COLLABORATIVE IOT AGENT IN DYNAMIC ENVIRONMENT

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Abstract

In the commercial RFID industry, it is required to tune the antenna power and adjust antenna position to achieve the best reading performance and also it is the most difficult part of the tuning process due to the dynamic environment. Due to the commercial RFID frequency characteristics, there are a lot of environment factors contribute to the signal instability. The research objective includes creating an agent simulation environment and tunning assistant tool.

The collaborative agent simulation environment can be perceived as an environment to help researcher or engineer to analyse potential tuning setting combinations in the real world and also explore the possibility of future self-tuning RFID agent. Additionally, there are only few agents modelling framework/modelling toolkit available online and most of them are based on the java coding. Thus, it is essential to build a .NET based agent simulation environment.

The tunning assistant tool can be perceived as an environment factor analyser to collect as many as the environment data, in order to improve the framework tunning accuracy in the future.

This paper covers literature review (theory background), design, implementation and analysis process of applying Morphogenetic, Insect Vision and BDI models into the software architecture of RFID agent simulation environment framework and environment analyser, as well as, illustrates the agent internal interaction mechanism, and thus allowing multiple agents to work collaboratively to achieve the same goal at least effort. The research and development process followed agile development methodology, which is most suitable model for the multiple sprint cycles, in order to solve the new challenges, issues generated by self-evolved prototypes. To facilitate the research, there were 3 experimental projects implemented, which includes RFID distance detector, .NET agent simulation framework and environment factor analyser.

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List of Abbreviations

Abbreviation	Meaning
IoT	Internet of Things
RSSI	Received Signal Strength Indicator
BDI	Belief-Desire-Intention Model
COTS	Commercial Off-The-Shelf
ACL	Agent Communication Language
RNA	Ribonucleic Acid
FIPA	Foundation for Intelligent Physical Agents
RCS	Radar Cross Section
UHF	Ultra High Frequency
Hz	Unit of frequency (1Hz =1cycle/second)
LLRP	Low Level Reader Protocol
RFID	Radio Frequency Identification
IR	Infrared Vision
AR	Augmented Reality
VR	Virtual Reality
OS	Operating System
BCDS	Barcode Data System Solutions Pty Ltd.
TD-PDOA	Time Domain Phase Difference of Arrival
SD-PDOA	Spatial Domain Phase Difference of Arrival
FD-PDOA	Frequency Domain Phase Difference of Arrival
RTLS	Real Time Location Systems
SDLC	Software Development Life Cycle

CERTIFICATE OF ORIGINAL AUTHORSHIP

I, JIE LIU declare that this thesis, is submitted in fulfilment of the requirements for the award of Master of Engineering (Research) in the Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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