# COMP214

# Real-Time Traffic Control System for Single Intersection

# User Manual

## Team name: Mission Impossible


**Team members: Yuchen Zhang, Baichuan Huang, Jiaqin Chen, Shuhao Zhang, Jiayang Li, Fengyuan Zhang**

## Contents

# 1. Overview

The purpose of this user manual is to assist the user in using the Real-Time Traffic Control System (RTTCS).

The RTTCS simulates traffic flow of an intersection and provides an intelligent algorithm to control the signal light in order to release traffic jam. Vehicles can be added to the intersection by the user and released by the system automatically. The user can use this system to simulate traffic flow and collect corresponding traffic data.

Functionalities provided by this system are listed below:

- Adding vehicles into the intersection
- Computing real-time traffic data
- Pausing and accelerating the system process.

There are two different algorithms available to choose.

The intersection simulated in this system is a real intersection in Liverpool as illustrated in Figure. 1, which is in the north-east of the University of Liverpool campus. The W Derby St is under maintained recently, and that road is currently a one-way road.


Figure. 1

The GUI of this system is shown in the Figure. 2.

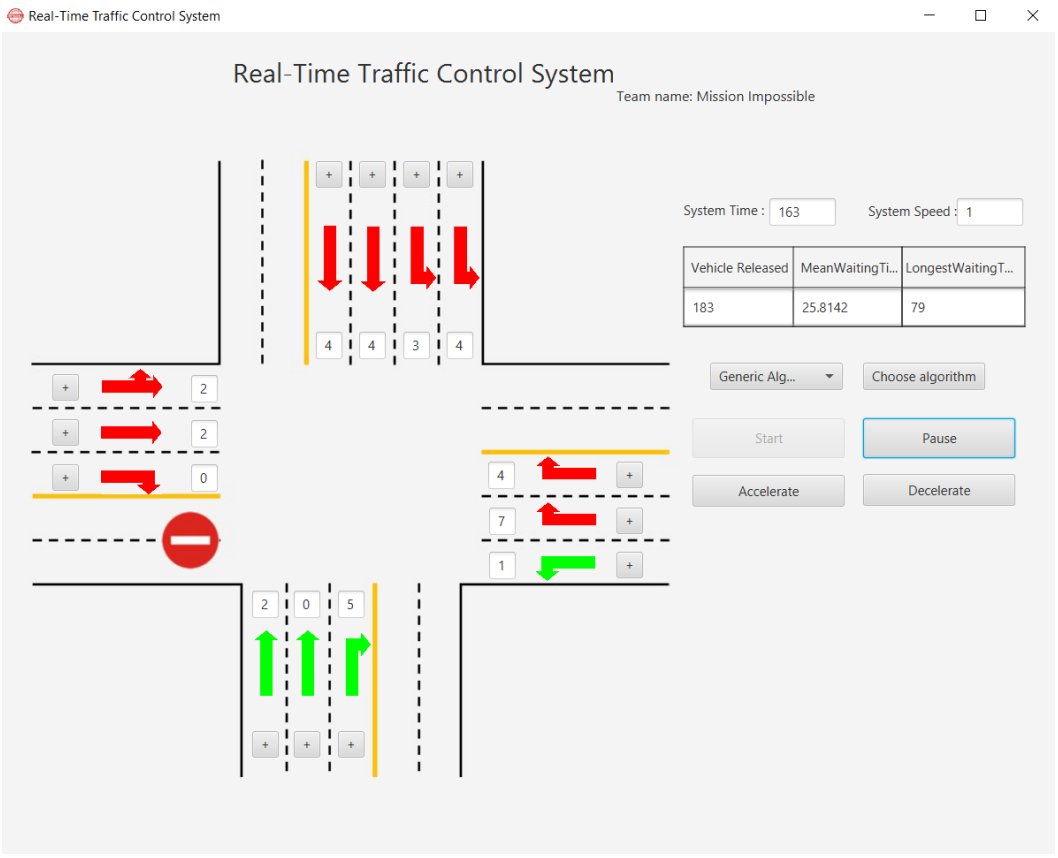


Figure. 2

Next two sections will explain the buttons and information shown on the GUI.

## 2. User operations

### 2.1 Select algorithm

Function description: This operation selects the control pattern of the signal light. There are three options – genetic algorithm, distribution algorithm, and a time-fixed traffic light with no algorithm.

Operation process: Click the pull-down menu, select one of three modes, and click button “Choose algorithm”

### 2.2 Start traffic process

Function description: This operation starts the traffic process. After this operation, vehicles can be added to the intersection and released.

Operation process: Click “Start” button

### 2.3 Pause

Function description: This operation pauses the traffic process and the system time updating. After pausing the process, the “Pause” button will be replaced by button “Resume”.

Operation process: Click “Pause” button

### 2.4 Resume

Function description: This operation restarts the traffic process and the system time updating after pausing. After restarting the process, the “Resume” button will be replaced by button “Pause”.

Operation process: Click “Resume” button

### 2.5 Accelerate

Function description: This operation increases the system speed. For example, in default speed which is 1, one second in the system equals to one second in the real world. When the system speed is 2, 2 seconds in system equal to one second in the real world. When the speed is 10, 10 seconds in system equal to one second in the real world. The maximum system speed is 60. However, when genetic algorithm is used, the maximum system speed is 18 since genetic algorithm takes time to run.

Operation process: Click “Accelerate” button

### 2.6 Decelerate

Function description: This operation decreases the system speed. Its function is opposite to function “Accelerate”.

Operation process: Click “Decelerate” button

## 2.7 Add vehicle in runtime

Function description: This operation adds one vehicle into the corresponding lane immediately during the runtime of the system. Each lane has a corresponding “Add vehicle” button as shown in Figure. 3. For each lane, only one vehicle can be added in a single second.

Operation process: Click “+” button

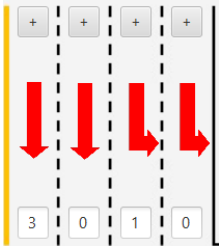


Figure. 3

## 2.8 Add vehicle in txt file

Function description: This operation schedules a set of vehicles which will be added into the intersection automatically. The information of all these vehicles is stored in a txt file called “Traffic Data.txt”. This txt file is in the base directory of this program. Each vehicle occupies one line with the format “x,x,xx:xx” as demonstrated in Figure. 4. The domain of the first x is {A,B,C,D} and the domain of the second x is {1,2,3,4}. {A,B,C,D} and {1,2,3,4} represents specific road and lane of the intersection. The last “xx:xx” represents minute and second of the entering time of that vehicle. For example, “A,2,8:9” indicates that one vehicle will be added to lane 2 of road A after 8 minutes and 9 seconds from the system starting point. By this function, the user can schedule all vehicles in advance and do not need to click “+” button to continuously add vehicles.

Operation process: File “Traffic data.txt” already contains 1954 vehicles as a sample test case. The user can modify this file according to the correct format to create a new test case before running the program.

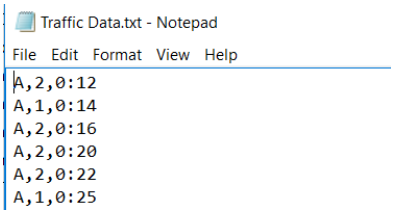


Figure. 4

## 3. Data displayed on GUI

3.1 System time: This data shows the time elapsed from the starting point. The unit of system time is second. One unit of system time is equivalent to one second in the real world.

3.2 System speed: This data shows the current system speed.

3.3 Vehicle released: This data shows the number of vehicles having released by the signal light after the starting of the system.

3.4 Mean waiting time: This data shows the meaning waiting time of all vehicles having released by the signal light after the starting point.

3.5 Longest waiting time: This data shows the longest waiting time of all vehicles having released by the signal light after the starting point.

3.6 Number of vehicles currently in the lane: This data shows the number of vehicles currently in the lane. Each lane has a corresponding number indicating how many cars are in that lane as illustrated in Figure. 5.

3.7 Arrows: Each lane has a corresponding arrow indicating the direction of that lane as shown in Figure. 5. There are three types of arrows – red arrows, green arrow, and yellow arrows. The red arrow indicates that lane is currently under red light phase. The green arrow indicates that lane is currently under green light phase. The yellow arrow indicates that lane is currently under yellow light phase.

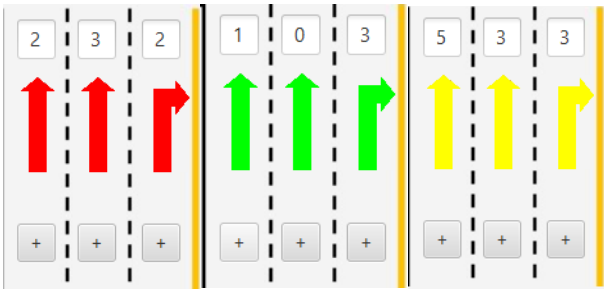


Figure. 5

## 4. Tutorial

This simple tutorial gives an example of how to use the RTTCS.

If you want to schedule a set of vehicles in advance, you should copy all vehicles' data into the file "Traffic Data.txt" before running the program. A littler reminder, backup data before you modify the txt file.

After that, open the program and choose one algorithm you would like to use, then click the "Start" button. Then you will get an overview of the simulation of traffic flow according to the number of cars on lanes, the color of arrows on each lane. You can click the "+" button to add vehicles at any time. On the right-hand side of the GUI, you can see the real-time traffic data.