initialization.....	64
D.3	ACL Message.....	64
D.4	CFP Process Implementation .....	65



## List of Figures

Figure 2.1 : Embedded Agent Communication with JADE .....	10
Figure 3.1 : Microcontroller Packages.....	13
Figure 3.2 : PWM - Duty Cycle.....	15
Figure 3.3 : MAX232 interfacing with microcontroller .....	16
Figure 3.4 : Radio Frequency Receiver and Transmitter modules .....	17
Figure 5.1 : Framework Components .....	30
Figure 6.1 : Indirect Agent Configuration .....	37
Figure 7.1 : Component Diagram of Home Garden Monitor System.....	43
Figure 7.2 : Plant Agent Configuration.....	44
Figure 7.3 : Plant Agent .....	44
Figure 7.4 : Water Tank Agent Configuration.....	44
Figure 7.5 : Water Tank Agent .....	44
Figure 7.6 : Resource Agent Configuration.....	45

## List of Tables

Table 3.1 : ACL Performatives .....	20
Table 3.2 : ACL Parameter List .....	22
Table 7.1 : Task Description Table .....	47
Table 7.2 : Framework Memory Consumption.....	50
Table A.1 : Arduino Hardware Specifications.....	55
Table B.1 : RF Module Specifications.....	58
Table B.2 : Wi-Fi Module Connection Details .....	59
Table B.3 : DHT Module Specifications .....	60
Table B.4 : OLED Module Features .....	61
Table B.5 : Arduino Ethernet Shield.....	61