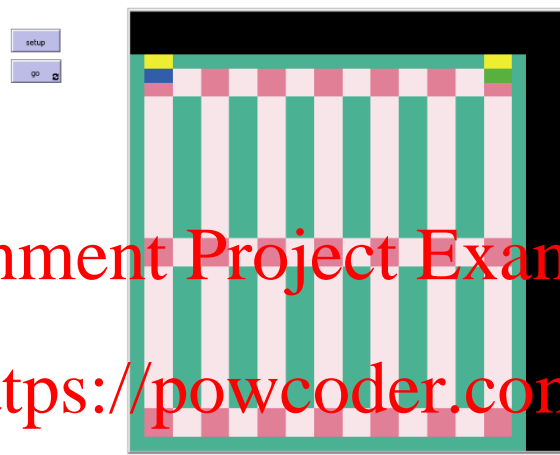


SECU0058 - Component 2 (70%) – 2800 words max

In this course you are learning how to create an agent-based model and use it to analyse shoplifting events. In our demonstrator model, customer agents memorise where they have walked in the supermarket, and use this information to decide where to go next. This customer behaviour is more realistic than a 'random walk' process but it is still far from the kind of behaviour we would observe in a real store. For example, our agents do not have a shopping list, and their trajectories and the shelves in front of which they stop are mostly determined by a random number generator.

For this assessment, imagine that you are a research assistant working on a simulation project that aims to better understand and reduce shoplifting. You have been provided with a supermarket layout (Fig 1.) and asked to develop a model that can simulate "fairly realistic in-store customer behaviour". The layout is similar to the one used in class but you will notice that the aisles are 2-patch wide and every intersection consists of 4 patches.



Assignment Project Exam Help

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Figure 1. Layout of the simulated supermarket.

TASKS:

1. Review the literature on in-store customer behaviour and extract relevant information that can be used to design and justify the behavioural rules of legitimate customer agents. Compile this information (including references) in a table.

Relevant information includes, but is not limited to how (real) customers navigate in supermarkets (e.g., how many customers use a shopping list, any navigation rules that influence their trajectories), how fast they walk, what proportion of the supermarket area they cover, how many aisles they visit, how many products they buy, how much time they spend in the store, etc.

Clearly indicate in the table if the statistics were obtained empirically (i.e., by analysing the behaviour of real customers).

2. Explain how you intend to simulate the behaviour of (legitimate) customers. For each customer behaviour strategy S that you include in your model, you should explain:
 - the operational process that customers will follow.
 - the functionalities in the operational process.
 - a method for each functionality.

along with a clear justification for each of them.

Example: A basic *operational process* for in-store customer behaviour may look like this: 'enter in the store', 'read the shopping list', 'locate products', repeat ['select product from the shopping list', repeat ['select next patch', 'move to next patch'], 'pick product and put it in the basket'], 'leave the store'. 'Select product in the shopping list' is a *functionality* that can have several *variants* (e.g., select the nearest product, select the preferred product, etc.).

3. Implement the proposed customer behaviour model using Netlogo.
4. Select a number of metrics you will use (in Task 5) to characterise the behaviour of customer agents, and assess how realistic their behaviour is.
5. **Validity:** Evaluate how realistic customer behaviour is in your model. For this, you should run simulations; save data about the behaviour of customer agents in a csv file, analyse the data using a software package (e.g., Excel or R) and compare the values of the metrics you selected (see Task 4) with the values found in literature (see Task 1).
Sensitivity analysis: Use Netlogo's behavioural space module to show whether and to what extent, changing the value of the model parameters affects the results.

Important: In Tasks 4 and 5, you must clearly differentiate between the values that were built in the model, and those that emerge from the simulation. For example, it should be clear if 'the amount of time spent in the supermarket' was built in the code (e.g. if there is a rule that asks agents to walk to the exit after 100 ticks) or emerges from the simulation (e.g. if it is an emergent property of the model, based on factors such as the number of products agents buy, their propensity to look at products on the shelves, their walking speed and the size of the supermarket).

SUBMISSION:

Submit your simulation files and report (Word doc) using Turn-it-In. The report must have the following structure:

1. Introduction (~100 words)

Introduce the work in your report and explain why it is worth reading the report.

2. Background (~800 words)

Customer Behaviour: Provide background information about in-store customer behaviour, and how it has been operationalized in published research. This is where you should include tables with statistics and references (see Task 1).

Proposed Customer Behaviour Strategies: Present the set of customer behaviour strategies you have decided to introduce in your code (including operational process, functionalities and methods), along with clear justification for your design choices.

Note: You should clearly explain why you selected a particular strategy or strategies for this assessment. For instance, if you decide that every customer should select a navigation pattern from a set of 10 spatial patterns, then you should explain why this is a better strategy than letting the agents decide where to go based on the location of the products in their shopping list. You are strongly encouraged to draw on the available literature to justify your design choices.

3. Implementation (~500 words)

List the model parameters and the selected parameter value(s) in a table. Provide a concise description of each parameter. Where possible, the selected values should be justified using references to the literature. This last point is especially important for Master's students.

Explain how you have implemented the most challenging part of the customer behaviour strategies.

Note: The code must be included in an Appendix. You may want to annotate it and/or copy and paste part of the code in this section.

4. Simulation results and analysis (~500 words)

Describe the indicators you have selected to characterise the behaviour of the customer agents.

Present the simulation design(s) you have used for the sensitivity analysis, and assess how realistic the customer behaviour model is.

Note: Present the results (i.e., the values of the indicators) in a table. It is highly recommended that you use graphs to show how the indicator values change over time and when the simulation parameters change.

5. Discussion (~300 words)

Describe the simulated customer behaviour and discuss how realistic it is. Although you are not asked to build the entire model (with guardians and shoplifters), you should still consider the final application when discussing the limitation of your customer behaviour model.

6. Conclusion (~100 words)

Make recommendations for researchers who may want to use your simulation model and/or create a new model based on your work.

7. References

Include a list of references using Vancouver style.

8. Appendix (N/A)

Include the code in Appendix.

Marking criteria

The following elements will be assessed in marking your copy:

- | | |
|---|------------|
| • Introduction | [5 marks] |
| • Background information (clarity, accuracy and references to the literature) and proposed strategies (clarity, accuracy, motivation and theoretical justification) | [20 marks] |
| • Implementation (clarity and quality of the code, performance, level of complexity) | [20 marks] |
| • Results and analysis (clarity of the presentation, quality and amount of results, appreciation of the limits of the method) | [10 marks] |
| • Discussion (clarity of the presentation, ability to draw on the results to make insightful arguments based on background literature) | [10 marks] |
| • Conclusions (clarity and pertinence of the recommendations) | [5 marks] |

For each section, the markers will also consider the quality of writing, including the organisation of the arguments, typographical errors, adequate use of technical words, etc.