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ECE 101-02 MATLAB and C Programming

Mr. Watchorn

May 16, 2023

Mr. Watchorn,

Executive Summary

I wrote a finite state machine to control that old traffic light you got a hold of. I did my best to reverse engineer a real traffic light’s function, just with faster light timings for effect. Since I made it in C, we should just be able to swap the code that prints to the console with code that sends signals to the light.

Discussion

See figure 1 on the next page for a diagram of the finite state machine.

You might notice that I made a separate state for each possible light combination rather than just a few states for INIT, DAY, NIGHT, END. There are definitely a few drawbacks to this implementation, but I like it because you know exactly what the light should be displaying at every step of the way. Not to mention, it’s much easier to read and write with this implementation (at a small scale like this) because you have to implement an exact behavior for each state, leaving no room for ways to get trapped in one state, or locked out of another.

That being said, the implementations are not as dissimilar as you might think. The states are very deliberately grouped within the main loop, creating pseudo-states out of the if-else loop. Figure two shows what that looks like.

Also, you might have noticed the while(1) loop, but I promise I know what I’m doing, you have nothing to worry about. If you press the escape key, it breaks out of the loop and the program ends. (lines 116-121)

There’s one other thing I want to mention, but it’s better suited for a video, so check that out!

Outcomes

It works exactly as I told you it would, check it against the diagram if you want to be sure. I also made a video that shows it working just in case: [video link](https://youtu.be/GdBVx-aB1so). Plus, it only took me 1 hour, 47 minutes, and 36 seconds to make.

Conclusions

I still have no idea how you got your hands on a traffic light, but send me a video once it’s hung! I’m sure it’ll make quite the conversation starter!

Let me know if you need anything,

Dylan

The naming scheme is as follows:

N/S LIGHT STATE – E/W LIGHT STATE

Therefore, in R-G the N/S LIGHT STATE is RED, and the E/W LIGHT STATE is GREEN.

O-O refers to each light being in the OFF state.

DAY is the collection of states used in the daytime mode. DAY contains the following states:

* R-G
* Y-R
* G-R
* R-Y

NIGHT is the collection of states used in the daytime mode. NIGHT contains the following states:

* R-R
* O-O

ANY is a collection of every state in the machine. Therefore, END can be reached from any other state.

A picture containing diagram, circle

Description automatically generatedFIGURE 1:

FIGURE 2:

A picture containing diagram, text, line, circle

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