

ECE 2039 Final Project

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This project covers designing and implementing a traffic light control system using finite state machines (FSM) in C. The system simulates traffic lights at a four-way intersection, ensuring safe vehicle passage by controlling two lights.

Prior to the implementation of the FSM I implemented code to read from the `config.txt` text file to set the necessary variables for the FSM. I did this using a switch statement that analyzed each line of the input file, checking only the important characters and then using a method called `getTime`. This is a function I made to read a certain block of a string. This is used to isolate the time for each state in the configuration file and use the `atoi()` function to convert from a char array to an integer.

I then implement this FSM for the intersection. To do this I first enumerated the states `GREEN`, `YELLOW`, and `RED` in an `enum` called `LightColor`. I then create a `struct` and `typedef` it to `State`. It is used to represent the state of a light at the intersection. This struct contains the members, "`LightColor current`", "`LightColor next`", and "`int duration`". These would store the current state of the light, the next state of the light and the duration of the current state of the light respectively.

To ensure the modular style of the code I first use `malloc()` to make pointers to 2 `State` structs, one for the main street and one for the side street. I chose pointers so that I may change the members of each struct. I then implemented a function called `changeLight()`. This function takes in a `State` pointer and, using a switch statement checks the next state and changes all members accordingly.

One of the challenges I faced while completing this project was reading the configuration file. I solved this by making the `getTime()` function to get the time out of each line in a configuration file. Another challenge was

altering the members in each **State** through a method. To solve this I chose to store each **State** struct as a pointer using `malloc()`.

In conclusion, the traffic light control system simulates real-world traffic management using a Finite State Machine. The strategy used ensured the code was modular, frequently reported on the state of the simulation, and used embedded systems like strategy for incrementing time.