

Adopting Agent Oriented Methodology (AOM) For Modelling and Simulation in Epidemiology and Ecological Studies

Cheah Wai Shiang¹, Shane Nissom¹, Nurfaeza binti Jali¹, Sim YeeWai²

¹ Faculty of Computer Science & IT, Universiti Malaysia Sarawak

² School of Computing, University College of Technology Sarawak

wscheah@unimas.my

Abstract—AOM (Agent Oriented Modeling) is a comprehensive and unified agent methodology for agent oriented software development. AOM methodology was proposed to aid developers with the introduction of technique, terminology, notation and guideline during agent systems development. Although AOM methodology is claimed to be capable of developing a complex real-world system, its potential is yet to be realized and recognized by the mainstream software community and the adoption of AOM is still in its infancy. Among the reason is that there are not much case studies or success story of AOM. This paper presents two case studies on the adoption of AOM for individual-based modelling and simulation. It demonstrates how the AOM is useful for epidemiology study and ecological study. Hence, it further validates the AOM in a qualitative manner.

Index Terms—Agent Oriented Modeling; Agent Modeling; Agent Simulation; Software Development.

I. INTRODUCTION

Agent methodology is introduced to cope with the development of the complex system. Agent methodology is a software engineering paradigm that makes use of agent paradigm to engineer complex systems. The agent can be described as a program or software that is autonomous, able to exhibit social interaction behaviour and can perform tasks in proactive or reactively manner [5]. Agent paradigm is suitable for complex system development because it can provide systems with problem solving or social interaction capabilities through means of agent abstraction [7].

To date, various agent methodologies have been introduced. AOM (Agent Oriented Modeling) methodology is one of agent methodologies introduced to aid developers with the introduction of technique, terminology, notation and guideline during agent systems development [5]. AOM methodology is suitable to cope with complex system development due to the nature of this methodology that it is able to describe a complex system with high level of abstraction, has less degree of ambiguity and can promote communications across different stakeholders [8]. However, there are not many case studies, be it empirical or heuristic studies or experience sharing to support the usefulness of AOM. Therefore, it is vital to conduct an investigation through case studies to validate AOM methodology. Validation and evaluation are needed to investigate to what extent this methodology is good at and also, to what extent it might fail, and importantly, highlight what extent AOM needs for improvement. Understanding the strength and

weaknesses of agent methodologies can lead to develop better solutions and ultimately, increase the chance of methodology being successfully adopted by industrial players. Additionally, exploring agent methodology with many case studies from a range of domains can develop the confidence of industrial players to adopt agent methodology [10].

In this paper, the AOM is investigated as a technique for individual-based modeling and simulations. The individual-based modeling and simulation have received much attention in the area of epidemiology, criminal study, social study and etc. It would be great to identify the potential of AOM for individual-based modelling as IBM may be a potential “killer” application for agent technology. The paper presents two case studies on the adoption of AOM for individual-based modelling and simulation. It demonstrates the potential usage of AOM for epidemiology study and ecological study. Hence, it further validates the AOM in a qualitative manner. Section two presents background knowledge of Agent Oriented Methodology (AOM). Section three presents the case studies to be used to validate AOM. They are malaria transmission study and eutrophication study. In this section, a simplified modelling process is presented together with the NetLogo simulation. Section four presents the findings from the case studies. It describes the insufficiency of AOM towards NetLogo modelling and simulation. The related works of validating agent methodologies are presented in Section 5. The paper is concluded in Section 6.

II. AGENT ORIENTED METHODOLOGY (AOM)

Agent Oriented Methodology (AOM) is a methodology that is introduced for complex system development (the art). The AOM consists of three phases. They are conceptual domain modelling, platform independent design and modelling and platform specific design and modelling. The conceptual domain modelling was also known as motivation layer in which it models the system from an owner perspective. This involves understanding the goal of the system without further details on how the system is designed and implemented. The platform-independent design and modelling involve designing the system without looking into any particular implementation platform and language. The PSM layer is the lowest level of the system design. The design description at this layer allows the system to be deployed and executed in a particular environment like specific platform, hardware, technology, and architecture. The AOM consists of several modeling types like goal model, role model,