# ASSIGNMENT 4

## My Bus Network

In this assignment project we aim to understand the working of graphs, adjacency list and finding the shortest path while traversing the graph.

## Folder Structure

```
.
├── .vscode                 # Workspace settings files (ignore)
│   ├── launch.json         # Build and debug
│   ├── settings.json       # settings
│   └── tasks.json          # Build active file
├── BusNames.txt            # Bus names text file
├── BusRoutes.txt           # Bus routes text file
├── BusStops.txt            # Bus stops text file
├── Distance.txt            # Distance text file
├── MyBusNetwork            # Unix executable file
├── MyBusNetwork.c          # Main logic file
├── MyGraph.h               # Graph data structure header file
├── MyHeap.h                # Min heap data structure header file
├── MyDesignManual.pdf      # Design manual pdf
├── README.pdf              # readme pdf
└── ...
```

## Installation and Compiling

This assignment project was developed on macOS Catalina (version 10.15.4) and will work on any mac system but gives segmentation fault on vlab. The known problem on vlab is no/weak handling of memory leaks, which is not the case with other UNIX systems.
No third-party software is needed is to run or compile this project. GCC is pre-installed in all the UNIX operating systems.

### MacOS Commands

```
% gcc MyBusNetwork.c -o MyBusNetwork
% ./MyBusNetwork
```

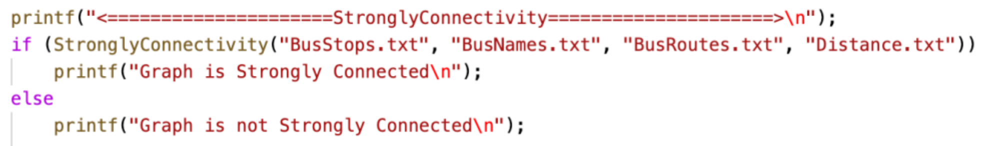
## Running the tests

There are no automated tests build for this project. Only manual testing can be done on the all of the four functions listed as below:

1. int StronglyConnectivity(const char *busStops, const char *BusNames, const char *BusRoutes, const char *Distance)
2. void maximalStronglyComponents(const char *busStops, const char *BusNames, const char *BusRoutes, const char *Distance)
3. void reachableStops(const char *sourceStop, const char *busStops, const char *BusNames, const char *BusRoutes, const char *Distance)
4. void TravelRoute(const char *sourceStop, const char *destinationStop, const char *busStops, const char *BusNames, const char *BusRoutes, const char *Distance)

## Strongly Connectivity

The StronglyConnectivity function can be found in the main function. (as shown in Figure 1.)



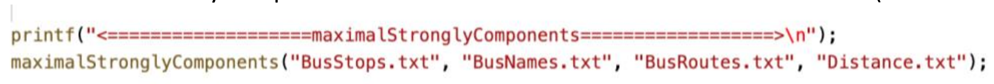
```
printf("<=====================StronglyConnectivity====================>\n");
if (StronglyConnectivity("BusStops.txt", "BusNames.txt", "BusRoutes.txt", "Distance.txt"))
    printf("Graph is Strongly Connected\n");
else
    printf("Graph is not Strongly Connected\n");
```

*Figure 1: StronglyConnectivity*

It can be easily modified by just changing the filenames which are passed in the function as arguments and those files must be present in the same working directory.

## Maximal Strongly Connected Components

The maximalStronlyComponents function can be found in the main function. (as shown in Figure 2.)



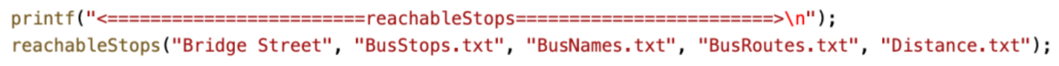
```
printf("<===================maximalStronglyComponents=================>\n");
maximalStronglyComponents("BusStops.txt", "BusNames.txt", "BusRoutes.txt", "Distance.txt");
```

*Figure 2: MaximalStronglyComponents*

It can be easily modified by just changing the filenames which are passed in the function as arguments and those files must be present in the same working directory.

## Reachable Stops

The reachableStops function can be found in the main function. (as shown in Figure 3.)



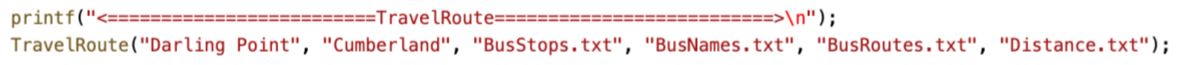
```
printf("<========================reachableStops=======================>\n");
reachableStops("Bridge Street", "BusStops.txt", "BusNames.txt", "BusRoutes.txt", "Distance.txt");
```

*Figure 3: ReachableStops*

It can be easily modified by just changing the source stop and  filenames which are passed in the function as arguments and those files must be present in the same working directory.

## Travel Route

The TravelRoute function can be found in the main function. (as shown in Figure 4.)



```
printf("<=========================TravelRoute=========================>\n");
TravelRoute("Darling Point", "Cumberland", "BusStops.txt", "BusNames.txt", "BusRoutes.txt", "Distance.txt");
```

*Figure 4: TravelRoute*

It can be easily modified by just changing the source and the destination stops and the filenames which are passed in the function as arguments and those files must be present in the same working directory.