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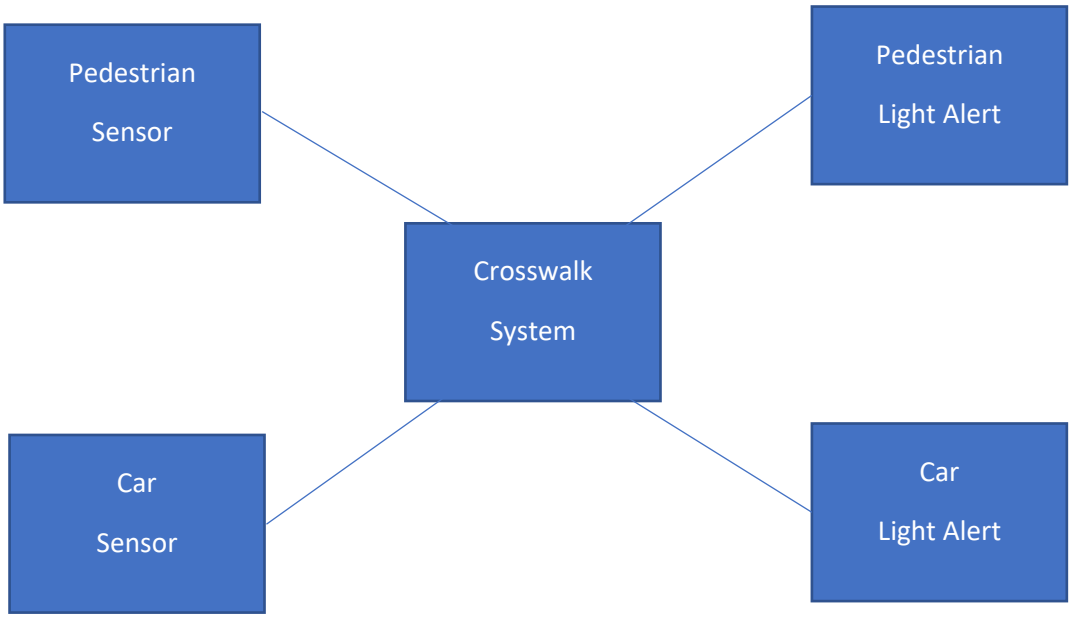
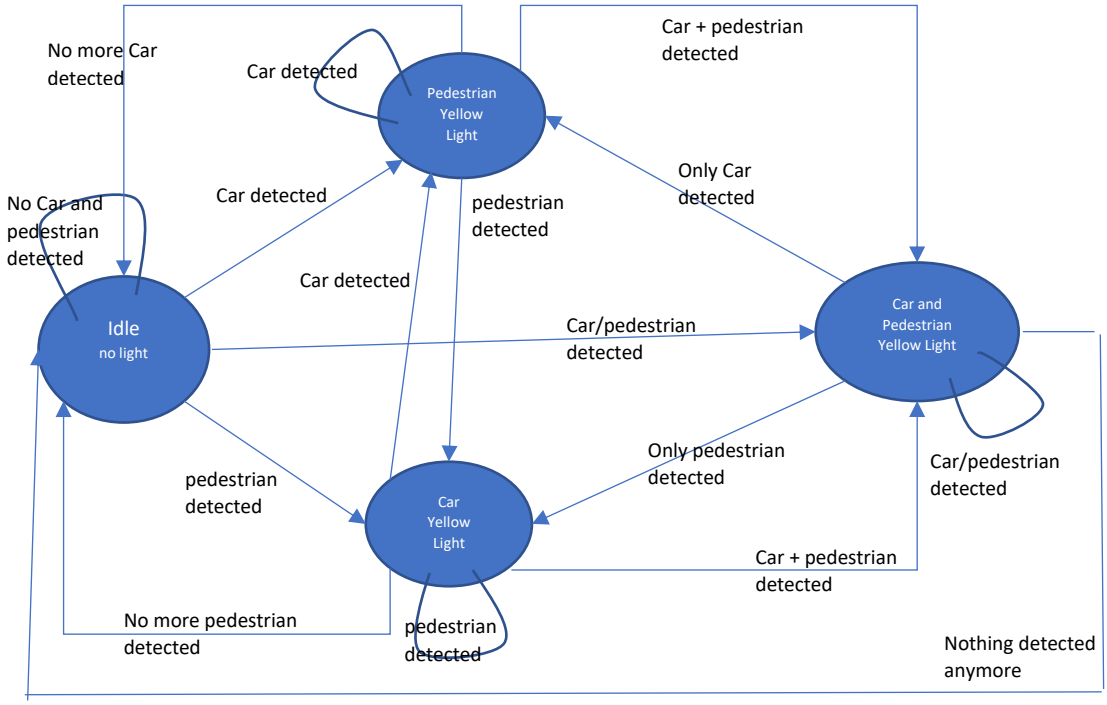
CS 487 – Spring 2022

Homework 2

Context model



State-transitions



Binary Protocol for C-C-I

Pedestrian Detected	Car Detected	Pedestrian Yellow Light	Car Yellow Light
0	0	0	0
0	1	1	0
1	0	0	1
1	1	1	1

Protocol for H-C-I

Pedestrian = Green, Car/Driver = Red, Computer/System = Purple

Human goes near sidewalk -> Pedestrian detected from sensor and yellow light is shown to the cars (even if no cars detected) -> Pedestrian acknowledges no yellow light and proceeds to cross

Human goes near sidewalk and car is nearby -> Pedestrian and car detected and yellow light is shown to both cars and pedestrian -> Car sees yellow light and knows a pedestrian is near or about to cross and proceeds to slow down or stop and be cautious. Human sees pedestrian yellow light and looks for a car and proceeds with caution.

Car is driving and nearby -> Car detected and yellow light is shown to pedestrian even if no pedestrians are detected -> Driver from car acknowledges no yellow light and proceeds to drive.

Yellow light is shown to either pedestrian or car based on either detection, so it can be a little fail safe. For example, the last HCI presented. Imagine if there is both a car and a pedestrian but the system only detects the car. It would still be alright because the yellow light is being shown to pedestrians, even if it didn't detect the pedestrian. That way, the pedestrian will notice the yellow light and acknowledge that there is a car and proceeds with caution.

The addition of signals enhances the awareness of both the pedestrian and drivers. At times, it may be hard to notice a car or a pedestrian but with the sensors and the light, people instinctively know to proceed with caution when there is a yellow light. This is much simpler than crosswalks in an intersection and allows for better flow for both pedestrians and cars while having an added safety measure.

Pseudocode

```
def failure_detection():
    While(True):
        Sleep(10) // does failure/exception detection every 10 seconds
        Try:
            sensors = send(sensors) // sends signal to sensors if working as they should
```

```
if sensors.cars_working == False:
        pedestrian_yellow_light_always_on(True)
        // turn on pedestrian yellow light to be always on so that they be cautious when crossing the street
Else: // car sensors working, turn off always on if was previously on
        pedestrian_yellow_light_always_on(False)
        // now that we know sensors are working, make sure that its not always on, and only on when it detects a car


if sensors.pedestrians_working == False:
        car_yellow_light_always_on(True)
        // turn on car yellow light to be always on so that they be cautious when driving as sensors cant sense pedestrians
else: // pedestrian sensors working, turn off always on if it was on
        car_yellow_light_always_on(False)
        // now that we know sensors are working, make sure that its not always on, and only on when it detects a pedestrian


alerts = send(light) // send signal to lights if working as they should
if alerts.cars_working == False: // light(alert) for cars not working
        pedestrian_yellow_light_always_on(True)
else:
        pedestrian_yellow_light_always_on(False)


if alerts.pedestrians_working == False: // light(alert) for pedestrians not working
        car_yellow_light_always_on(True)
else:
        car_yellow_light_always_on(False)
```

```
        // if both sensors not working, always yellow, so both pedestrians and drivers
        will be cautious

        // if both lights are not working, then no lights at all, which would be fine since
        there are still signs on the road for drivers to acknowledge that pedestrians may
        be crossing and should give way

except: // exception handing, if something unexpected happens

        car_yellow_light_always_on(True)

        pedestrian_yellow_light_always_on(True)

        notify_staff()

        // if something unexpected happens, then just turn on the yellow lights for both
        drivers and pedestrians so they are cautious when approaching the crosswalk

        // will still work even if the lights are not working, it would just not do anything
        and be like a normal crosswalk. Also sends a message to staff that can look at
        the problem and fix it.
```