

GENERIC NODAL ABSTRACTION FOR
ENHANCING HUMAN-AGENT
COLLABORATIVE MODEL WITH AN
INTEGRATED SECURITY AND TRUST
ASPECTS

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Doctor of Philosophy

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Sistem Kolaborasi merupakan platform berdaya maju yang memainkan peranan yang besar dalam prestasi tugas. Ini sangat ketara apabila Sistem Kolaborasi yang dimodelkan berdasarkan manusia dan agen perisian yang memerlukan tugas dan tanggungjawab di dalam proses-proses sistem, merangkumi penyelesaian-penyelesaian terbaik, dan menambah baik kemahiran menyelesaikan masalah yang dihadapi pengguna-pengguna (manusia). Walau bagaimanapun, hasil dari permodelan perisian agen di dalam sistem-sistem kolaborasi mencatatkan beberapa masalah. Ini disebabkan oleh kepelbagaian tugas dan prosedur. Akibat dari isu-isu yang dinyatakan, implementasi kepada tugas yang dijadualkan dan proses aliran kerja menjadi sukar dan mencabar. Di dalam tesis ini, kami mencadangkan pendekatan inovatif untuk memodelkan sistem kolaborasi manusia-agen yang memberi kemudahan kepada kolaborasi dan proses-proses aliran kerja yang efektif. Pendekatan ini menggunakan manusia bersama agen yang pelbagai (MAS) dibawah tingkah-laku kolaborasi. Tingkah laku kolaboratif dibina berdasarkan konsep abstraksi nodal pintar, di mana setiap nod pintar terdiri daripada manusia, ejen pengantara, agen normal dan fungsi-fungsi yang dikongsikan. Fungsi-fungsi tersebut diberikan kepada nod yang sepadan dengan fungsi-fungsi yang dimiliki manusia, agen-agen normal dan agen pengantara mereka. Abstraksi nodal adalah generik, yang boleh digunakan dalam banyak aplikasi domain. Pendekatan Abstraksi Nodal Generik (Generic Nodal Abstraction - GNA) disusun dengan nod utama dan sub-nod untuk membentuk seni bina hierarki yang bermanfaat. Konsep ini memberi tanggapan bahawa agen boleh digunakan bagi membantu rakan-rakan manusia dalam pelbagai proses aliran kerja dan dalam pengendalian tugas biasa. Untuk mengenal pasti tugas umum bagi manusia dan pengantaranya yang rapat dan agen normal di dalam nod, kami menjalankan tinjauan soal selidik mengenai jabatan sumber manusia (HR) dari organisasi yang berlainan (majlis perbandaran dan kerja awam dan pentadbiran penjagaan kesihatan). Soal selidik yang dijalankan bertujuan mendapatkan maklumat yang berkaitan dengan fungsi yang dilakukan oleh pekerja-pekerja mereka. Bagi memastikan keselamatan dan ketepatan maklumat yang dikongsi dilaksanakan melalui pendekatan GNA, kami mengintegrasikan pendekatan tersebut dengan keselamatan dan sub model yang amanah. Sub model yang digunakan membolehkan maklumat yang dikongsi antara nod tersebut selamat, efisien, tepat dan meningkatkan tahap keyakinan, boleh diharap dan boleh dipercayai pada nod GNA. Kami telah menguji GNA dan keputusannya mengesahkan (i) pendekatan GNA memudahkan kolaborasi antara manusia dan/atau ejen untuk melaksanakan tindakan-tindakan bersama di dalam tahap kerjasama yang mudah, (ii) ia mengurangkan beban kerja manusia dan mengurangkan edaran penyelesaian masalah, dan (iii) hasilnya, ia membuktikan yang GNA dengan keselamatan dan aspek amanah telah meningkatkan daya maju sistem kolaborasi manusia agen apabila beroperasi dalam pelbagai persekitaran.

ABSTRACT

Collaborative systems are viable platforms for humans that play substantial roles in task performance. Notably, collaborative systems that are modelled based on humans and software agents entail tasks and responsibilities within system processes, covers the most suitable solutions, and improve problem-solving skills of the human users. However, the issues of modelling software agents in collaborative systems present some problems caused by the diversity of tasks and the procedures. Consequently, such issues pose critical challenges to implement scheduled tasks and workflow processes. Models, which compose of humans and systems manifest various complexities. A significant challenge is how to construct purpose-built approaches for multi-agent models that collaborate with humans based on humans' demands and positions to reduce his/her workload daily processes. In this thesis, we propose an innovative approach for modelling a human-agent collaborative system that facilitates effective collaboration and alleviate human workflow process. This approach employs humans with multi-agent systems (MAS) under applicable collaborative behavior. The applicable collaborative behavior is built based on the concept of an intelligent nodal abstraction, in which each intelligent node comprises of a human, mediator agent, normal agents, and their shared functions. The functions are assigned to the node which corresponds to those that belong to a human, normal agents and their mediator agent. The nodal abstraction is generic, which could be deployed in many domain applications. The Generic Nodal Abstraction (GNA) approach is conceived with a main node and sub-nodes to shape a hierarchical architecture which benefits. This concept espouses the notion that agents could be deployed to assist their human counterparts in various workflow processes and handle mundane tasks. To identify generalized tasks for the human and his/her tightly-coupled mediator and normal agents in a node, we conduct a questionnaire survey on human resource departments (HR) of different organizations (municipalities and public work and healthcare administration) soliciting information pertaining to the functions performed by their employees. To ensure the safety and accuracy of the shared information performed in the GNA approach, we integrate the approach with security and trust aspects. These aspects enable safe, efficient and precise information sharing between the nodes and increase the GNA nodes confidentiality, reliability, and trustworthy. We test and simulate the GNA approach which confirm that, (i) the GNA approach facilitates the collaboration between the humans and/or agents to perform their shared actions in a convenient cooperative levels, (ii) it reduces humans' workload and mitigate the distributed problem-solving, and (iii) consequently, its proves that the GNA with security and trust aspect enhances the viability of human agent collaborative systems when operating in various environments.

TABLE OF CONTENT

DECLARATION	
TITLE PAGE	
ACKNOWLEDGEMENTS	ii
ABSTRAK	iii
ABSTRACT	iv
TABLE OF CONTENT	v
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xv
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Background	1
1.3 Research Motivation	4
1.4 Problem Statement	5
1.5 Research Questions	7
1.6 Research Objectives	7
1.7 Research Scope	8
1.8 Research Significance	10
1.9 Thesis Organization	11
CHAPTER 2 LITERATURE REVIEW	12
2.1 Introduction	12
2.2 Software Agents	13

2.2.1	Definitions	15
2.2.2	Characteristics	17
2.3	Multi-Agent Systems	20
2.4	Agent Communication Language (ACL)	22
2.4.1	Speech Act Theory	22
2.4.2	The Knowledge Query and Manipulation Language	23
2.4.3	The Foundation for Intelligent Physical Agents (FIPA)	24
2.4.4	BDI Semantics	26
2.4.5	Agent Development Systems	28
2.5	Collaboration Issues	30
2.5.1	Issues in Collaborative Work Processes	30
2.5.2	Human Agent Collaborative Frameworks	31
2.6	Social Network Analysis (SNA)	32
2.6.1	Node Structures in a Network	34
2.6.2	Node Interaction in Networks	35
2.6.3	Mediation Approach	38
2.7	Security and Trust in HAC	38
2.7.1	Security in MAS	39
2.7.2	Trust and Trustworthiness	42
2.8	The Related Works	44
2.8.1	Nader and Richards (2013):	46
2.8.2	Ramchurn et al. (2015)	50
2.8.3	Gutierrez-Garcia and Adrian Ramirez-Nafarrate (2015)	54
2.8.4	Rashvand et al. (2010)	59
2.8.5	Merabet et al. (2014)	63
2.8.6	Ciortea, Tulbure et al. 2016	65

2.8.7	El Ajjouri, Benhadou et al. (2015)	68
2.8.8	Wang, Shi et al. (2015)	72
2.8.9	Research Gaps of the Related Work	74
2.9	Summary	78
CHAPTER 3 RESEARCH METHODOLOGY		79
3.1	Introduction	79
3.2	Research Approach	79
3.3	The Research Development Phases	82
3.3.1	Preliminary Study	84
3.3.2	Quantitative and Qualitative Analysis Of Collaborative Processes	85
3.3.3	Develop a Generic Approach for Human Agent Collaboration	86
3.3.4	Integrate Security and Trust Aspects	87
3.3.5	Develop a Simulation Environment	88
3.3.6	Evaluation Metrics	88
3.4	Implementation Simulation for Proposed GNA Approach	89
3.4.1	Demonstrating a GNA Approach for Agent-Based System Using the Concept of Nodes	90
3.4.2	Security Aspects for The Proposed GNA Approach	92
3.4.3	Trust Aspects for the GNA	93
3.5	Development Platforms	94
3.6	Case Study	95
3.7	Validation/Verification	97
3.8	Questionnaire Analysis	98
3.8.1	Quantitative Analysis	98
3.8.2	Qualitative Analysis - Semantics of Items	103
3.8.3	Human and Agent's Identification Functions	106

3.9	Summary	111
CHAPTER 4 A CONCEPTUAL DESIGN OF (GNA) APPROACH FOR HUMAN-AGENT COLLABORATION		112
4.1	Introduction	112
4.2	Preliminary	112
4.3	The Generic Nodal Abstraction (GNA) Approach	113
4.4	A high-Level General Flowchart of the GNA	115
4.5	A Collaboration Process for GNA	118
4.6	The Mediator Agent Performances	119
4.7	Style of Collaborative Nodes in the GNA	123
4.7.1	Human-Human Collaborative Nodes	123
4.7.2	Human-Mediator Agent Collaborative Node	125
4.7.3	Mediator-Mediator Agent Collaborative Nodes	126
4.7.4	Mediator -Normal Agent Collaborative Node	127
4.7.5	Normal-Normal Agent Collaborative Mode in the Node	129
4.8	GNA Implementation Design Approach	130
4.8.1	Inner Node Interaction	131
4.8.2	Outer Node Interaction	132
4.8.3	Human and Agents Characteristics in the GNA	133
4.9	Summary	134
CHAPTER 5 SECURITY AND TRUST ASPECTS FOR THE GNA		136
5.1	Introduction	136
5.2	Background	136
5.3	Security Aspects for the GNA	138
5.3.1	Node User Name and Password	140

5.3.2	Message Encryption among Nodes	141
5.3.3	Interaction Constraint	142
5.3.4	Restricted Time of Interactions between Nodes	143
5.3.5	Restricted Number of Interactions between Nodes	143
5.4	Trust Aspects for the GNA	144
5.4.1	Factors that Influence a GNA Trust Value	145
5.4.2	A GNA's Trust Values	146
5.4.3	Trusted Node Based Agent Performance	147
5.4.4	Trusted Node Based Human-Agent Performance	148
5.5	Summary	150
CHAPTER 6 HUMAN RESOURCE DEPARTMENT: CASE STUDY		151
6.1	Introduction	151
6.2	Human Resource Overview	151
6.3	HR Collaborative Performances	153
6.4	The Promotion and Upgrading Unit	154
6.5	Employee Promotion Procedure	155
6.5.1	Upgrading Structure of the Employees	158
6.5.2	Award, Attention, Warning Letters	160
6.6	The GNA Approach System Implementation	164
6.6.1	The GNA under Collaboration Behaviour	164
6.6.2	GNA Nodes' Tasks, Actions, and Interactions	168
6.6.3	Simulating the GNA Approach using Jade	173
6.6.4	The Human-Agent Collaboration	178
6.6.5	The GNA under Security and Trust Aspects	181
6.6.6	Data and Variables	186

6.6.7	Performance Visualization Module	188
6.7	The GNA Approach Testing	189
6.7.1	The GNA Collaboration Experiment	189
6.7.2	The GNA Security Experiment	190
6.7.3	The GNA Trust Experiment	191
6.8	Result and Analysis	194
6.8.1	The Essential GNA Results	194
6.8.2	The Final GNA Results	203
6.9	The Assessment of the Work	217
6.9.1	The Usability Assessment	217
6.9.2	The Trust Assessment	218
6.9.3	The Security Assessment	219
6.9.4	The Assessment Results	219
6.10	Discussions and Findings	221
6.11	Summary	222
CHAPTER 7 CONCLUSION AND FUTURE WORKS		224
7.1	Introduction	224
7.2	Summary of Work	226
7.3	Contribution	228
7.4	Concluding Remarks	230
7.5	Limitations	232
7.6	Future Work	232
REFERENCES		235
APPENDIX A QUESTIONNAIRE		247
APPENDIX B THE LIST OF PUBLICATIONS		255

LIST OF TABLES

Table 2.1	The characteristics of the software agent	18
Table 2.2	Collaboration trust and security test and assessment matrix	44
Table 2.3	Assessment of each work results and contributions	77
Table 3.1	Collaboration aspect between employees	99
Table 3.2	Security and trust aspects	100
Table 3.3	Assistant agent questions	101
Table 3.4	Collaborative functions of human	103
Table 3.5	Security functions	105
Table 3.6	Assistant agent functions	105
Table 3.7	Human functions semantics definitions	107
Table 3.8	Security semantics definitions	108
Table 3.9	Assistant semantics definitions	109
Table 5.1	GNA trust values-decision	146
Table 6.1	Upgrading structure of the employee	159
Table 6.2	Award letters examples	162
Table 6.3	Attention and warning letters examples	162
Table 6.4	Sample of vacant grades	173
Table 6.5	Five employees' names recorded in EE list	192
Table 6.6	Tests and runs of GNA	192
Table 6.7	Ten employees' names recorded in EE list	193
Table 6.8	Final EE list results 5 employees within one year duration	196
Table 6.9	Final EE list 5 employees' results of two years duration	201
Table 6.10	Final EE list 10 employees' results one year duration	205
Table 6.11	Final EE list 10 employees' results of two years duration	209
Table 6.12	Average results of test 1 and test 2	213
Table 6.13	Comparison between manual and GNA approach	214
Table 6.14	The overall collaboration viability assessment results	220

LIST OF FIGURES

Figure 2.1	Tree structure of the literature review	13
Figure 2.2	Artificial intelligence and software agent	14
Figure 2.3	Basic agent characteristics	17
Figure 2.4	Classification of software agents	20
Figure 2.5	Examples for the syntax for KQML	24
Figure 2.6	A belief-desire-intention agent nomenclature	26
Figure 2.7	A generic BDI architecture	27
Figure 2.8	Social network components	33
Figure 2.9	Social network nodes	34
Figure 2.10	Node structures in a network	35
Figure 2.11	Star network	36
Figure 2.12	Circle network	37
Figure 2.13	Line network	37
Figure 2.14	Complete MACVILLE collaborative agent architecture	47
Figure 2.15	Camera view (left) for six UAVs, planner view (right) in task edit mode and the monitor mode bar	52
Figure 2.16	Agent-based cloud data center architecture	55
Figure 2.17	Greedy selection of destination hosts	57
Figure 2.18	Collaborative load management protocol, cprotocol	58
Figure 2.19	Basic model of an agent used in MAS	60
Figure 2.20	Usual occurrence for MAS security deployment	61
Figure 2.21	Components of smart grids	63
Figure 2.22	System architecture	66
Figure 2.23	The model applied to S.C. ROTINA PRODUCT	67
Figure 2.24	Simplified model of intrusion detection system	69
Figure 2.25	Architecture of intrusion detection proposed	69
Figure 2.26	O-MaSE methodology framework	71
Figure 2.27	Illustrates the viability assessment results of the related work (Blue is Usability, Green is Trust and Yellow is Security)	75
Figure 3.1	Some important human and agent collaboration challenges	81
Figure 3.2	Research methodology phases	83
Figure 3.3	The research framework	87
Figure 3.4	GNA nodes interactions	91
Figure 3.5	The security architecture for the GNA	93

Figure 3.6	Human agent functions node	96
Figure 4.1	Flowchart of a GNA approach	115
Figure 4.2	Generic nodal abstraction concept	116
Figure 4.3	Main and sub-nodes of the GNA	117
Figure 4.4	Overview of collaboration process for three nodes	119
Figure 4.5	The GNA mediator agents interactions	122
Figure 4.6	Human-human collaborative node	124
Figure 4.7	The collaboration between various human nodes	125
Figure 4.8	Human-mediator agent collaborative nodes	126
Figure 4.9	Mediator-mediator agent collaborative nodes	127
Figure 4.10	Mediator agent-normal agent collaborative node	128
Figure 4.11	Normal-normal agent collaborative mode in the node	129
Figure 4.12	Inner node interaction	131
Figure 4.13	Outer node interaction	133
Figure 4.14	Human and agent characteristics	134
Figure 5.1	Security aspects architecture for the GNA	139
Figure 5.2	Node user name and password	140
Figure 5.3	Node secret message mechanism	141
Figure 5.4	Nodes interaction constraints	144
Figure 5.5	Trust based agents	148
Figure 5.6	Trusted node based human-agent performance	149
Figure 6.1	Use case diagram of employee promotion procedures	156
Figure 6.2	Upgrading employees collaborative procedures	165
Figure 6.3	The main GUI of the GNA approach	167
Figure 6.4	The promotion and upgrading GNA steps processes	169
Figure 6.5	The promotion and upgrading unit sub-node	171
Figure 6.6	Human agent GUI for sub-node	179
Figure 6.7	EE list of promotion and upgrading sub-node	180
Figure 6.8	Final EE list of main node	181
Figure 6.9	Node's user name and password	182
Figure 6.10	Malicious node attacks	183
Figure 6.11	Implementation of GNA under trust	185
Figure 6.12	SQL employees sample database	187
Figure 6.13	Performance visualization module of the GNA	188

Figure 6.14	GNA 5 employees simulation with one year under normal processes	195
Figure 6.15	Final EE list 5 employees results	196
Figure 6.16	GNA 5 employees simulation with one year under security processes	198
Figure 6.17	GNA 5 employees simulation with one year under trust processes	199
Figure 6.18	GNA 5 employees simulation with one year under all its components	200
Figure 6.19	GNA 5 employees simulation with two years under normal processes	200
Figure 6.20	GNA 5 employees simulation with two years under security processes	202
Figure 6.21	GNA 5 employees simulation with two years under trust processes	202
Figure 6.22	GNA 5 employees simulation with two years under all its components	203
Figure 6.23	GNA 10 employees simulation with one year under normal processes	204
Figure 6.24	GNA 10 employees simulation with two years under security processes	206
Figure 6.25	GNA 10 employees simulation with one years under trust processes	207
Figure 6.26	GNA 10 employees simulation with one year under all its components	208
Figure 6.27	GNA 10 employees simulation with two years under normal processes	208
Figure 6.28	GNA 10 employees simulation with two years under security processes	210
Figure 6.29	GNA 10 employees simulation with two years under trust processes	211
Figure 6.30	GNA 10 employees simulation with two years under all its features	212
Figure 6.31	Average results of test 1 and test 2	213

LIST OF ABBREVIATIONS

ACL	Agent Communication Language
AI	Artificial Intelligence
AIMA	Artificial Intelligence Modern Approach
BDI	Beliefs, Desires, and Intentions
CSRP 1986	Civil Service Rules and Policies issued in 1986
CST	Collaboration, Security, and Trust
DAI	Distributed Artificial Intelligence
EE	Eligible Employee
FIPA	The Foundation for Intelligent Physical Agents
FU	Financial Unit
GNA	Generic Node Abstraction
HAC	Human-Agent Collaboration
HMDA	Human-Mediator Agent with one agent Node
HMDAs	Human-Mediator agent with multiple Agents' node
HoD	Head of Department
HR	Human Resource
IoT	Internet of Things
JADE	The Java Agent DEvelopment
JDK	Java Development Kit
KAoS	Knowledgeable Agent-oriented System
KQML	Knowledge Query and Manipulation Language
KSE	Knowledge Sharing Effort
MACVILLE	Multi-Agent Collaborative VirtuaL Learning Environment
MAS	Multi-Agent Systems
MDA	Mediator agent with one agent node
NH	human-only node
OAA	Open Agent Architecture
O-MaSE	Organization based Multi-agents System Engineering
PIC	Person In Charge
PVM	Performance Visualization Module
SDLC	Software Development Life Cycle

SMA	Server Manager Agents
SMMall	Shared Mental Models for all
SNA	Social Network Analysis
UAV	Unmanned Aerial Vehicles
UM	Unit Manager
VM	Virtual Machines
VU	Vacancy Unit
XML	Extensible Mark-up Language

REFERENCES

- Abdul Majid, M., (2011). Human behaviour modelling: An investigation using traditional discrete event and combined discrete event and agent-based simulation. *Ph.D. Thesis. University of Nottingham, UK.*
- Abedinzadeh, S. and Sadaoui, S., (2013). ScubAA: A human plausible reasoning approach to agent trust management. *In International Conference on Software Engineering and Knowledge Engineering, A-2.*
- Adam, C., Danet, G., Thangarajah, J. and Dugdale, J., (2016). BDI modelling and simulation of human behaviours in bushfires. *In International Conference on Information Systems for Crisis Response and Management in Mediterranean Countries, 47-61.*
- Adameit, S., Betz, T., Cabac, L., Hars, F., Hewelt, M., Köhler-Bußmeier, M., Moldt, D., Popov, D., Quenum, J., Theilmann, A. and Wagner, T., (2010). Modelling distributed network security in a petri net-and agent-based approach. *In German Conference on Multiagent System Technologies, 209-220.*
- Ahlbrecht, T., Dix, J., Fiekas, N., Köster, M., Kraus, P. and Müller, J.P., (2016). An architecture for scalable simulation of systems of cognitive agents. *International Journal of Agent-Oriented Software Engineering, 5(2-3), 232-265.*
- Ahmed, M., Ahmad, and Yusoff, M., (2010). Modeling agent-based collaborative process. *In International Conference on Computational Collective Intelligence, 296-305.*
- Andreadis, G., Klazoglou, P., Niotaki, K. and Bouzakis, K.D., (2014). Classification and review of multi-agents systems in the manufacturing section. *Procedia Engineering, 69, 282-290.*
- Baker, M. and Bielaczyc, K., (1995). Missed opportunities for learning in collaborative problem-solving interactions. *In World Conference on Artificial Intelligence in Education, 210-217.*
- Base64. (2016). "What is Base 64 encoding?", from <https://howtodoinjava.com/java8/base64-encoding-and-decoding-example-in-java-8/>, last accessed on (February, 2015).
- Becker-Asano, C. and Wachsmuth, I., (2010). Affective computing with primary and secondary emotions in a virtual human. *Autonomous Agents and Multi-Agent Systems, 20(1), 32.*
- Bellifemine, F., Bergenti, F., Caire, G. and Poggi, A., (2005). *Jade—a Java agent development framework. In Multi-Agent Programming.* Springer, Boston, MA.
- Bellifemine, F.L., Caire, G. and Greenwood, D., (2007). *Developing multi-agent systems with Jade.* John Wiley & Sons.
- Bergenti, F., Iotti, E. and Poggi, A., (2016). Core features of an agent-oriented domain-

- specific language for Jade agents. *In International Conference on Trends in Practical Applications of Scalable Multi-Agent Systems*, 213-224.
- Bertuccelli, L., Beckers, W. and Cummings, M., (2010). Developing operator models for UAV search scheduling. *In International Conference on Guidance, Navigation, and Control*, 78-63.
- Bhamra, G.S., Verma, A.K. and Patel, R.B., (2014). Intelligent software agent technology: an overview. *International Journal of Computer Applications*, 89(2), 19-31.
- Bradshaw, J.M., (1996). KAOs: An open agent architecture supporting reuse, interoperability, and extensibility. *In 10th International Workshop Knowledge Acquisition for Knowledge-Based Systems*, 1-19.
- Bresciani, P., Perini, A., Giorgini, P., Giunchiglia, F. and Mylopoulos, J., (2004). Tropos: An agent-oriented software development methodology. *Autonomous Agents and Multi-Agent Systems*, 8(3), 203-236.
- Briggs, G.M. and Scheutz, M., (2013). A hybrid architectural approach to understanding and appropriately generating indirect speech acts. *In 27th AAAI Conference on Artificial Intelligence*, 1213-1219.
- Butner, J.E., Wiltshire, T.J. and Munion, A.K., (2017). Modeling multi-agent self-organization through the lens of higher order attractor dynamics. *Frontiers in Psychology*, 8, 380.
- Byrski, A., Dreżewski, R., Siwik, L. and Kisiel-Dorohinicki, M., (2015). *Evolutionary multi-agent systems. The Knowledge Engineering Review*, 30(2), 171-186.
- Caillou, P., Gaudou, B., Grignard, A., Truong, C.Q. and Taillandier, P., (2017). A Simple-to-use BDI architecture for Agent-based modeling and simulation. *In International Conference on Advances in Social Simulation*, 15-28.
- Cao, M., Luo, X., Luo, X.R. and Dai, X., (2015). Automated negotiation for e-commerce decision making: A goal deliberated agent architecture for multi-strategy selection. *Decision Support Systems*, 73, 1-14.
- Chen, H., Finin, T., Joshi, A., Kagal, L., Perich, F. and Chakraborty, D., (2004). Intelligent agents meet the semantic web in smart spaces. *IEEE Internet Computing*, 8(6), 69-79.
- Chen, W., Durfee, E. and Dumas, M., (2009). Human agent collaboration in a simulated combat medical scenario. *In International Symposium on Collaborative Technologies and Systems*, 367-375.
- Chen, W., Manikonda, V. and Durfee, E., (2007). A flexible human agent collaboration (hac) framework for human-human activity coordination (h2ac). *In International Symposium Regarding the "Intelligence" in Distributed Intelligent Systems*, 38-41.
- Chira, O., Chira, C., Tormey, D., Brennan, A. and Roche, T., (2003). A multi-agent

- architecture for distributed design. *In International Conference on Industrial Applications of Holonic and Multi-Agent Systems*, 213-224.
- Chitre, M., Bhatnagar, R. and Soh, W.S., (2014). UnetStack: An agent-based software stack and simulator for underwater networks. *In International Conference on Oceans-St. John's*, 1-10.
- Chouhan, S.S. and Niyogi, R., (2016). Multi-agent planning with collaborative actions. *In Australasian Joint Conference on Artificial Intelligence*, 609-620.
- Ciortea, E.M., Tulbure, A. and Huțanu, C.T., (2016). Multi-agent for manufacturing systems optimization. *In International Conference on Series: Materials Science and Engineering*, 1-6.
- Cobb-Clark, D.A., (2001). Getting ahead: The determinants of and payoffs to internal promotion for young US men and women. *In Worker Wellbeing in a Changing Labor Market*, 339-372.
- Coppolino, L., Srl, E., Jäger, M., Kuntze, N. and Rieke, R., (2014). A trusted information agent for security information and event management. *Security Analysis of System Behaviour*, 265, 253-265.
- Cordasco, G., De Chiara, R., Mancuso, A., Mazzeo, D., Scarano, V. and Spagnuolo, C., (2011). A framework for distributing agent-based simulations. *In European Conference on Parallel Processing*, 460-470.
- Cummings, M.L., Brzezinski, A.S. and Lee, J.D., (2007). The impact of intelligent aiding for multiple unmanned aerial vehicle schedule management. *IEEE Intelligent Systems: Special Issue on Interacting with Autonomy*, 22(2), 52-59.
- Das, A. and Islam, M.M., (2012). SecuredTrust: A dynamic trust computation model for secured communication in multiagent systems. *IEEE Transactions on Dependable and Secure Computing*, 9(2), 261-274.
- Day, M.Y., Shih, S.P. and Chang, W., (2011). Social network analysis of research collaboration in information reuse and integration. *In Information Conference on Reuse and Integration*, 551-556.
- De Pauw, G., Wagacha, P.W. and de Schryver, G.M., (2009). The SAWA corpus: A parallel corpus English-Swahili. *In 1st International Workshop on Language Technologies for African Languages*, 9-16.
- De Tjerk, E.G., Henryk, F.A. and Neerincx, M.A., (2010). Adaptive automation based on an object-oriented task model: Implementation and evaluation in a realistic c2 environment. *Journal of Cognitive Engineering and Decision Making*, 4(2), 152-182.
- Debar, H., Dacier, M. and Wespi, A., (2000). A revised taxonomy for intrusion-detection systems. *In International Conference on Annales des télécommunications*, 361-378.
- Delle Fave, F.M., Rogers, A., Xu, Z., Sukkarieh, S. and Jennings, N.R., (2012).

- Deploying the max-sum algorithm for decentralised coordination and task allocation of unmanned aerial vehicles for live aerial imagery collection. *In International Conference on Robotics and Automation*, 469-476.
- Dunin-Keplicz, B. and Verbrugge, R., (2011). *Teamwork in multi-agent systems: A formal approach*. John Wiley & Sons.
- Ehlert, P.A. and Rothkrantz, L.J., (2001). Microscopic traffic simulation with reactive driving agents. *In International Conference on Intelligent Transportation Systems*, 861-866.
- El Ajjouri, M., Benhadou, S. and Medromi, H., (2015). New collaborative intrusion detection architecture based on multi agent systems. *In International Conference on Wireless Networks and Mobile Communications*, 1-6.
- Fan, X. and Yen, J., (2011). Modeling cognitive loads for evolving shared mental models in human-agent collaboration. *IEEE Transactions on Systems, Man, and Cybernetics*, 41(2), 354-367.
- Farnham, D. and Pimlott, J., (1995). *Understanding industrial relations*. Burns & Oates.
- Finin, T., Fritzon, R., McKay, D. and McEntire, R., (1994). KQML as an agent communication language. *In 3rd International Conference on Information and Knowledge Management*, 456-463.
- Firesmith, D.G. and Henderson-Sellers, B., (2002). *The open process framework: An introduction*. Pearson Education.
- Florea, A.M., (1998). *Introduction to multi-agent systems. International Summer School on Multi-Agent Systems*. Bucharest, 6.
- Franklin, S., A. Graesser, (1996). Is it an Agent or just a Program? A Taxonomy for Autonomous Agents. *In 3rd International Workshop on Agents Theories, Architectures, and Languages*, 1-10.
- Furmankiewicz, M., Sołtysik-Piorunkiewicz, A. and Ziuziański, P., (2014). Artificial intelligence and multi-agent software for e-health knowledge management system. *Informatyka Ekonomiczna*, 2(32), 51-63.
- Galland, S., Knapen, L., Gaud, N., Janssens, D., Lamotte, O., Koukam, A. and Wets, G., (2014). Multi-agent simulation of individual mobility behaviour in carpooling. *Transportation Research Part C: Emerging Technologies*, 45, 83-98.
- Genesereth, M.R., (1994). *Software agents michael R. Genesereth Logic Group Computer Science Department Stanford University. USA*
- Golpayegani, F., Dusparic, I., Taylor, A. and Clarke, S., (2016). Multi-agent collaboration for conflict management in residential demand response. *Computer Communications*, 96, 63-72.

- Gonçalves, E.J.T., Cortés, M.I., Campos, G.A.L., Lopes, Y.S., Freire, E.S., da Silva, V.T., de Oliveira, K.S.F. and de Oliveira, M.A., (2015). MAS-ML 2.0: Supporting the modelling of multi-agent systems with different agent architectures. *Journal of Systems and Software*, 108, 77-109.
- Gutierrez-Garcia, J.O. and Ramirez-Nafarrate, A., (2015). Collaborative agents for distributed load management in cloud data centres using live migration of virtual machines. *IEEE Transactions on Services Computing*, 8(6), 916-929.
- Hamid, N.H.A., Ahmad, M.S., Ahmad, A., Mustapha, A., Mahmoud, M.A. and Yusoff, M.Z.M., (2015). Trusting norms: A conceptual norms' trust framework for norms adoption in open normative multi-agent systems. In *12th International Conference on Distributed Computing and Artificial Intelligence*, 149-157.
- Hancock, P.A., Billings, D.R., Schaefer, K.E., Chen, J.Y., De Visser, E.J. and Parasuraman, R., (2011). A meta-analysis of factors affecting trust in human-robot interaction. *Human Factors*, 53(5), 517-527.
- Hanna, N. and Richards, D., (2012). A collaborative agent architecture with human-agent communication model. In *International Workshop on Cognitive Agents for Virtual Environments*, 70-88.
- Hayzelden, A.L. and Bigham, J., (1999). *Software agents for future communication systems*. Springer Science and Business Media.
- Hedin, Y. and Moradian, E., (2015). Security in multi-agent systems. *Procedia Computer Science*, 60, 1604-1612.
- Huynh, T.D., Jennings, N.R. and Shadbolt, N.R., (2006). An integrated trust and reputation model for open multi-agent systems. *Autonomous Agents and Multi-Agent Systems*, 13(2), 119-154.
- Itika, J., (2011). *Fundamentals of human resource management: Emerging experiences from Africa*. African Public Administration and Management Series. African Studies Centre, Leiden.
- Ivan, I., Ciurea, C. and Pavel, S., (2010). Very large data volumes analysis of collaborative systems with finite number of states. *Journal of Applied Quantitative Methods*, 5(1), 14-28.
- Izumi, T., Santoro, N. and Viglietta, G., (2017). Population protocols with faulty interactions: the impact of a leader. In *10th International Conference on Algorithms and Complexity*, 454.
- Jadbabaie, A., Lin, J. and Morse, A.S., (2003). Coordination of groups of mobile autonomous agents using nearest neighbour rules. *IEEE Transactions on Automatic Control*, 48(6), 988-1001.
- Jain, U.K., Bhatia, R.K., Rao, A.R., Singh, R., Saxena, A.K. and Sehar, I., (2014). Design and development of halogenated chalcone derivatives as potential anticancer agents. *Tropical Journal of Pharmaceutical Research*, 13(1), 73-80.

- Jennings, N.R., Sycara, K. and Wooldridge, M., (1998). A roadmap of agent research and development. *Autonomous Agents and Multi-Agent Systems*, 1(1), 7-38.
- Jing, Q., Vasilakos, A.V., Wan, J., Lu, J. and Qiu, D., (2014). Security of the internet of things: perspectives and challenges. *Wireless Networks*, 20(8), 2481-2501.
- Jöst, M., Merdes, M. and Malaka, R., (2004). Listening to agents—transparent representation and presentation of agent communication in mobile systems. *In International Conference on Object-Oriented and Internet-Based Technologies*, 55-68.
- Kazemi, A., Zarandi, M.H.F. and Azizmohammadi, M., (2017). A hybrid search approach in production-distribution planning problem in supply chain using multi-agent systems. *International Journal of Operational Research*, 28(4), 506-527.
- Khosravifar, B., Bentahar, J., Gomrokchi, M. and Alam, R., (2012). CRM: An efficient trust and reputation model for agent computing. *Knowledge-Based Systems*, 30, 1-16.
- Labrou, Y., Finin, T. and Peng, Y., (1999). Agent communication languages: The current landscape. *IEEE Intelligent Systems*, (2), 45-52.
- Li, S. and Kokar, M.M., (2013). Agent communication language. *In Flexible Adaptation in Cognitive Radios*, 37-44.
- Lipponen, L., (2002). Exploring foundations for computer-supported collaborative learning. *In International Conference on Computer Support for Collaborative Learning*, 72-81.
- Liu, C.L. and Liu, F., (2011). Stationary consensus of heterogeneous multi-agent systems with bounded communication delays. *Automatica*, 47(9), 2130-2133.
- Louis, V. and Martinez, T., (2005). The Jade semantic agent: Towards agent communication oriented middleware. *AgentLink News*, 18, 16-18.
- Lu, G., Lu, J., Yao, S. and Yip, Y.J., (2009). A review on computational trust models for multi-agent systems. *The Open Information Science Journal*, 2, 18-25.
- Ma, C.Q. and Zhang, J.F., (2010). Necessary and sufficient conditions for consensusability of linear multi-agent systems. *IEEE Transactions on Automatic Control*, 55(5), 1263-1268.
- Macal, C. and North, M., (2014). Introductory tutorial: Agent-based modeling and simulation. *In International Conference on Winter Simulation*, 6-20.
- Majid, M.A., Aickelin, U. and Siebers, P.O., (2009). Comparing simulation output accuracy of discrete event and agent based models: A quantitative approach. *In International Conference on Computer Simulation Society for Modeling and Simulation*, 177-184.
- Majid, M.A., Fakhreldin, M. and Zamli, K.Z., (2016). An enhanced simulation model

- for complex human pedestrian movement system using hybrid discrete event and agent based simulation. *International Information Institute (Tokyo) Information*, 19(9B), 4213.
- Maliah, S., Shani, G. and Stern, R., (2017). Collaborative privacy preserving multi-agent planning. *Autonomous Agents and Multi-Agent Systems*, 31(3), 493-530.
- McBurney, P. and Luck, M., (2007). The agents are all busy doing stuff. *IEEE Intelligent Systems*, 22(4), 6-7.
- Meads, G., Ashcroft, J., Barr, H., Scott, R. and Wild, A., (2008). *The case for interprofessional collaboration: In Health and Social Care*. John Wiley & Sons.
- Mekdeci, B. and Cummings, M.L., (2009). Modeling multiple human operators in the supervisory control of heterogeneous unmanned vehicles. *In 9th International Workshop on Performance Metrics for Intelligent Systems*, 1-8.
- Mekid, S., (2006). Further structural intelligence for sensors cluster technology in manufacturing. *Sensors*, 6(6), 557-577.
- Merabet, G.H., Essaaidi, M., Talei, H., Abid, M.R., Khalil, N., Madkour, M. and Benhaddou, D., (2014). Applications of multi-agent systems in smart grids: A survey. *In International Conference on Multimedia Computing and Systems*, 1088-1094.
- Mohammed, K.A., Ahmad, M.S., Mostafa, S.A. and Sharifuddin, F.M.A.M., (2012). A nodal approach to modeling human-agents collaboration. *International Journal of Computer Applications, Foundation of Computer Science*, 43(12), 33-40.
- Mohammed, K.A., Mostafa, S.A., Ahmad, M.S. and Mahmoud, M.A., (2014). A qualitative analysis of human-agent functions for collaborative multi-agent system. *In International Conference on Information Technology and Multimedia*, 244-249.
- Moradian, E., (2013). Security of e-commerce software systems. *In Agent and Multi-Agent Systems in Distributed Systems-Digital Economy and E-Commerce*, 95-103.
- Mouratidis, H. and Giorgini, P., (2007). Secure tropos: A security-oriented extension of the tropos methodology. *International Journal of Software Engineering and Knowledge Engineering*, 17(02), 285-309.
- Mouratidis, H., Giorgini, P. and Manson, G., (2003). An ontology for modelling security: The tropos approach. *In International Conference on Knowledge-Based and Intelligent Information and Engineering Systems*, 1387-1394.
- Müller, F., (2016). *What is a speech act? A brief introduction to Searle's theory on speech acts*. GRIN, Verlag.
- Mustapha, K., Mcheick, H. and Mellouli, S., (2016). Smart cities and resilience plans: A multi-agent based simulation for extreme event rescuing. *In Smarter as the*

New Urban Agenda, 149-170.

- Mwinyi, A.K., Al-Haddad, S.A.R., Hashim, S.B. and Abdullah, R.B.H., (2014). Review on multi-agent system collaboration in learning management system domain by deploying wireless sensor networks for student location detection. *Journal of Computer Science*, 10(6), 995.
- Norling, E., (2004). Folk psychology for human modelling: Extending the BDI paradigm. In *3rd International Conference on Autonomous Agents and Multiagent Systems*, 202-209.
- Nwana, H., (1996). Software Agents: An overview. Intelligent Systems Research. *The Knowledge Engineering Review*, 11(3), 205-244. .
- Nwana, H.S. and Wooldridge, M., (1996). Software agent technologies. *BT Technology Journal*, 14(4).
- Nyame-Asiamah, F. and Patel, N.V., (2009). Research methods and methodologies for studying organisational learning. In *European and Mediterranean Conference on Information Systems*, 1-12
- Olfati-Saber, R., Fax, J.A. and Murray, R.M., (2007). Consensus and cooperation in networked multi-agent systems. In *Proceeding of IEEE*, 215-233.
- Park, J.S. and Jang, G.J., (2015). Implementation of voice emotion recognition for interaction with mobile agent. In *3rd International Conference on Human-Agent Interaction*, 307-308.
- Perrault, C.R. and Kohen, P.R., (1977). Overview of planning speech acts. In *International Joint Conference on Artificial Intelligence*, 119.
- Pinyol, I. and Sabater-Mir, J., (2013). Computational trust and reputation models for open multi-agent systems: A review. *Artificial Intelligence Review*, 40(1), 1-25.
- Poslad, S., Charlton, P. and Calisti, M., (2002). Specifying standard security mechanisms in multi-agent systems. In *International Workshop on Deception, Fraud and Trust in Agent Societies*, 163-176.
- Poveda, G. and Schumann, R., (2016). An ontology-driven approach for modeling a multi-agent-based electricity market. In *German Conference on Multiagent System Technologies*, 27-40.
- Pujari, S. and Mukhopadhyay, S., (2012). Agent oriented e-learning system for visually impaired students using Jade agent technology. *International Journal of Advanced Research in Computer Science*, 3(3), 48-56.
- Ramchurn, S.D., Farinelli, A., Macarthur, K.S. and Jennings, N.R., (2010). Decentralized coordination in robocup rescue. *The Computer Journal*, 53(9), 1447-1461.
- Ramchurn, S.D., Fischer, J.E., Ikuno, Y., Wu, F., Flann, J. and Waldock, A., (2015). A study of human-agent collaboration for multi-UAV task allocation in dynamic

- environments. *In International Joint Conferences on Artificial Intelligence*, 1184-1192.
- Ramchurn, S.D., Wu, F., Jiang, W., Fischer, J.E., Reece, S., Roberts, S., Rodden, T., Greenhalgh, C. and Jennings, N.R., (2016). Human-agent collaboration for disaster response. *Autonomous Agents and Multi-Agent Systems*, 30(1), 82-111.
- Rao, A.S. and Georgeff, M.P., (1995). BDI agents: From theory to practice. *In 1st International Conference on Multi-Agent Systems*, 312-319.
- Rao, A.S. and Georgeff, M.P., (1995). The semantics of intention maintenance for rational agents. *In 14th International Joint Conference on Artificial Intelligence*, 704-710.
- Rao, A.S., (1996). AgentSpeak (L): BDI agents speak out in a logical computable language. *In European Workshop on Modelling Autonomous Agents in a Multi-Agent World*, 42-55.
- Rashvand, H.F., Salah, K., Calero, J.M.A. and Harn, L., (2010). Distributed security for multi-agent systems-review and applications. *IET Information Security*, 4(4), 188-201.
- Ren, W. and Cao, Y., (2010). *Distributed coordination of multi-agent networks: Emergent problems, models, and issues*. Springer Science & Business Media.
- Ren, W. and Sorensen, N., (2008). Distributed coordination architecture for multi-robot formation control. *Robotics and Autonomous Systems*, 56(4), 324-333.
- Rogers, A., Farinelli, A., Stranders, R. and Jennings, N.R., (2011). Bounded approximate decentralised coordination via the max-sum algorithm. *Artificial Intelligence*, 175(2), 730-759.
- Rosaci, D. and Sarné, G.M., (2013). Cloning mechanisms to improve agent performances. *Journal of Network and Computer Applications*, 36(1), 402-408.
- Rosaci, D., (2012). Trust measures for competitive agents. *Knowledge-Based Systems*, 28, 38-46.
- Russell, S., Norvig, P. and Intelligence, A., (1995). A modern approach. *Artificial Intelligence*, 25(27), 79-80.
- Sanders, T., Oleson, K.E., Billings, D.R., Chen, J.Y. and Hancock, P.A., (2011). A model of human-robot trust: Theoretical model development. *In International Conference on Human Factors and Ergonomics Society Annual Meeting*, 1432-1436.
- Santra, S. and Acharjya, P.P., (2013). A Study and analysis on computer network topology for data communication. *International Journal of Emerging Technology and Advanced Engineering*, 3(1), 522-525
- Sato, G.Y., Azevedo, H.J. and Barthès, J.P.A., (2012). Agent and multi-agent applications to support distributed communities of practice: A short review.

Autonomous Agents and Multi-Agent Systems, 25(1), 87-129.

- Sawa, Y., Bhakta, R., Harris, I.G. and Hadnagy, C., (2016). Detection of social engineering attacks through natural language processing of conversations. *In 10th International Conference on Semantic Computing*, 262-265.
- Schut, M., Wooldridge, M. and Parsons, S., (2004). The theory and practice of intention reconsideration. *Journal of Experimental & Theoretical Artificial Intelligence*, 16(4), 261-293.
- Searle, J.R., (1980). *The background of meaning. In Speech act theory and pragmatics.* Springer, Dordrecht.
- Shajari, M. and Ghorbani, A.A., (2004). Application of belief-desire-intention agents in intrusion detection & response. *In PST*, 181-191.
- Shih, D.H., Chiang, H.S., Yen, D.C. and Huang, S.C., (2013). An intelligent embedded system for malicious email filtering. *Computer Standards and Interfaces*, 35(5), 557-565.
- Singh, B., Tran, D., Mkandawire, S. and Rodriguez, A., (2017). *Self-adjusting mobile platform policy enforcement agent for controlling network access, mobility and efficient use of local and network resources*, U.S. Patent 9,781,645.
- Stranders, R., (2006). Argumentation based decision making for trust in multi-agent systems. *IEEE Transactions on Knowledge and Data Engineering*, 6(1), 64-71.
- Suguri, H., (1999). A standardization effort for agent technologies: The foundation for intelligent physical agents and its activities. *In Annual Hawaii International Conference on System Sciences*, 80-61.
- Taddeo, M., (2010). Modelling trust in artificial agents, a first step toward the analysis of e-trust. *Minds and Machines*, 20(2), 243-257.
- Thirumalai, C.S. and Senthilkumar, M., (2016). Secured E-mail system using base 128 encoding scheme. *International Journal of Pharmacy And Technology*, 8(4), 21797-806.
- Tramullas, J. ed., (2012). *Library Automation and OPAC 2.0: Information Access and Services in the 2.0 Landscape: Information Access and Services in the 2.0 Landscape.* IGI Global.
- Tsai, W.T., Fan, C., Chen, Y. and Paul, R., (2006). Ddsos: A dynamic distributed service-oriented simulation framework. *In 39th International Conference on Annual Symposium on Simulation*, 160-167.
- Tweedale, J.W., (2014). A review of cognitive decision-making within future mission systems. *Procedia Computer Science*, 35, 1043-1052.
- Van Hoof, B. and Thiell, M., (2014). Collaboration capacity for sustainable supply chain management: small and medium-sized enterprises in Mexico. *Journal of*

Cleaner Production, 67, 239-248.

- Van Wissen, A., Gal, Y.A., Kamphorst, B.A. and Dignum, M.V., (2012). Human-agent teamwork in dynamic environments. *Computers in Human Behavior*, 28(1), 23-33.
- Vidoni, R., (2011). A multi agent robotic system for simulation and control of a manufacturing process. *Acta Technica Corviniensis-Bulletin of Engineering*, 4(1), 93.
- Walton, D., Toniolo, A. and Norman, T.J., (2016). Speech acts and burden of proof in computational models of deliberation dialogue. *In 1st European Conference on Argumentation*, 1-20.
- Wang, X., Shi, Z., Zhang, F. and Wang, Y., (2015). Dynamic real-time scheduling for human-agent collaboration systems based on mutual trust. *Cyber-Physical Systems*, (2-4), 76-90.
- Wardell, D.C., Mills, R.F., Peterson, G.L. and Oxley, M.E., (2016). A method for revealing and addressing security vulnerabilities in cyber-physical systems by modeling malicious agent interactions with formal verification. *Procedia Computer Science*, 95, 24-31.
- Wijngaards, N.J., Overeinder, B.J., van Steen, M. and Brazier, F.M., (2002). Supporting internet-scale multi-agent systems. *Data & Knowledge Engineering*, 41(2-3), 229-245.
- Willmott, S., Calisti, M., Faltings, B., Macho-Gonzalez, S., Belahdar, O. and Torrens, M., (2000). CCL: Expressions of choice in agent communication. *In 4th International Conference on Multi-Agent Systems*, 325-332.
- Wooldridge, M. and Jennings, N.R., (1995). Intelligent agents: Theory and practice. *The Knowledge Engineering Review*, 10(2), 115-152.
- Wooldridge, M., Jennings, N.R. and Kinny, D., (2000). The Gaia methodology for agent-oriented analysis and design. *Autonomous Agents and Multi-Agent systems*, 3(3), 285-312.
- Yu, B. and Singh, M.P., (2003). Detecting deception in reputation management. *In 2nd International Joint Conference on Autonomous Agents And Multi-Agent Systems*, 73-80.
- Yu, W., Chen, G. and Cao, M., (2010). Some necessary and sufficient conditions for second-order consensus in multi-agent dynamical systems. *Automatica*, 46(6), 1089-1095.
- Yuan, J., Zhang, Q.M., Gao, J., Zhang, L., Wan, X.S., Yu, X.J. and Zhou, T., (2016). Promotion and resignation in employee networks. *Physica A: Statistical Mechanics and its Applications*, 444, 442-447.
- Yue, X., Qiu, X., Ji, Y. and Zhang, C., (2009). P2P attack taxonomy and relationship analysis. *In 11th International Conference on Advanced Communication*

Technology, 1207-1210.

- Zambonelli, F., Jennings, N.R. and Wooldridge, M., (2003). Developing multi-agent systems: The Gaia methodology. *ACM Transactions on Software Engineering and Methodology*, 12(3), 317-370.
- Zambonelli, F., Omicini, A., Anzengruber, B., Castelli, G., De Angelis, F.L., Serugendo, G.D.M., Dobson, S., Fernandez-Marquez, J.L., Ferscha, A., Mamei, M. and Mariani, S., (2015). Developing pervasive multi-agent systems with nature-inspired coordination. *Pervasive and Mobile Computing*, 17, 236-252.
- Zhang, A., (2014). *Collaboration in the australian and chinese mobile telecommunication markets*. Springer. Berlin and Heidelberg.
- Zhao, R., Papangelis, A. and Cassell, J., (2014). Towards a dyadic computational model of rapport management for human-virtual agent interaction. *In International Conference on Intelligent Virtual Agents*, 514-527.
- Zhou, H. and Benton Jr, W.C., (2007). Supply chain practice and information sharing. *Journal of Operations management*, 25(6), 1348-1365.