Multi-Agent Systems Coursework Report

Abstract

AAA

Introduction

This project tackles the “smartphone supply chain problem”, a computing problem focused on the automation of the manufacture and sales of mobile phones. The problem takes place from the perspective of a mobile phone manufacturer, who needs to buy parts from their suppliers, take orders from customers and then construct telephones based upon their orders with the parts in stock. The crux of the problem is maximising profits and minimising squandered time through the use of computing solutions. This is important in the current market due to the ongoing “arms race” to automate every part of the supply chain, allowing businesses to be more efficient in their processing with the aim of landing higher net profits. The automation allows for a reduction in unnecessary staff as well as improving the efficiency and accuracy of tasks, such as finding parts at the best price from suppliers, at the cost of the lump sum development cost of a system to undergo the process.

There are various potential approaches to tackling the automation, however the one of interest with this project is using multi-agent systems. Groves, Collins, Gini and Ketter (2014) explore the idea of utilising agents for use within supply chain management. They suggest that agents can be very effectively utilised under the right market environments. They present the idea using their own set of agents with various simulated market conditions. They conclude that although their simulated market conditions did not match that of any real-world markets, valuable insights were gained to suggest strong potential of agents having usage within real-world market environments.

Model design

Agent role identification:

Manufacturer - The “main” agent within the system, of which there will only be one at any given time. This agent is tasked with receiving orders from customer agents, ordering parts from supplier agents, and optimising time and cost efficiency by planning how to tackle each order, and which suppliers to buy which parts from. This agent calculates all profits made and deducts all costs for parts and part storage to calculate net profit. A maximum of 50 ordered phones can be made within a single simulated day. When a customer’s order is received, a total due date is provided for the order, if this date is not met, a penalty is also incurred.

Customer - Within the system, there will be three customer agents by default, which can be changed with a variable. For every day simulated within the system, each customer will generate one order per day. Each order will consist of only one type of phone (each having all the same parts) which will be randomly generated each day, in a random quantity, which is also randomised per day.

Supplier - There will be two suppliers within the system by default, each with their own inventory and parameters. The first supplier stocks every part required by the manufacturer and delivers ordered parts the next day. The second supplier only has around half of the parts that the manufacturer needs and takes four days to deliver, however the stocked parts are massively discounted in comparison to the first supplier.

Ontology justification:

BBB

Model implementation

AAA

Design of manufacturer agent control strategy

AAA

Experimental results

AAA

Conclusions

AAA

References

Groves, W., Collins, J., Gini, M., & Ketter, W. (2014). Agent-assisted supply chain management: Analysis and lessons learned. *Decision Support Systems, 57*(1), 274-284. doi:10.1016/j.dss.2013.09.006

Appendix 1: ontology

AAA

Appendix 2: communication protocols

AAA

Appendix 3: source code

AAA