Experiments for the

Lab9500

Experiment 225
- Traffic Light with Features -

Introduction: Once the simple traffic light is working with the down-counter timing the states based on the state, we can now add some features. One feature is what we will call Night mode. We'll assign a DIP switch to select this feature. Let S9, the MSB, select night mode when high.

In night mode, the main direction will flash amber and the side direction will flash red. The flash rate should be two Hertz.

The problem would be complicated if we were able to go into night mode from any state. Also it could be confusing and disconcerting if the side were given green and it started flashing red. It makes things cleaner if we go into night mode from the state where the main direction is already amber, and the side direction red. Similarly night mode should exit into this same state.

It has already been suggested that the flash rate be 2 Hz. This could be accomplished by clocking the traffic state machine with 2 Hz instead of 1 Hz, but the down-counter would have to have an additional bit. A cleaner approach is simply to have a single state for night mode. This state is entered when the current state is Amber/red and the night mode switch is true. So instead of switching back in forth between two states, one of which the lights are on, and the other the lights are off, you simply state in the night mode state and in that state the Amber/red combination is true, but it is ANDed with the 2Hz so that it flashes. Got it?

So this addition is really easy. The nice part is that if the traffic light is implemented with the state machine function of ABEL, it is only necessary to add a couple of new conditions such that you go to a Red/red state from the Amber/red state when night mode is false, but go to the night mode state when night mode is true (DIP switch). When in this state, you remain in this state until the night mode switch goes false. Then, you will proceed to the appropriate Red/red state.

An interesting question, is how often is the state change tested? Well, we could let the night mode state load two seconds, just like the Amber/red state does.

Trip Mode

Another feature we will call "Trip mode". Let DIP switch S8 select this mode when true. When in trip mode and the long green times out, instead of proceeding to the Amber/red state, the machine remains in the Green/red state (or goes to another state where the lights remain Green/red).

Now, a car approaches the light from the side. In the pavement is a switch that is tripped. This tells the state machine to continue to cycle. It will then go through a side cycle, giving a green to the side and letting the vehicle that tripped the switch proceed.

Does this require an additional state in the state machine? Maybe, maybe not. Here are some considerations.

1. Once the full long green time has occurred, the response to a trip should be quick. On the other hand,
2. A trip should never truncate a long green time. That is, if the long green just started, a trip should not knock you out.
3. If you get additional trips while in a side green, should it be extended?

Suppose a car trips the switch but moves slightly beyond the trip point and the trip goes away. Should the trip be remembered or latched. That would seem to be a good idea. So the "trip" itself could or perhaps should be considered a momentary, but be used to set a flip-flop. The flip-flop should be cleared, then, when the side cycle is entered.

Experimentation

1. Add the night mode to the simple traffic light. Night mode is indicated by DIP switch S9.
2. Add a trip mode to the light. Trip mode is indicated by DIP switch S8. Let pushbutton PB1 be the momentary trip.

The instructor may suggest additional features for the traffic light.