Ain Shams University
Faculty of Engineering
Computer and Systems Engineering Department

Performance Evaluation of Multi-Agent System

A Thesis submitted in partial fulfillment of the requirements of
The Degree of Master of Science (M.Sc.) in Electrical Engineering
(Computer and Systems Engineering)

by

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Thesis Title: **Performance Evaluation of Multi-Agent System**

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Date: May 4, 2019

Statement

This thesis is submitted as a partial fulfilment of Master of Science in Electrical Engineering Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis Summary

Name:	**Sabah Aly Darweesh Aly**
Thesis:	**Performance Evaluation of Multi-Agent System**
Degree:	**Master of Science (M.Sc.) in Electrical Engineering (Computer and Systems Engineering)**

Multi-Agent Systems (MASes) are commonly used in the emergence of computing from human behavior. This emergence appears in the autonomy, sociability, rationality, reactivity, adapting and learning characteristics of MAS. Therefore, MASes exist in a wide field in our lives and introduce the proper services. These services may be the non-mind machine, unmanned plane, banking transporting, smart device services and self-driving car.

Nevertheless, the standardization of performance evaluation methodologies of MASes is still very lack because of the variety of MASes, their agents and their functionalities. This research introduces a general approach to evaluate MAS performance. Especially, in this thesis, MAS performance means that how the agents perform in their MAS environment. Consequently, the evaluation process is based on some criteria of MAS. Meanwhile, these criteria are intelligence, security and scalability criterion. Mainly, the suggested approach depends on the Goal/Question/Metric (GQM) model and Fuzzy Logic. Firstly, the criteria are typically exemplified using the GQM model. Secondly, the criteria are computed using mean functions and FISs. Finally, the agent performance is the output of FIS, which its inputs are the intelligence, security and scalability criteria. Practically, the agent performance is measured then MAS performance value is the mean of its agents. The evaluation process results are percentages of MAS criteria and its performance. In addition, a case study is evaluated using the suggested approach and its results are discussed. Finally, the sensitivity of the suggested approach is tested. Specifically, the approach sensitivity inducts the impact of user behavior change. Deductively, this thesis is going to measure MAS performance and the results enhance the explication of MAS advantages and disadvantages.

The contribution of this work is that it is the first time to introduce a general model to evaluate MAS performance and test the model sensitivity. Accordingly, the MAS developer can clearly use this evaluation to define the system. In addition, the MAS owner can identify MAS cost-effective. Moreover, the MAS manager simplifies and time-effectively uses this work to manage the system. Furthermore, the suggested model is a dynamic evaluation model. New criteria can be added to enhance the evaluation process.

Keywords: Fuzzy Logic, Goal/Question/Metric (GQM), Multi-Agent System (MAS), Performance Evaluation.

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Sabah Aly Darweesh Aly

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