**Simulating Commuters: What can we learn from sim- ulating commuters.**

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**ABSTRACT** [Please write your abstract here. Abstract should be no more than 750 words in length and does not have to contain bibliographic references]

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Commuting affects just about every member of the workforce in the UK, those who do not commute are affected by the congestion and pollution generated by such activities. There is increasing pressure on organisations to adopt practices and measures that reduce the amount of commuting associated with their activities. Many possible interventions exist which may be implemented by organisations to address commuting issues, these include, reducing car parking, moving work locations, promoting cycling, adopting flexible working practices etc. The majority of such interventions are expensive to implement and the timescales involved may be a considerable risk an intervention will not have the desired effect. This paper examines the possibilities of using intelligent software agents to simulate commuters and to assess the impact of commuting activities.

An Agent is an autonomous component within a software system (often referred to as a multi-agent-system) which represents a specific entity. An agent has one or more goals to achieve and acts autonomously, though possibly in collaboration or competition with other agents to achieve that goal. Agents based systems have had considerable success in the fields of simulation and optimisation.

This paper highlights the initial work being undertaken, by the authors, to develop software agents which can simulate the decisions made by commuters. In the system under discussion, each commuter is represented by an agent. The agent knows the workplace and home address associated with that commuter. The agent can request details of the travel costs associated with various modes of transport. Each agent has to make a choice of transportation mode, the agent evaluates its decision in terms objectives such as cost, convenience or environmental impact. The ultimate goal is to have the agents' decision-making process act in the same manner as a human commuter. If the agents can meet that goal, then they can be used to try out possible interventions, thus the organisation can evaluate the likely outcome of interventions in silico.

The work being undertaken builds upon previous work by Ge and Polhill, but with a number of significant improvements, firstly at a technical level we utilise the JADE environment for creating and hosting our agents, this allows for far more agents to be simulated and ultimately can support a range of artificial intelligence techniques for modeling the decision making. Secondly, we include public transport in our formulation, using data obtained from Travel Line Scotland. Other tools used include Open StreetMap and GraphHopper for walking, driving and cycling information. We currently focus on modeling the commuting activities of one organisation, although that can include multiple workplaces.

The initial experimental work has focused upon simulating the commuting activities of the employees of Edinburgh Napier University. This involves using over 1500 agents to simulate the commuting activities on a daily basis. The initial decision- making model is based on selfish decision making. This is being replaced by a rule based model based on information gathered from a travel survey of University employees.

In this intial work, we present the agent framework, including data sources and methodologies used. We then present the commuting problem and a case study based around Edinburgh Napier University.

**KEYWORDS** [List 3 to 5 keywords]

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| Keyword 1 | Transport |
| Keyword 2 | Commuting |
| Keyword 3 | Computer Science |
| Keyword 4 | Modelling |
| Keyword 5 |  |

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