Tasks

This assignment comprises of three main tasks:

1. Extending the model.
2. Analyzing the model.
3. Writing a report.

## Task 1: Extending the model

As you should have seen the current model is very simplistic. (demo.py) For example, buses have no maximum capacity and all the passengers get off at the same stop. We would like you to extend the model to make it more realistic and thus more interesting. There are many ways you could do this, with varying difficulty levels. Here are some examples of what could be done, with an idea of how ambitious they are. Note that this is not an exhaustive list and we encourage creativity.

Less ambitious extensions:

Maximum passenger capacity on buses. Passengers generated with different destinations.

Passenger pick up times, i.e. a busier bus stop results in the bus taking longer to pick up all the passengers.

Buses have different speeds.

More ambitious extensions:

Passenger patience, i.e. how long will they wait for a bus. Grumpy passengers could change color for example.

Different routes for buses, i.e. they cater for different stops on the route.

Very ambitious extensions:

A non-linear bus network. (We recommend you start with a cross shape comprising of one vertical and one horizontal route which share a single stop in the middle.)

Adding a cost structure to the model.

## Task 2: Analyzing the model

Simulations help us to understand the effects of changing different parameters in our model. Task 2 wants you to investigate the model and create some figures showing interesting behavior and relationships between

parameters. For example, how does the number of buses affect average passenger waiting times? To do this we want you to produce some code which uses the simulation to create data, which is then stored and analyzed. You should create two files; one which contains general analysis and plotting functions and another which uses these functions to generate every figure in the report.

Performance of this task will be assessed on the rigor of parameter searches, difficulty of questions asked and the range and suitability of plot types used. We give some examples below, but again these lists are not

exhaustive. Higher marks will be awarded for novelty of questions. Questions which could be asked:

How does the number of buses affect the average waiting times of passengers?

How do the rates of passenger generation affect the average number of passengers on each bus? What is the ideal number of buses in the network under different conditions?

Examples of different plot types we would hope

to see include: line plots

scatter plots

heat maps

histograms

## Task 3: Writing the report

The report should be a pdf file no more than 3-4 pages and consist of the following: Introduction

Explanation of the model and any extensions added.

Results from the analysis, including figures and discussion. (This should form the bulk of the report.) Conclusions and further work.

Complete two extensions from the less ambitious list and one from the more ambitious list. Three questions analysed, two of which are novel. Three different plot types used, with multiple plot types being used to answer a different aspect of the same question.