

# ECE 579 | Homework 1

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## Response

Assuming correct state machine logic, the first step of implementation would be finding a way to translate the digital logic that we have created and implement it in the real world. This means using traffic signals.

While the current system works in a very simplified situation, the real world is much more complex. Implementation of a yellow light in the traffic signal would further complicate the logic required to control this system.

When considering more parameters for optimization, such as the throughput of the crossing, implementing sensors that detect the amount of vehicles that may be waiting for their turn to cross may allow for better optimization of the time that each light should be green. The inclusion of a left turn signal would also involve the use of more logic to make sure that throughput pipelines are not being squandered by a waste of time showing left turn arrows when there are no cars present.

If the implementor wanted to take pedestrians into account, this would also affect the timing for the traffic signals in a significant manner. Sensors would have to be placed that can detect when a pedestrian is present, and additional logic would have to be put in place to allow timings for the signals to change accordingly.

Up to this point, we have increased the complexity of the system many times over. From a simple state machine with less than 5 states, to a much larger state machine that takes into account the green state of one intersection, the changing state of another, the ability to change how quickly a system transitions states. Our system is quickly growing...

After considering the most basic implementation of a crossing with slight modifications to allow for better throughput of vehicles at the single crossing and perhaps even considering the pedestrian, further optimization can take place. This could be in the form of creating networks of traffic signals that allow one large section of crossings to have green lights and then allow the other cardinal crossings have their turn. This massively increases the computation power needed to analyze the system and take appropriate action.

This exercise shows how even a system as simple as a road crossing can increase to any amount of complexity desired by the engineer, so optimizing it can only be done by looking at what parameters want to be optimized, because in the real world factors may not always be ideal. Sometimes the priority is time to completion, quality of the result, or the cost of development.