

Traffic Light Control System

- **Problem Definition:**

There are four roads in four different directions, north, south, east and west, and there are pedestrians on each road and there Four traffic lights are installed on the first of each road, and there is a button for each traffic signal for pedestrian crossing.

Every car that passes on the northern or southern road must turn on the right only and all cars located on the east or west must drive in front only.

Each traffic signal has three colors - red, yellow and green, and it has a button.

Each of the red flags must continue to R From the second and each of the green signals must continue to G From the second and each of the yellow signals must continue to Y of a second and each of the green signals should continue for C of a second Traffic on the north and south is red for an R of a second.

In the event that the traffic lights on the north and south are red.

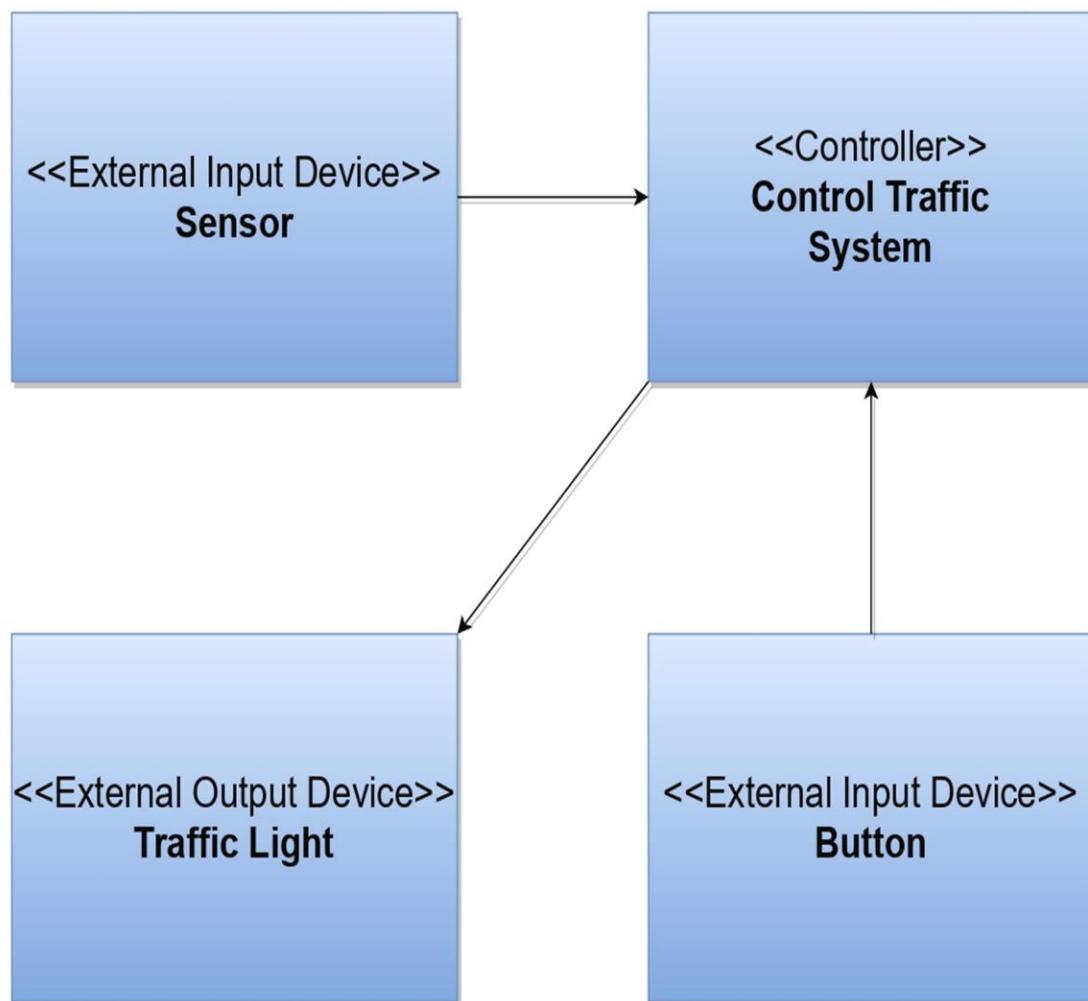
In this case, each of the traffic lights on the east and west turns green, and on all the cars on the east and west road traffic, if the traffic lights in the east and west are red, then the traffic light on the north and south should turn from red to yellow For Y from the second, then it turns green for G from the second, so all cars on the left or south turn to the right.

In the event that the button on the traffic light is pressed, the traffic light must turn into red, in the case that there are people on a road and the color has become green, the green color must be converted to red and pedestrians cross there is a sensor present in the traffic light to sense the number of cars on the road.

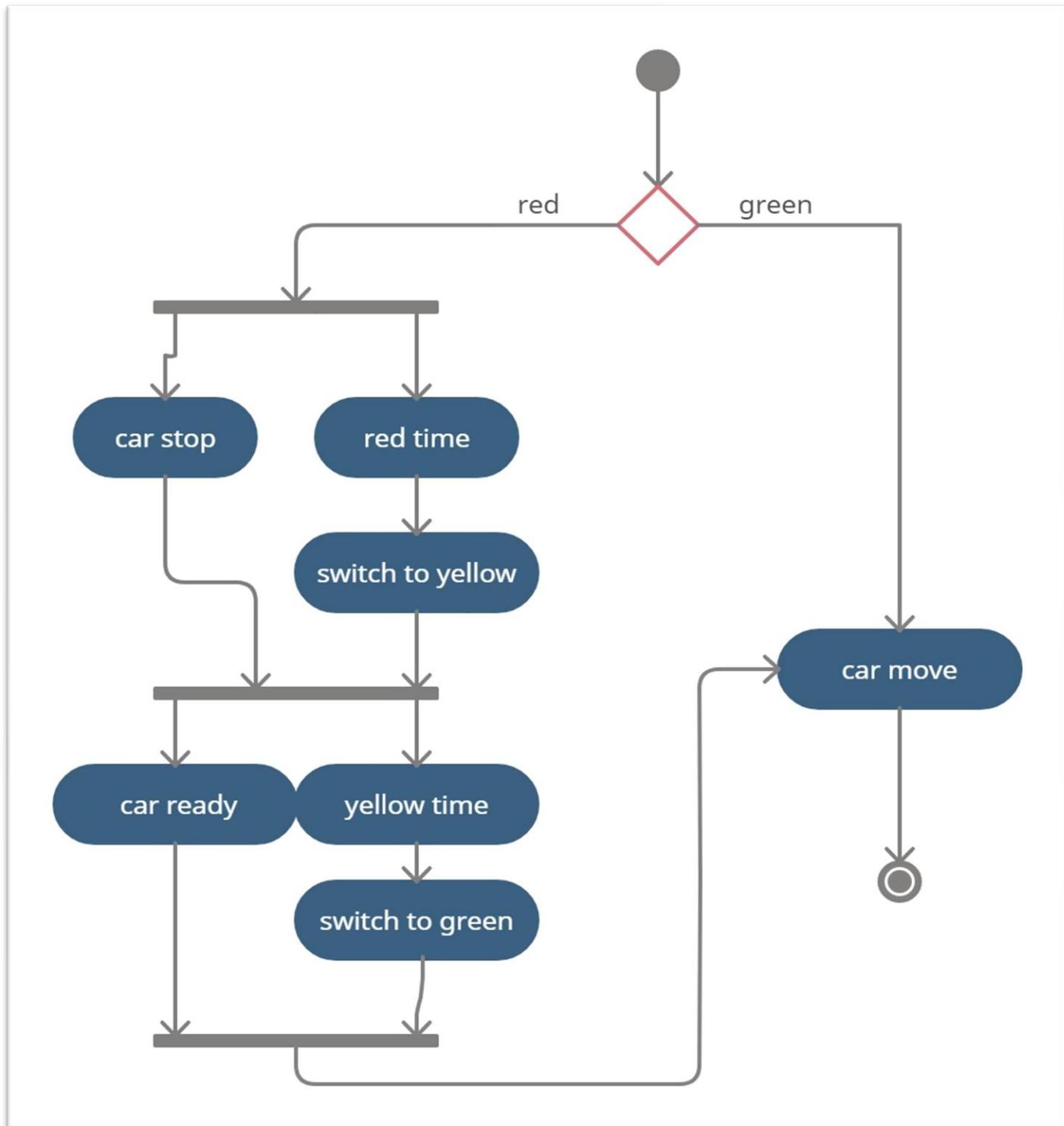
What if the number of cars on the North or South Road is M, then the traffic lights for these two roads must be changed to green and all green colors on the eastern and western roads must be changed to red If there are a number of M cars present on the eastern or western road, the traffic lights must be changed to green and the traffic lights on the north and south must be changed to red.

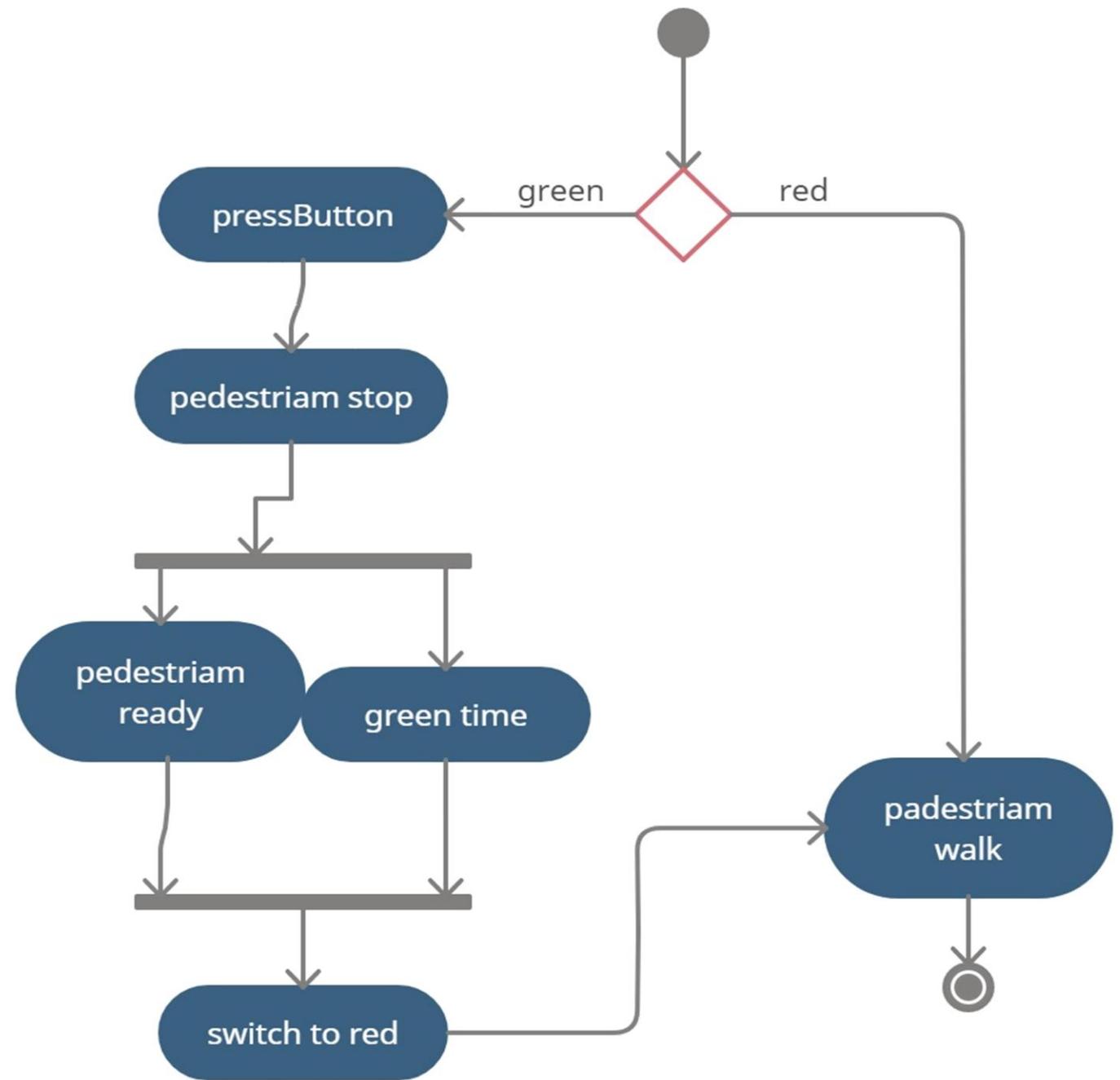
- Diagrams:

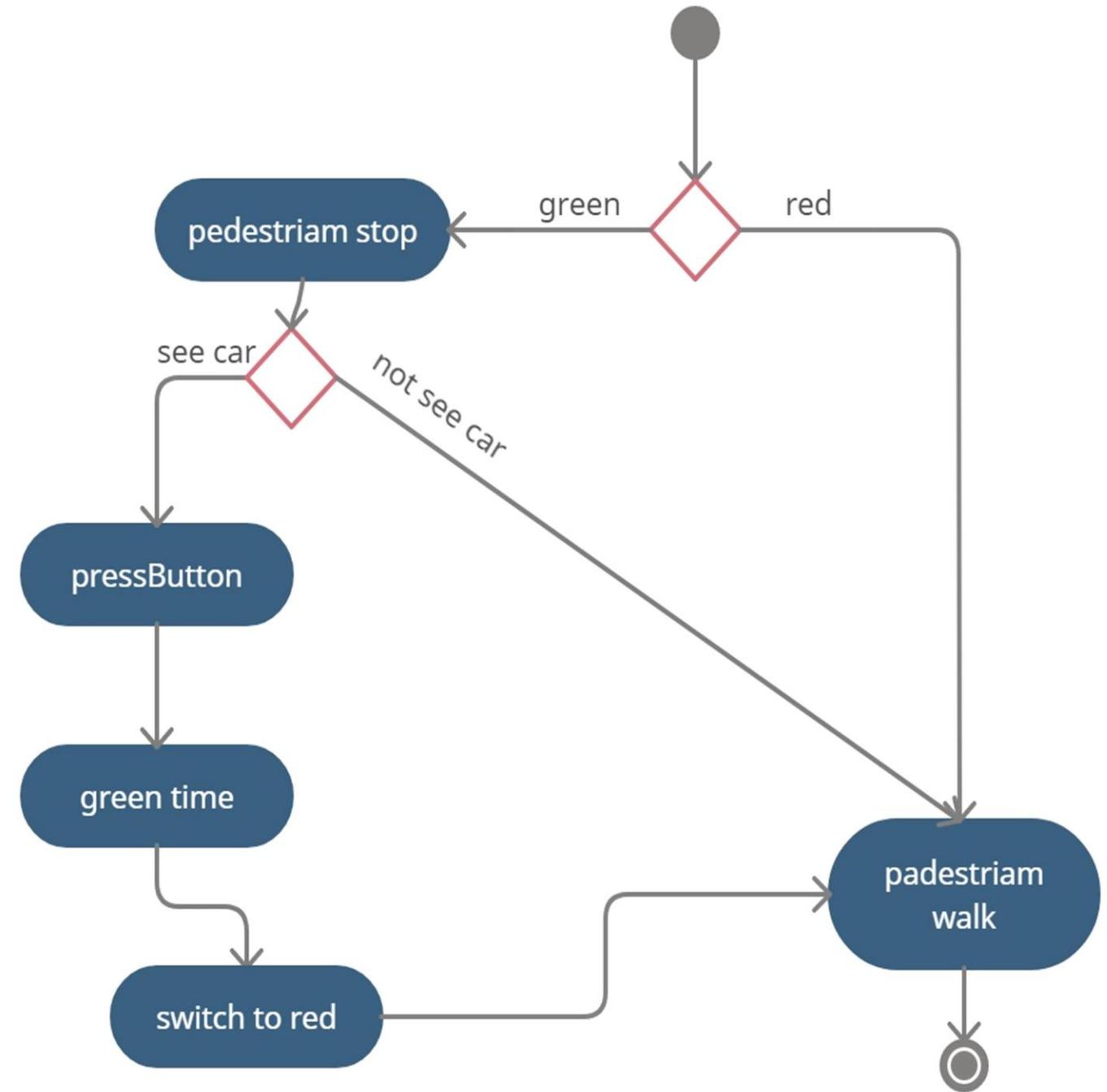
Block Diagram

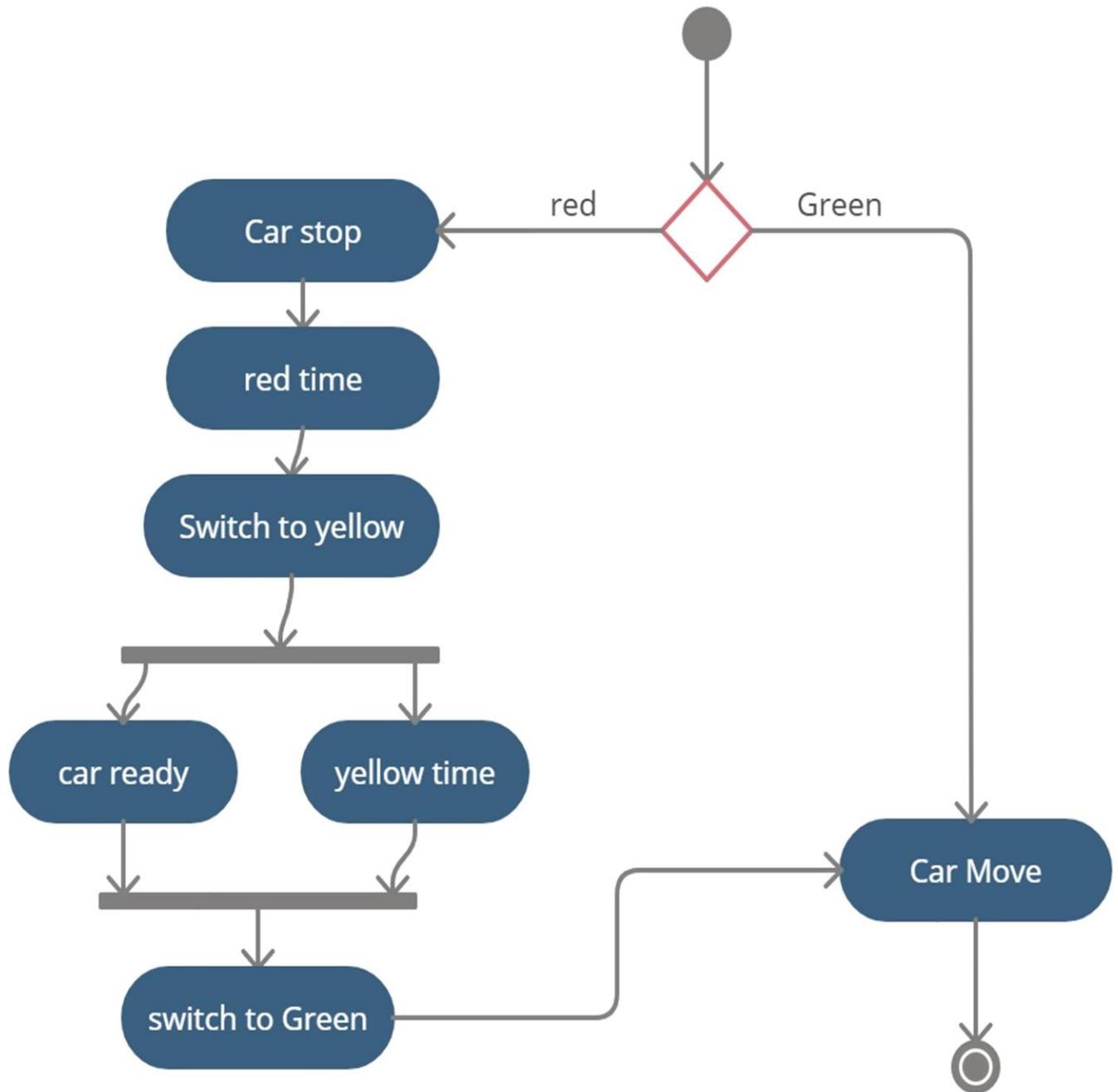


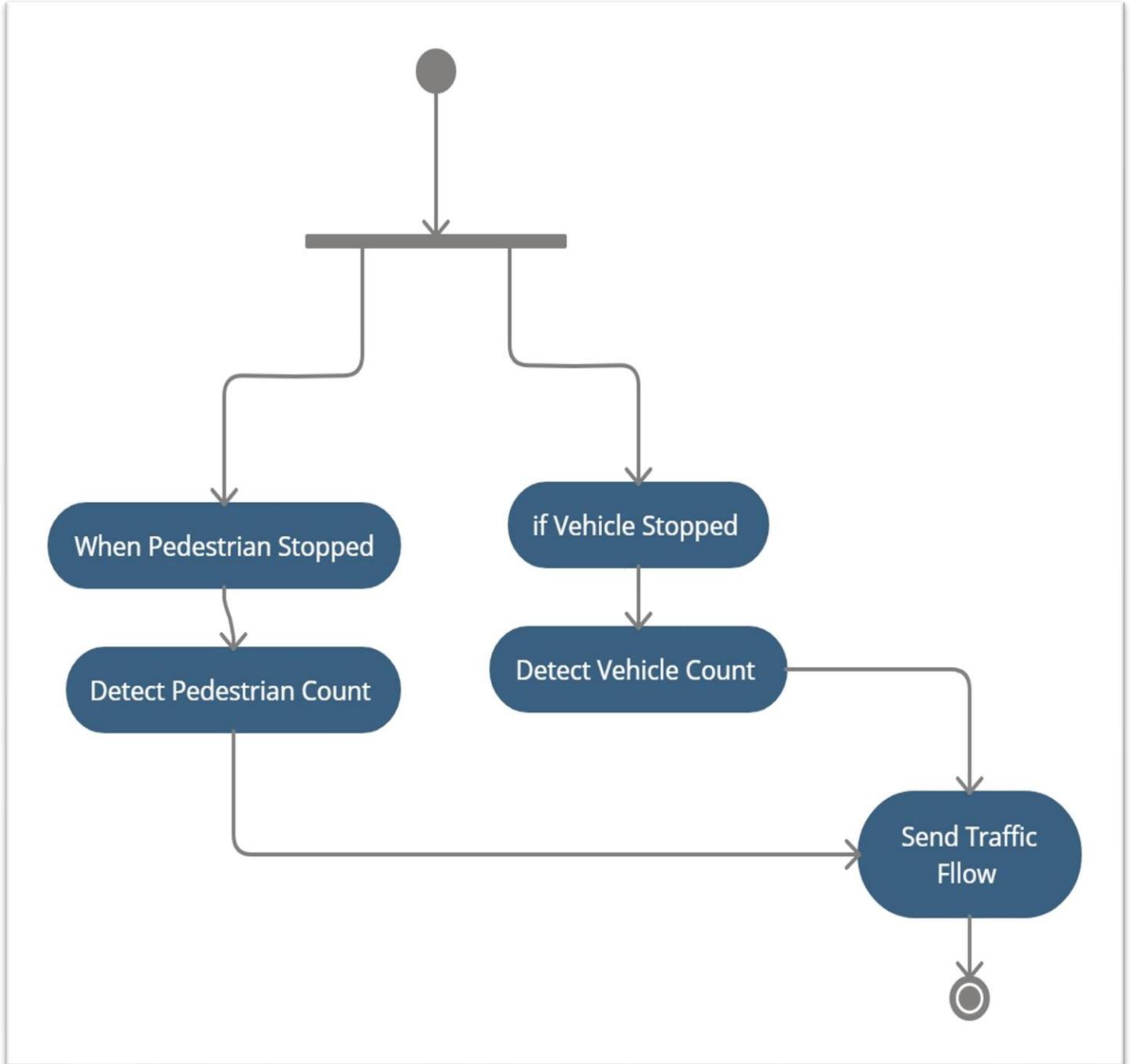
- Activity Diagram:

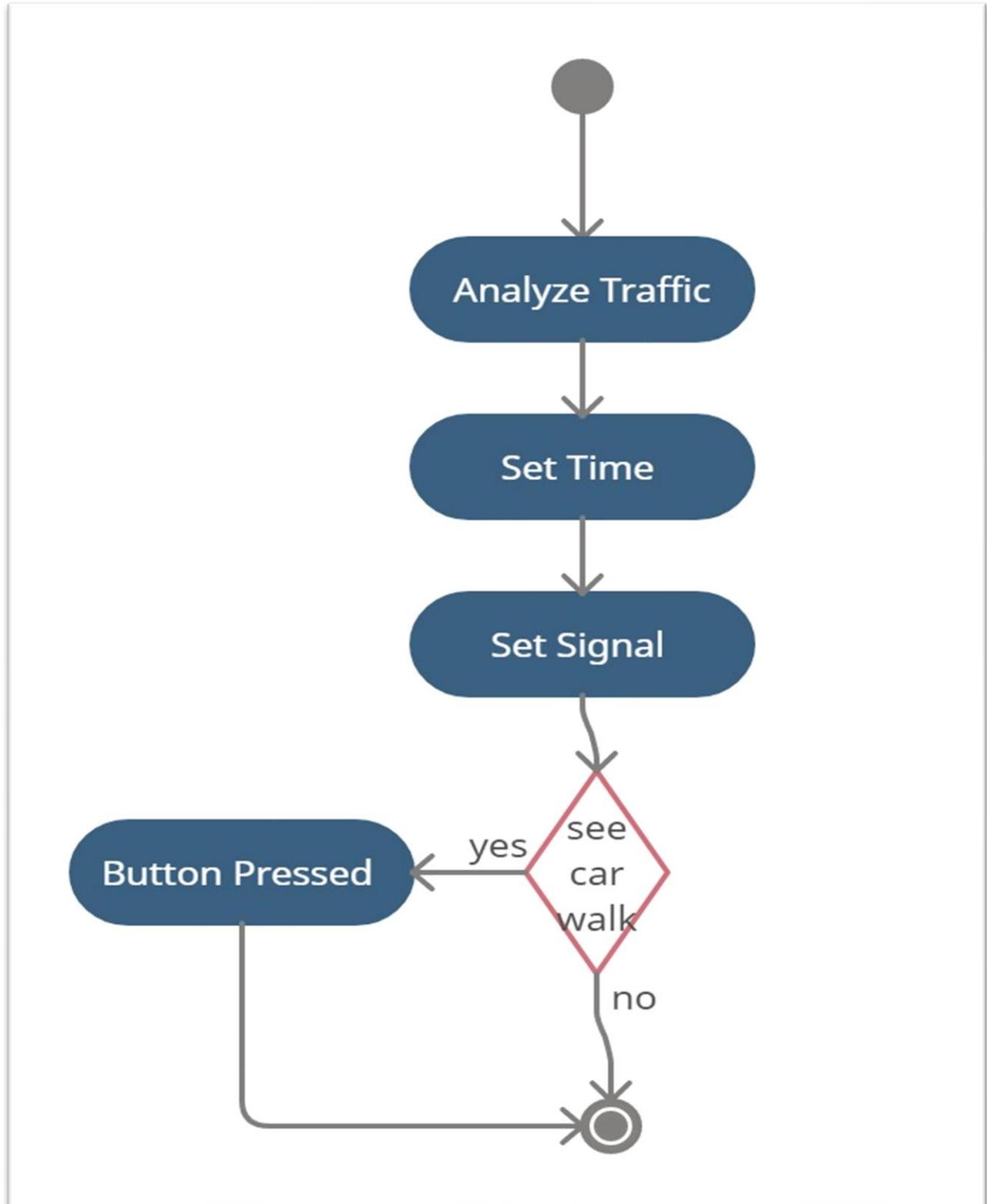




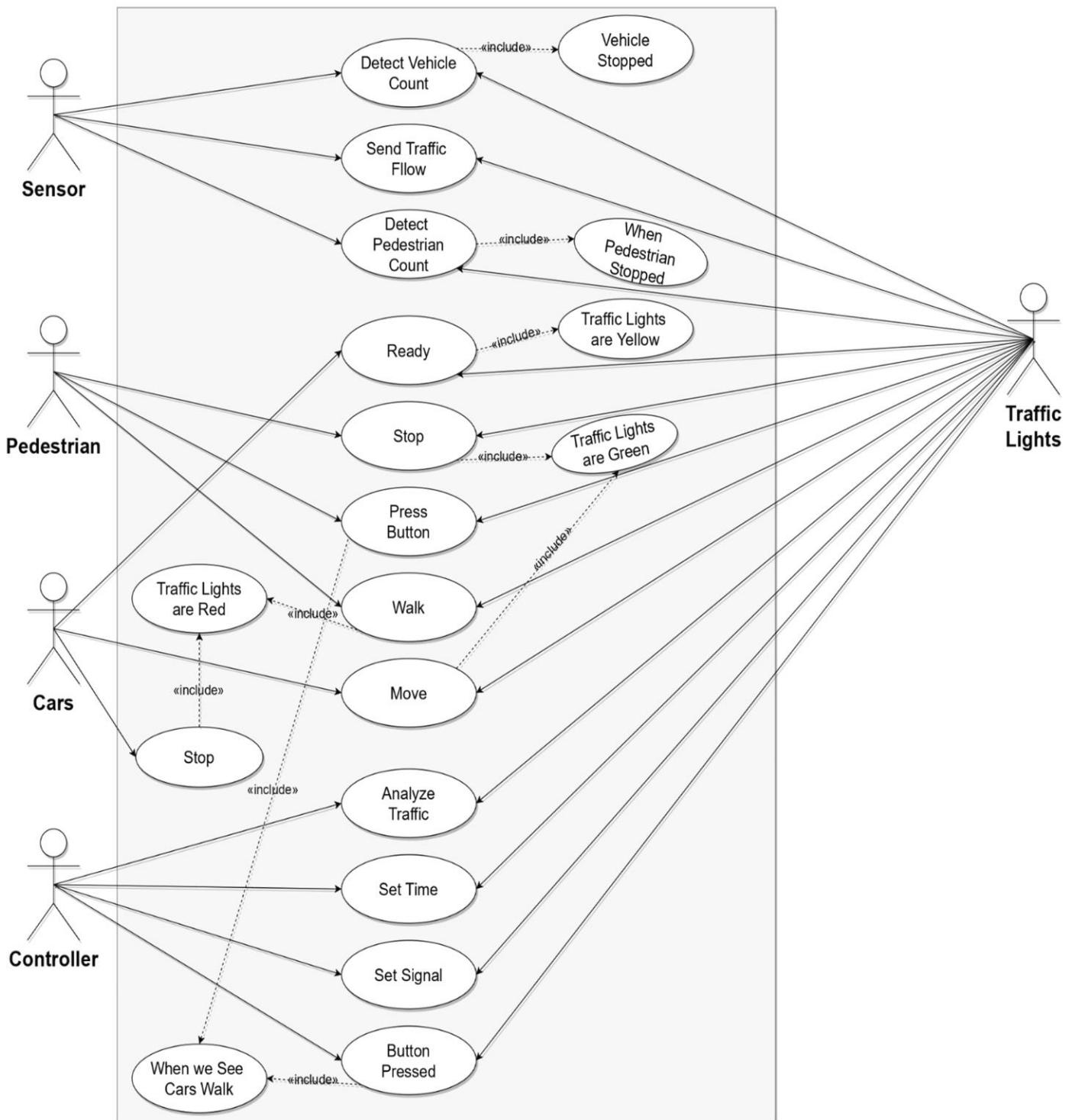








Use Case Diagram



- **Use Case Description:**

Use case name: detect vehicle comet.

Summary: it is detecting the number of the car to show if number of the car is more or not.

Dependency: this use case include another use case “vehicles stopped”.

Actor: “sensor” is the actor’s name.

Precondition: sensor is run and cars was stop.

Description of main sequence: 1. Cars stopped 2. sensor prepare vehicles

Nonfunctional requirements: vehicles stopped few second.

Post condition: sensor prepare vehicles.

Use case name: send traffic flow.

Summary: this send expected the efficiency of the movement.

Dependency: none

Actor: “sensor” is the actor’s name.

Precondition: sensor is run.

Description of main sequence:

Description of alternative sequence: none.

Nonfunctional requirements: none.

Post condition: send traffic flow.

Use case name: detect pedestrian comet.

Summary: it is detecting the number of the pedestrian to show if number of the pedestrian is more or not.

Dependency: this use case include another use case “pedestrian stopped”.

Actor: “sensor” is the actor’s name.

Precondition: sensor is run and pedestrian was stop.

Description of main sequence: none.

Description of alternative sequence: none

Nonfunctional requirements: none.

Post condition: detect pedestrian number.

Use case name: ready.

Summary: the cars are getting ready to go.

Dependency: this use case include another use case “traffic lights are yellow”.

Actor: “cars” is the actor’s name.

Precondition: cars was stop.

Description of main sequence: traffic lights yellow tandoor and cars ready.

Description of alternative sequence: none

Nonfunctional requirements: none

Post condition: traffic lights yellow tandoor and cars ready.

Use case name: stop.

Summary: if traffic lights are green pedestrians stopped.

Dependency: this use case include another use case “traffic light is green”.

Actor: “pedestrians” is the actor’s name.

Precondition: traffic lights are green.

Description of main sequence: if traffic lights are green pedestrians stopped

Description of alternative sequence: none

Nonfunctional requirements: none.

Post condition: pedestrians stopped.

Use case name: stop.

Summary: if traffic lights are red cars stopped.

Dependency: this use case include another use case “traffic light is red”.

Actor: “cars” is the actor’s name.

Precondition: traffic lights are red.

Description of main sequence: if traffic lights are red cars stopped

Description of alternative sequence: none

Nonfunctional requirements: none.

Post condition: cars stopped.

Use case name: press button.

Summary: Pedestrians press the button so that the traffic light remains red when the cars are walking

Dependency: this use case include another use case “when we cars walk”.

Actor: “pedestrians and controller” is the actor’s name.

Precondition: cars walk.

Description of main sequence: pedestrians press on button then traffic lights become red.

Description of alternative sequence: none.

Nonfunctional requirements: pedestrians wait few second to the cars stopped.

Post condition: traffic lights are red.

Use case name: walk.

Summary: pedestrians are driving when the traffic lights are red.

Dependency: this use case include another use case “traffic lights are red”.

Actor: “pedestrians” is the actor’s name.

Precondition: cars are stopped.

Description of main sequence: press bouton then traffic lights are red and pedestrians walk.

Description of alternative sequence: none.

Nonfunctional requirements: pedestrians wait few second to the cars stopped.

Post condition: pedestrians walk.

Use case name: move.

Summary: Cars are driving when the traffic lights are green.

Dependency: this use case include another use case “traffic lights are green”.

Actor: “cars” is the actor’s name.

Precondition: cars was ready.

Description of main sequence: traffic lights are green and cars walk.

Description of alternative sequence: none

Nonfunctional requirements: cars wait few second.

Post condition: cars walk

Use case name: analysis traffic.

Summary: If pedestrians are more, they are the ones who cross first, and if cars are more, they are the ones who cross first.

Dependency: none

Actor: “controller” is the actor’s name.

Precondition: traffic lights are red.

Description of main sequence: If pedestrians are more, they are the ones who cross first, and if cars are more, they are the ones who cross first.

Description of alternative sequence: none.

Nonfunctional requirements: none.

Post condition: analysis traffic Regulates traffic.

Use case name: set time.

Summary: traffic lights Wait a few seconds to move to the next mode when the traffic lights are green.

Dependency: none

Actor: “controller” is the actor’s name.

Precondition: traffic lights are green.

Description of main sequence: There is time between each color of the traffic light

Description of alternative sequence: none

Nonfunctional requirements: none

Post condition: set time.

Use case name: set signal.

Summary: The traffic light gives a red, yellow or green signal.

Dependency: none.

Actor: “controller” is the actor’s name.

Precondition: The controller controls the traffic light.

Description of main sequence: If the signal is red, it means to stop. If it is yellow, it means to be ready. If the signal is green, it means to move

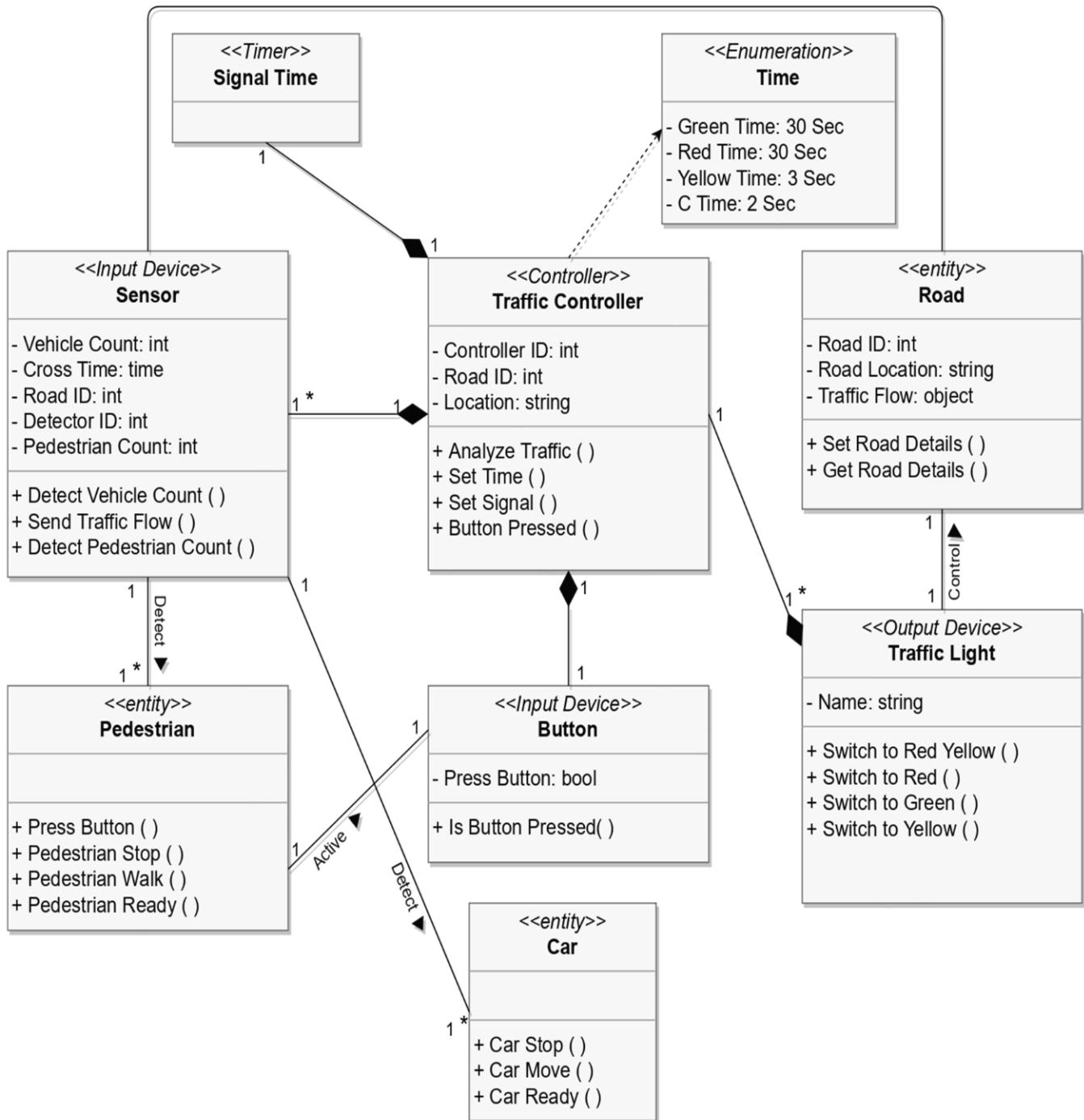
Description of alternative sequence: none

Nonfunctional requirements: traffic lights Wait a few seconds to move to the next mode

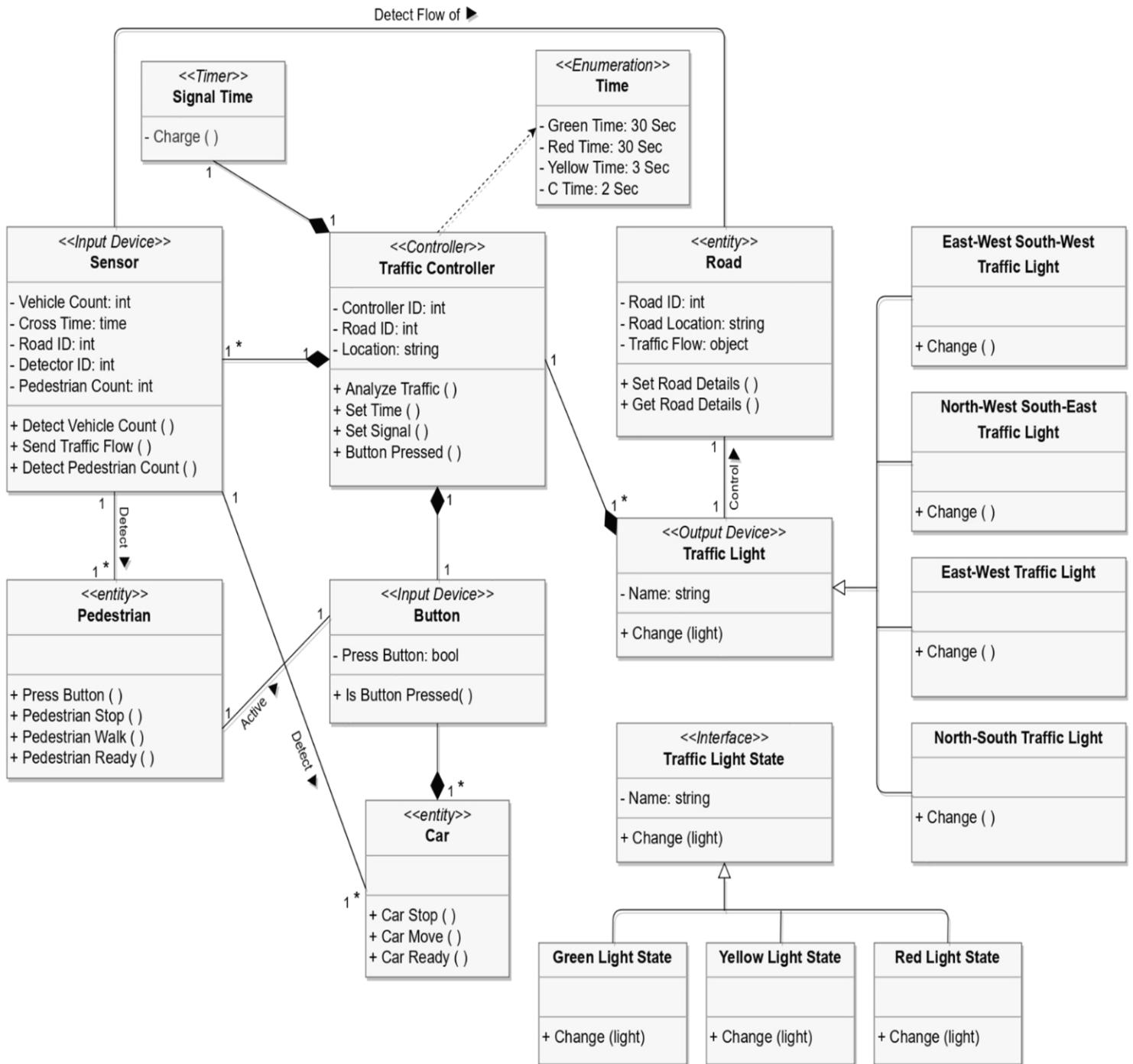
Post condition: cars movement regulation.

Class Diagram

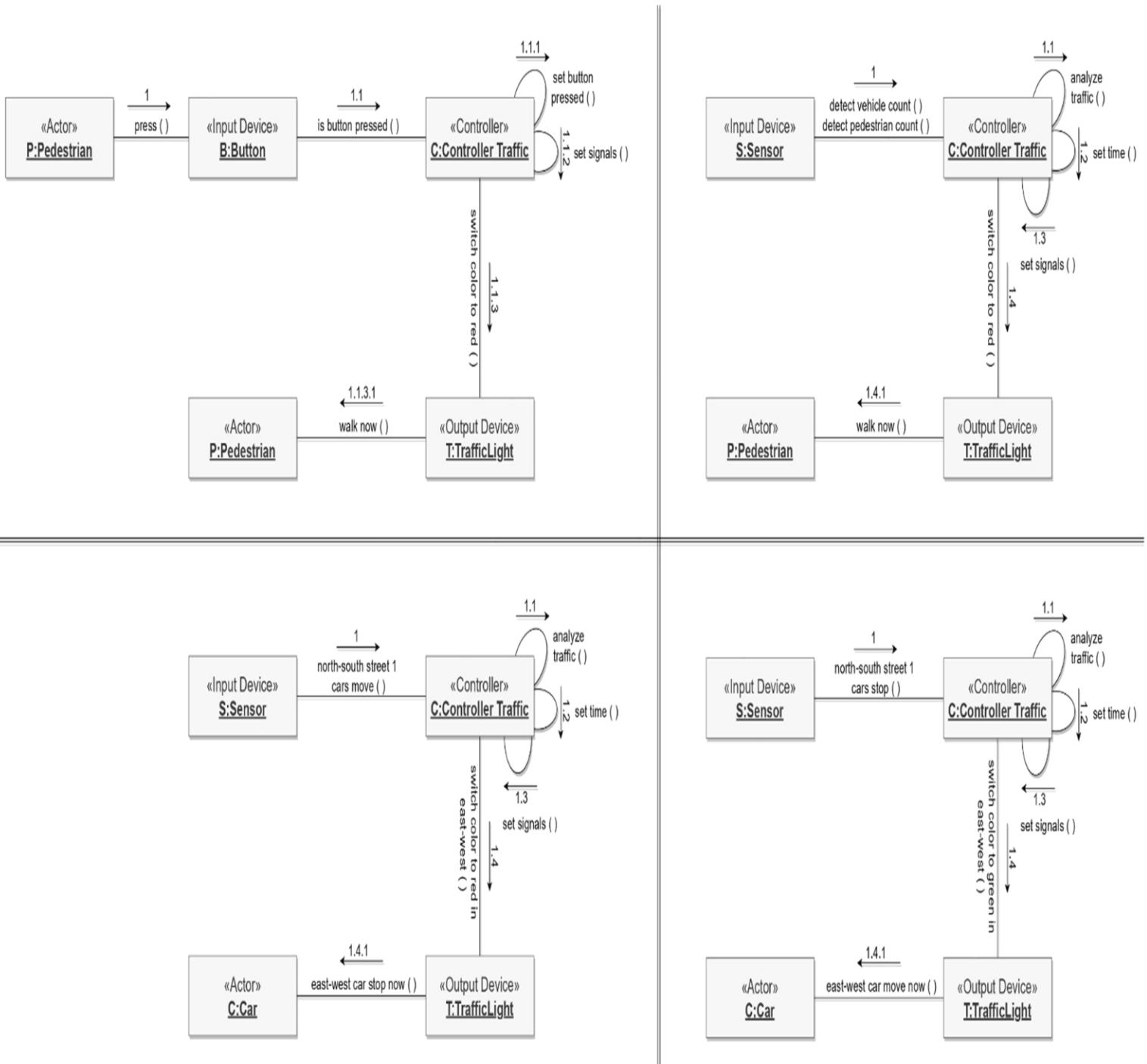
Detect Flow of ►



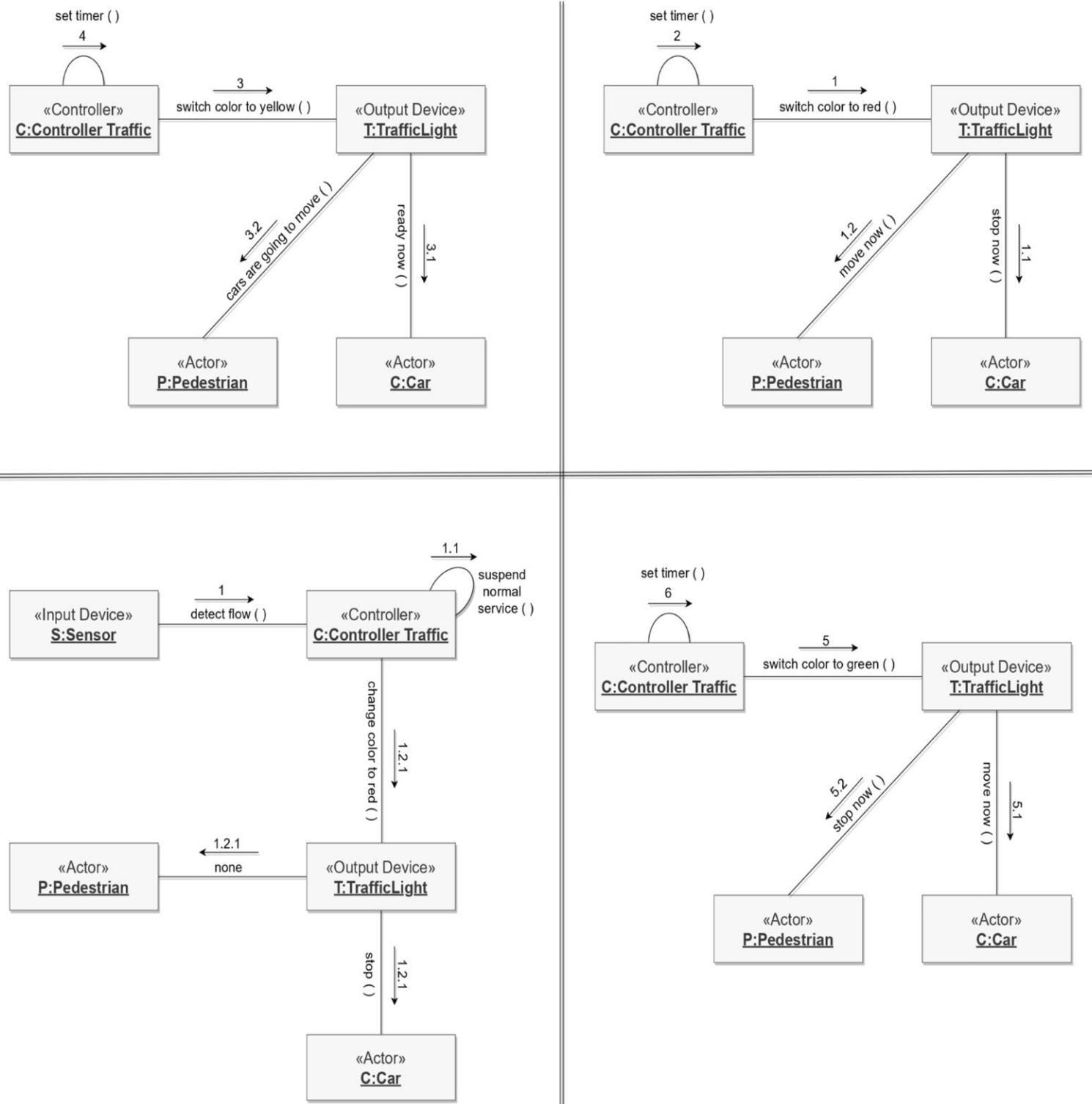
Class Diagram (Pattern)



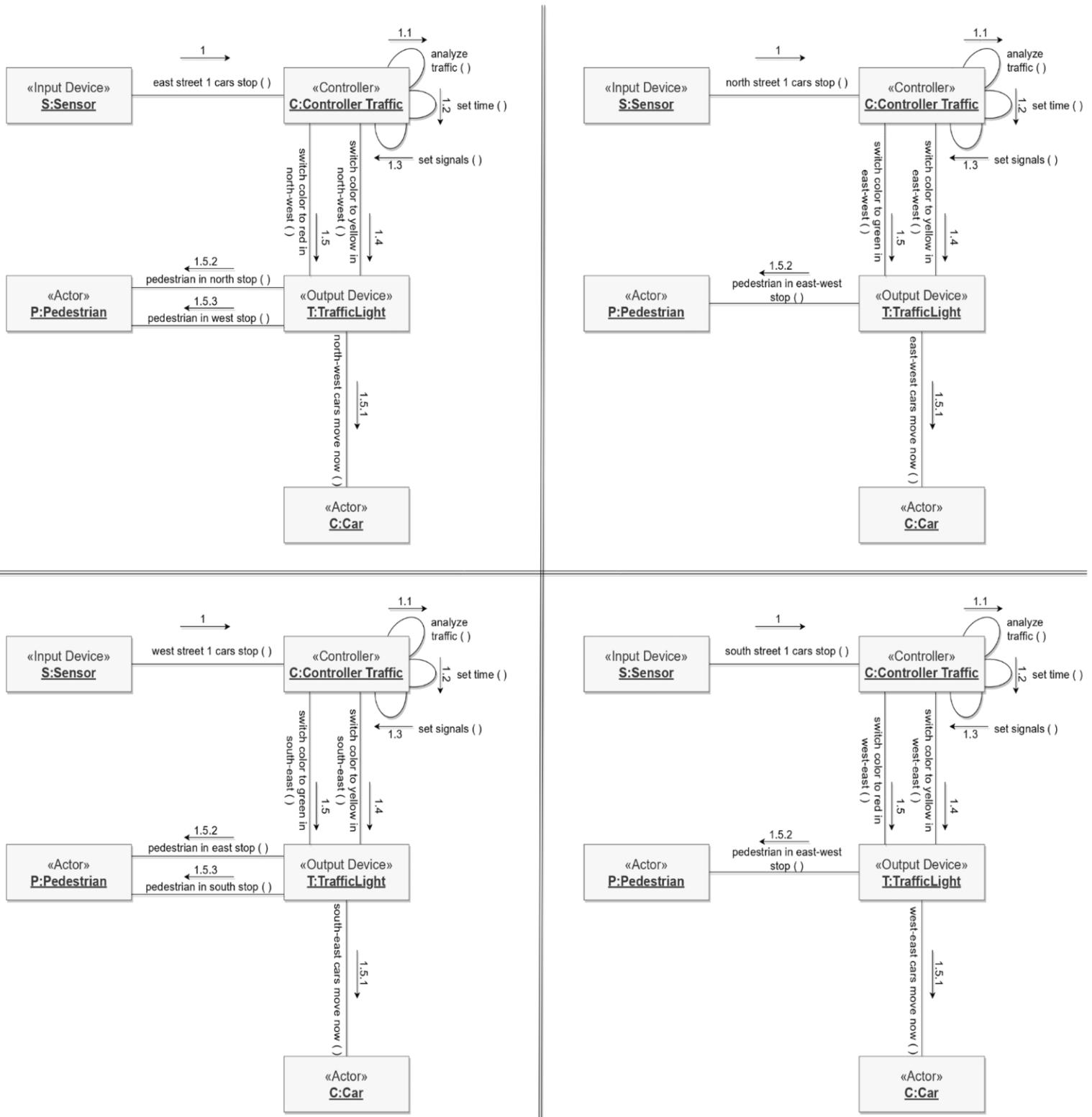
Collaboration Diagram (Part 1)



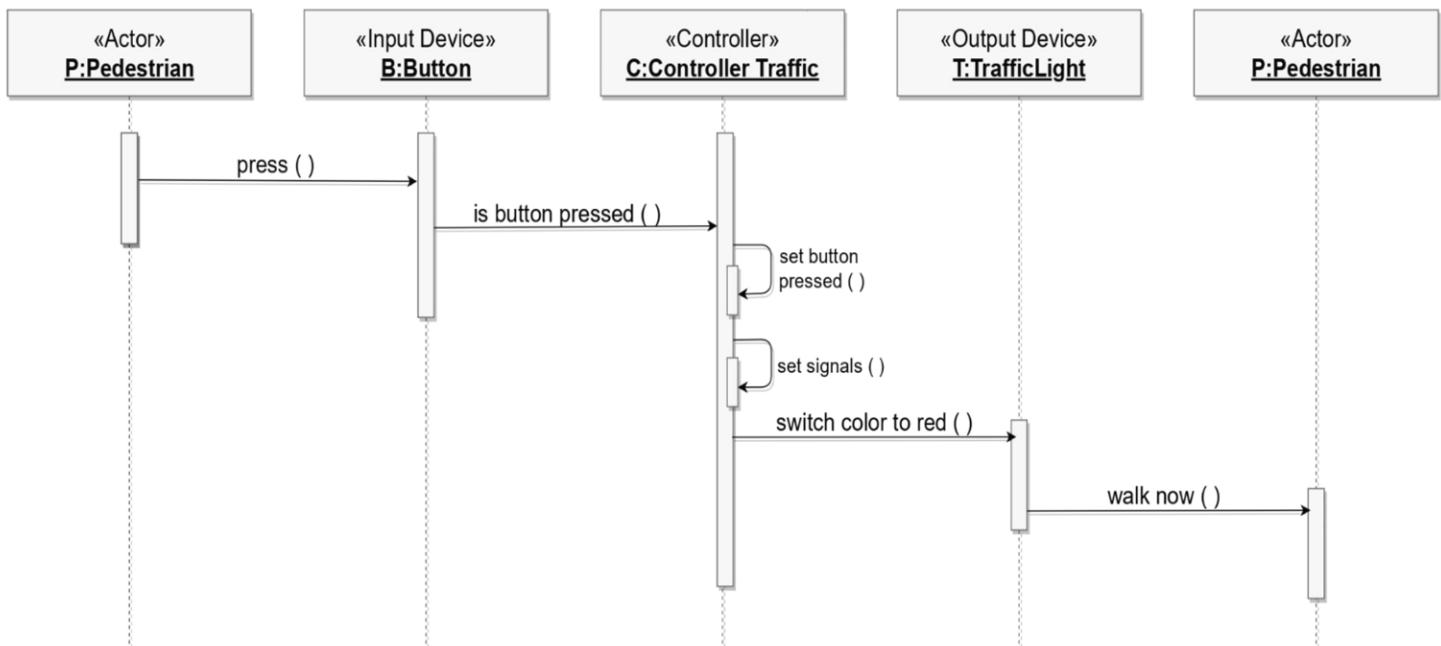
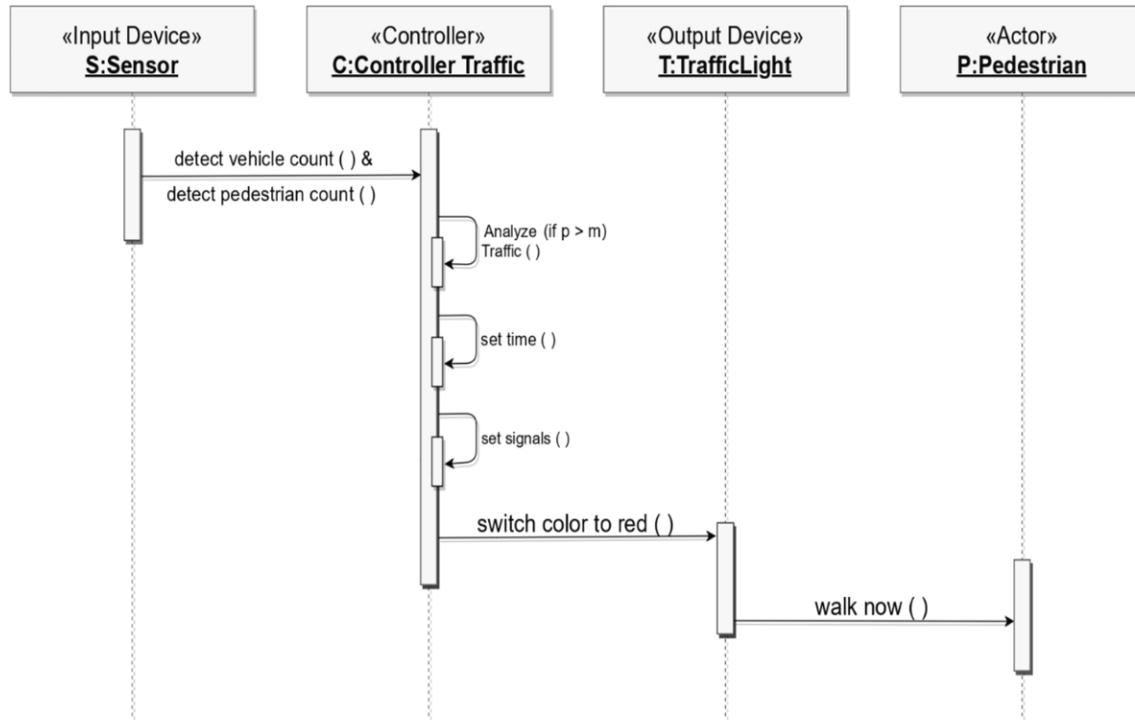
Collaboration Diagram (Part 2)



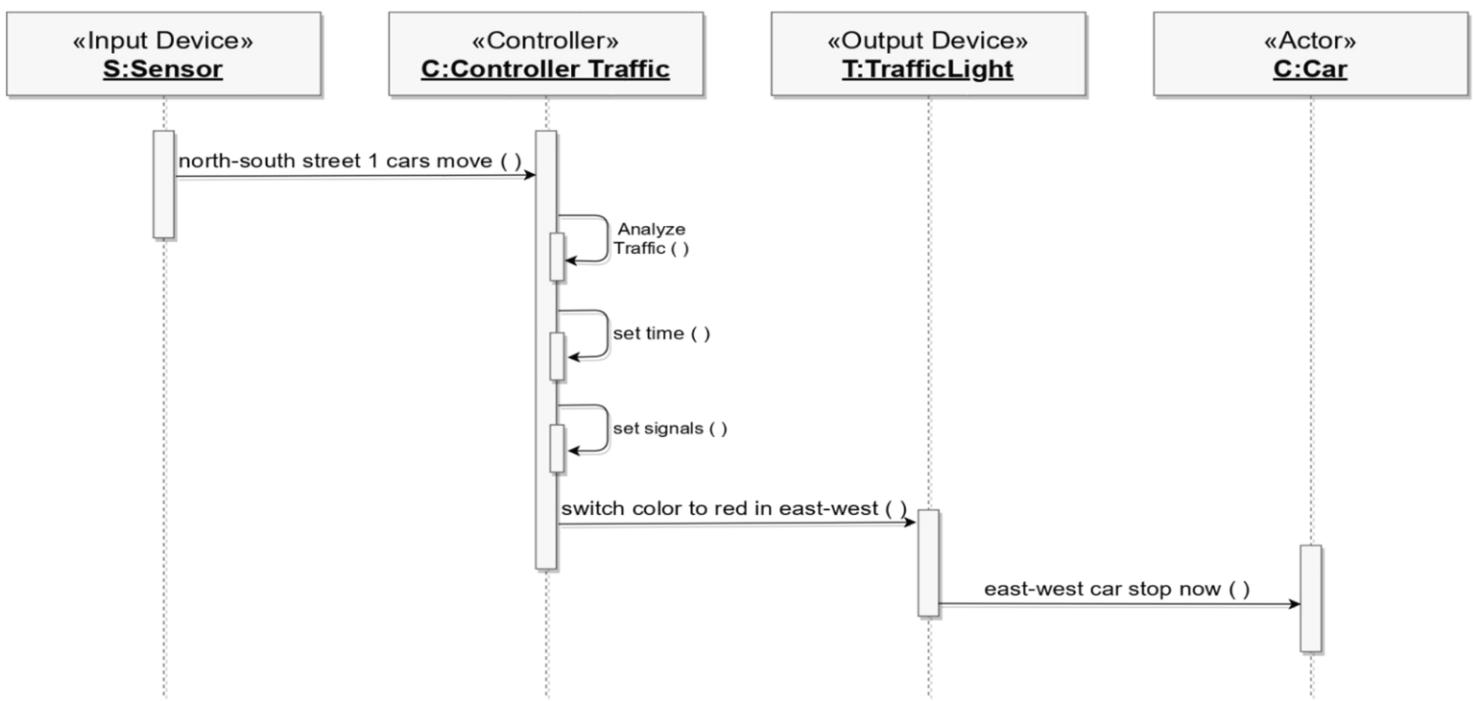
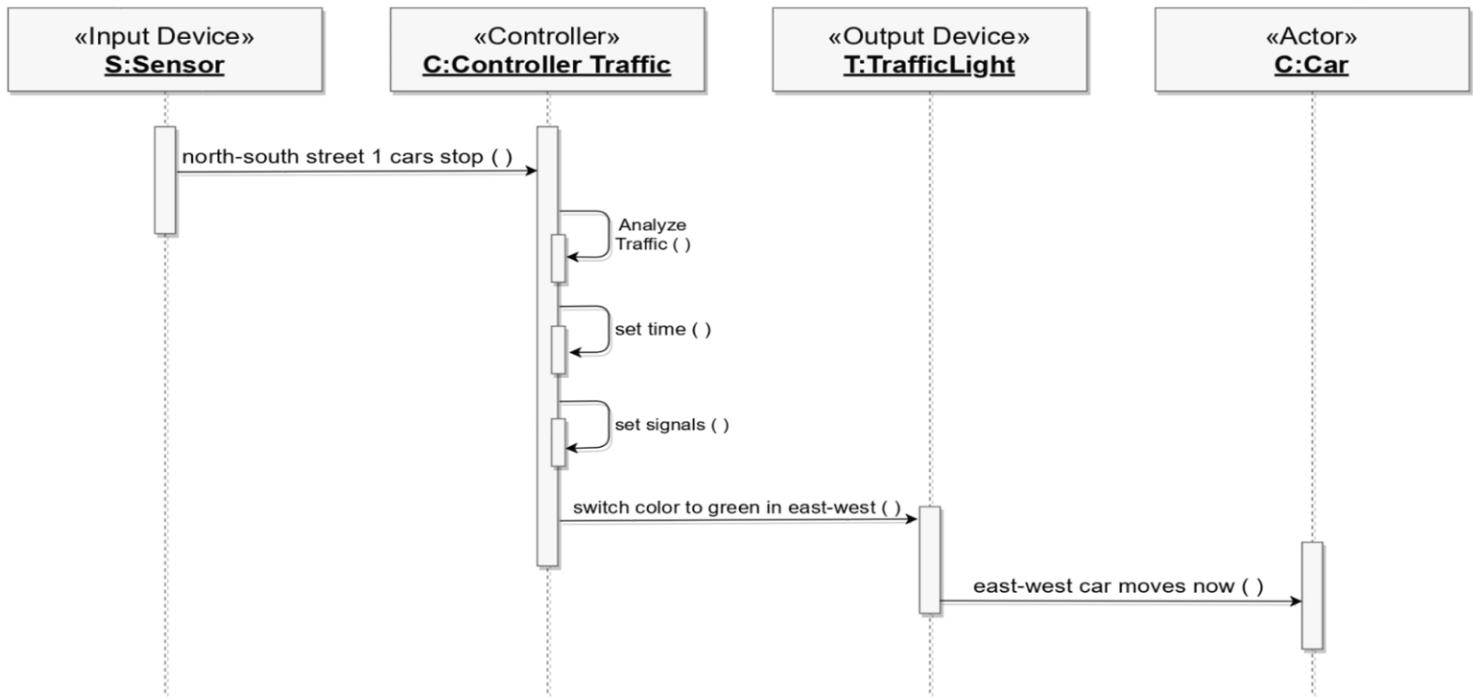
Collaboration Diagram (Part 3).



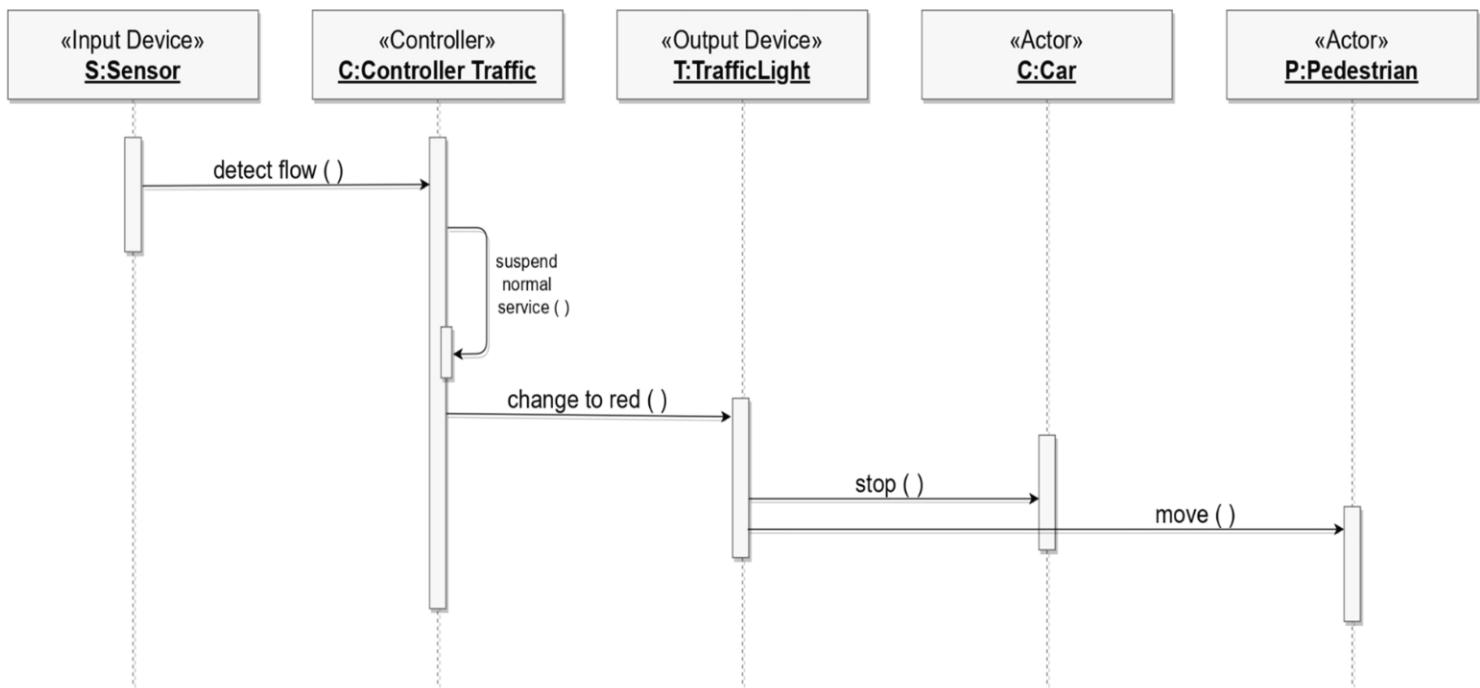
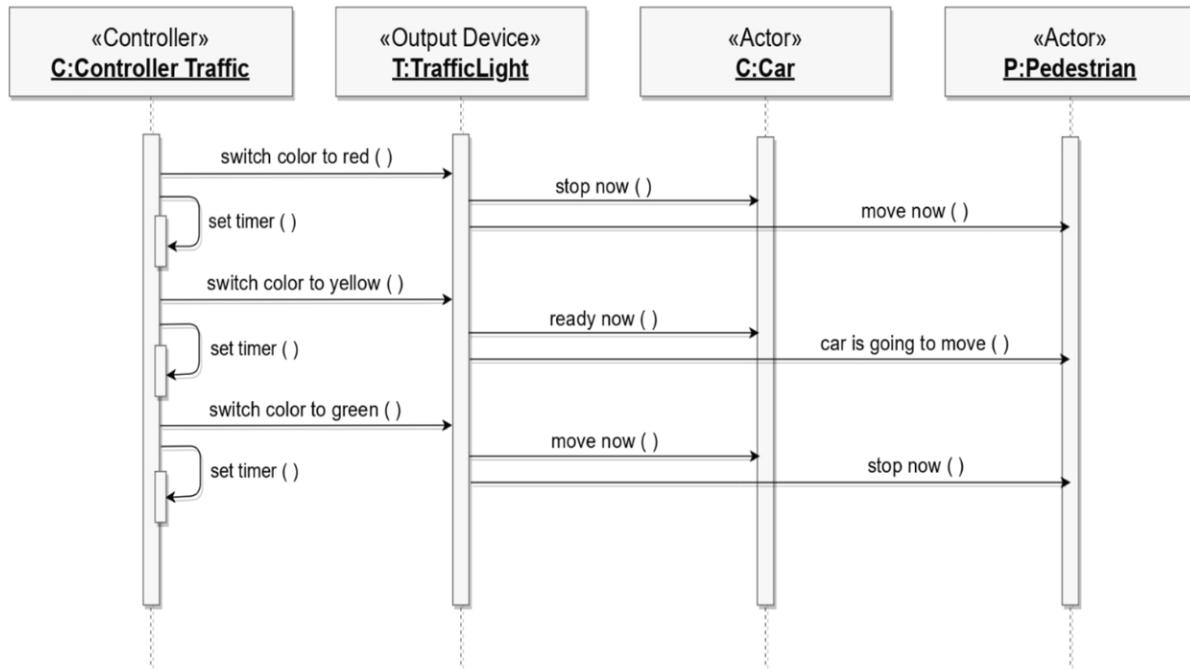
Sequence Diagram (Part 1)



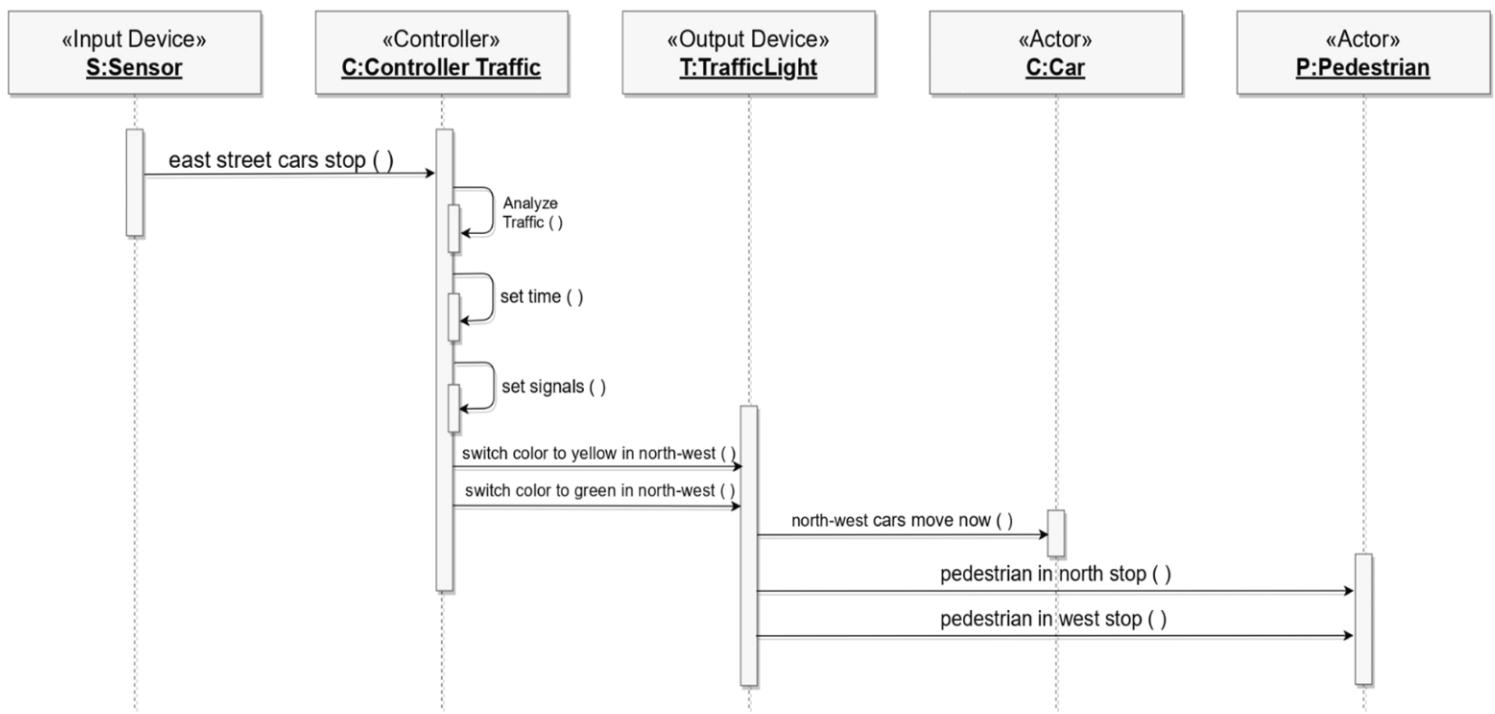
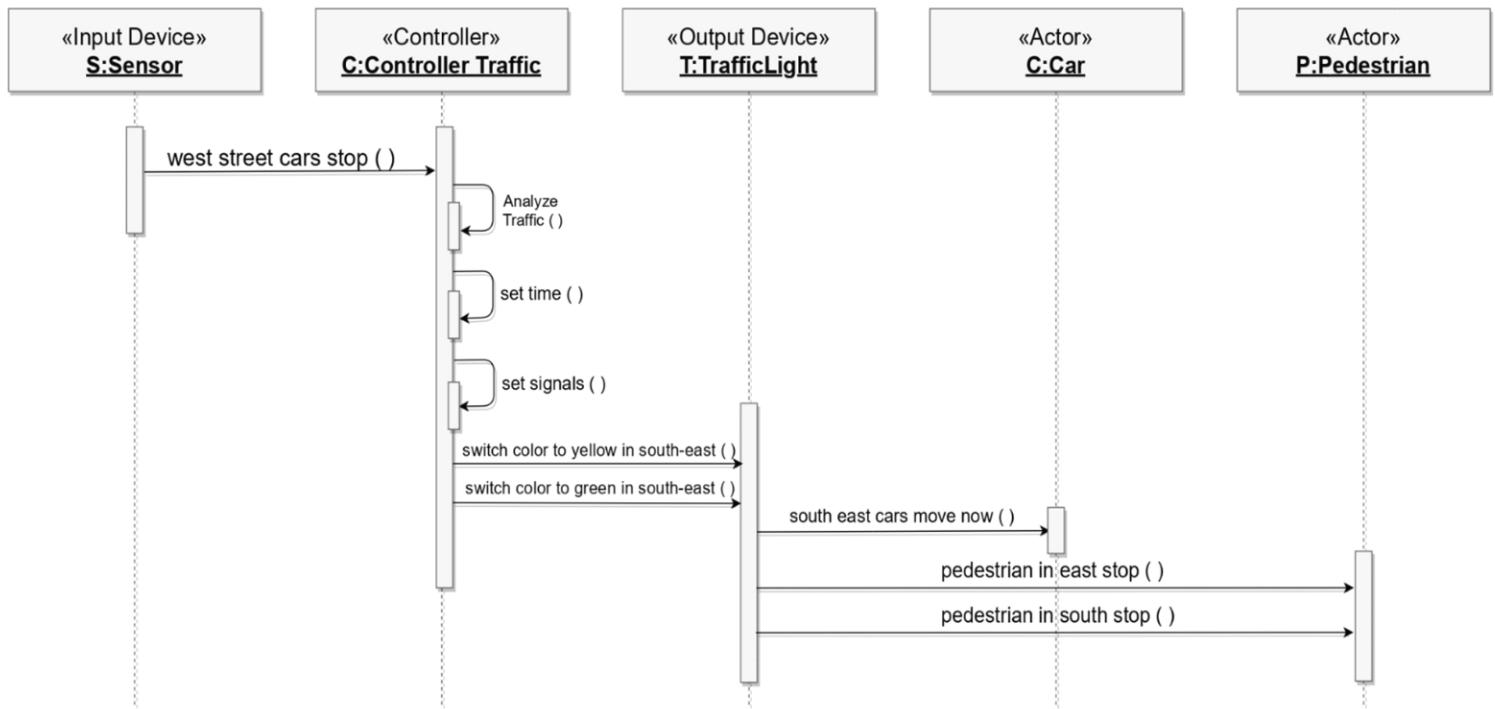
Sequence Diagram (Part 2)



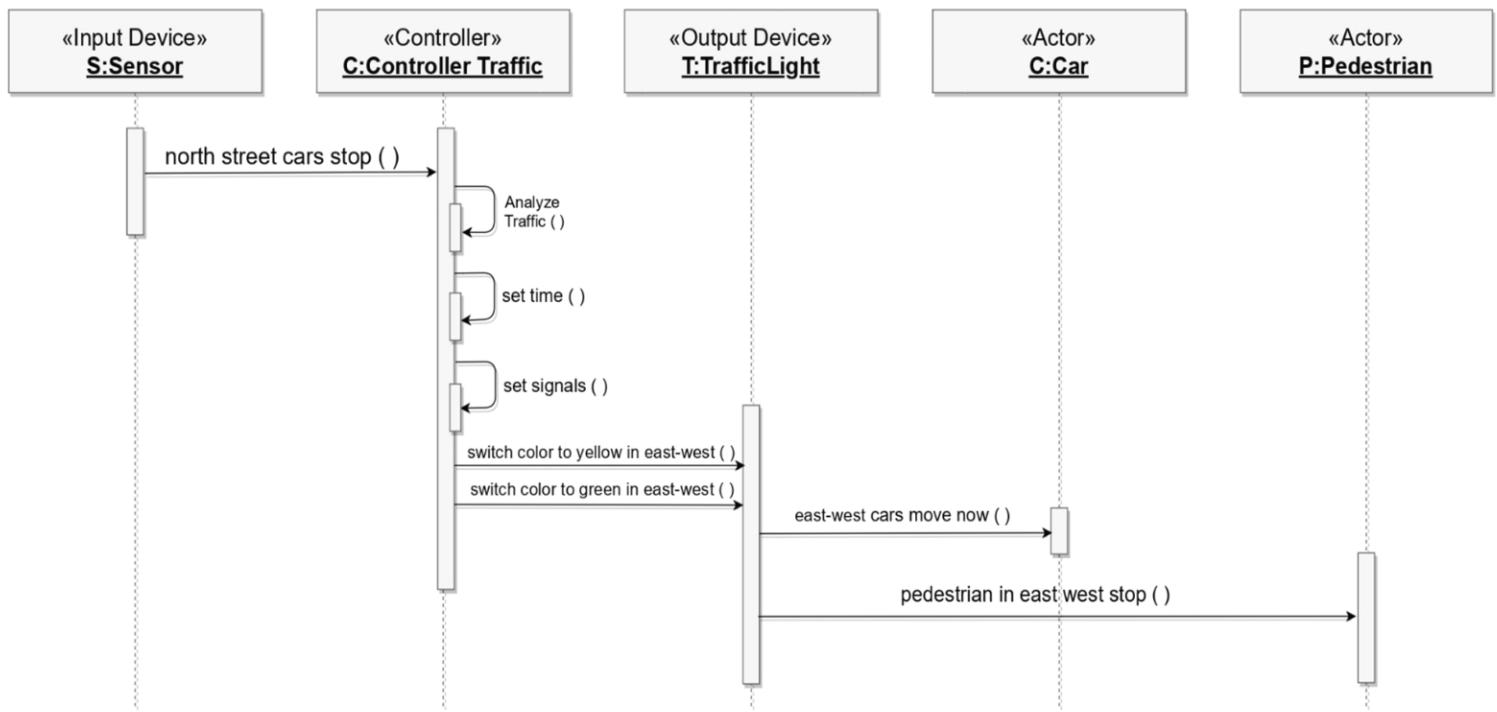
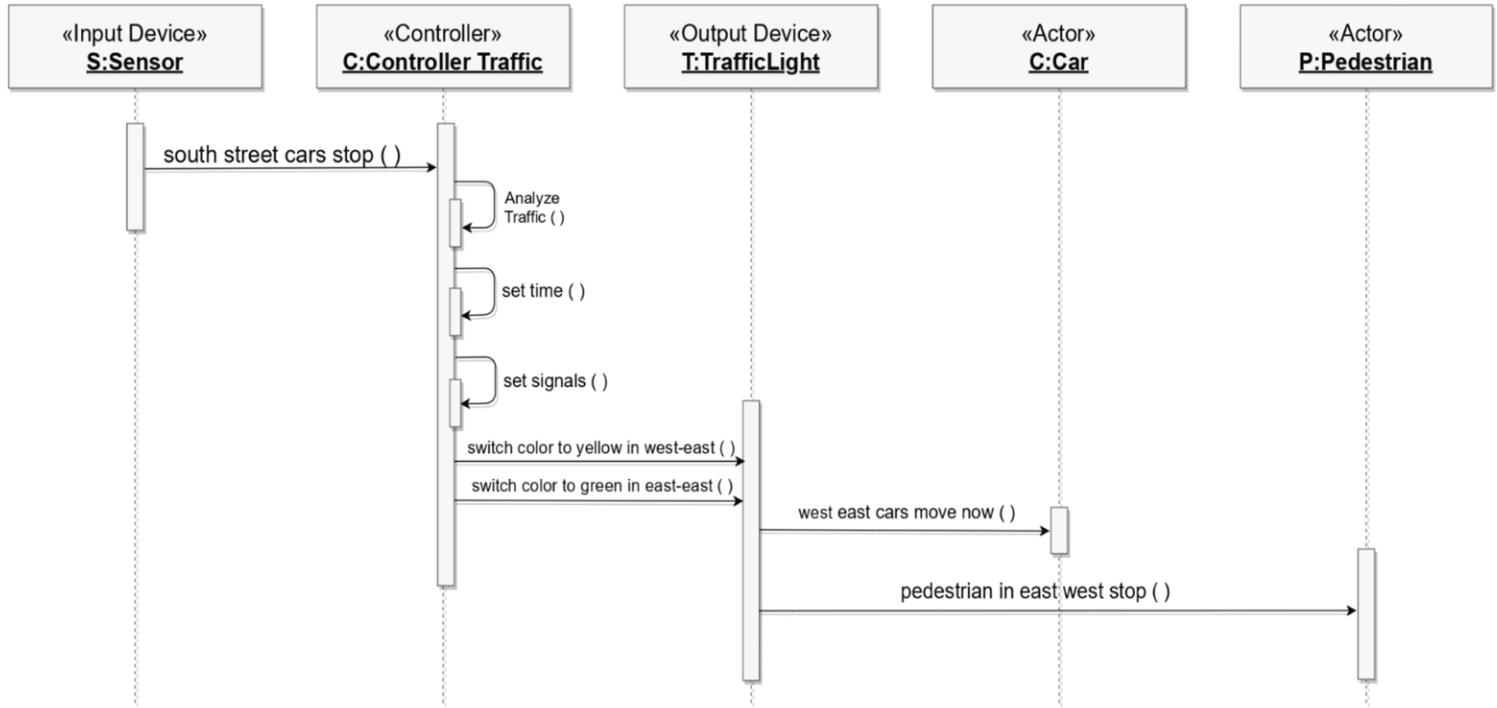
Sequence Diagram (Part 3)



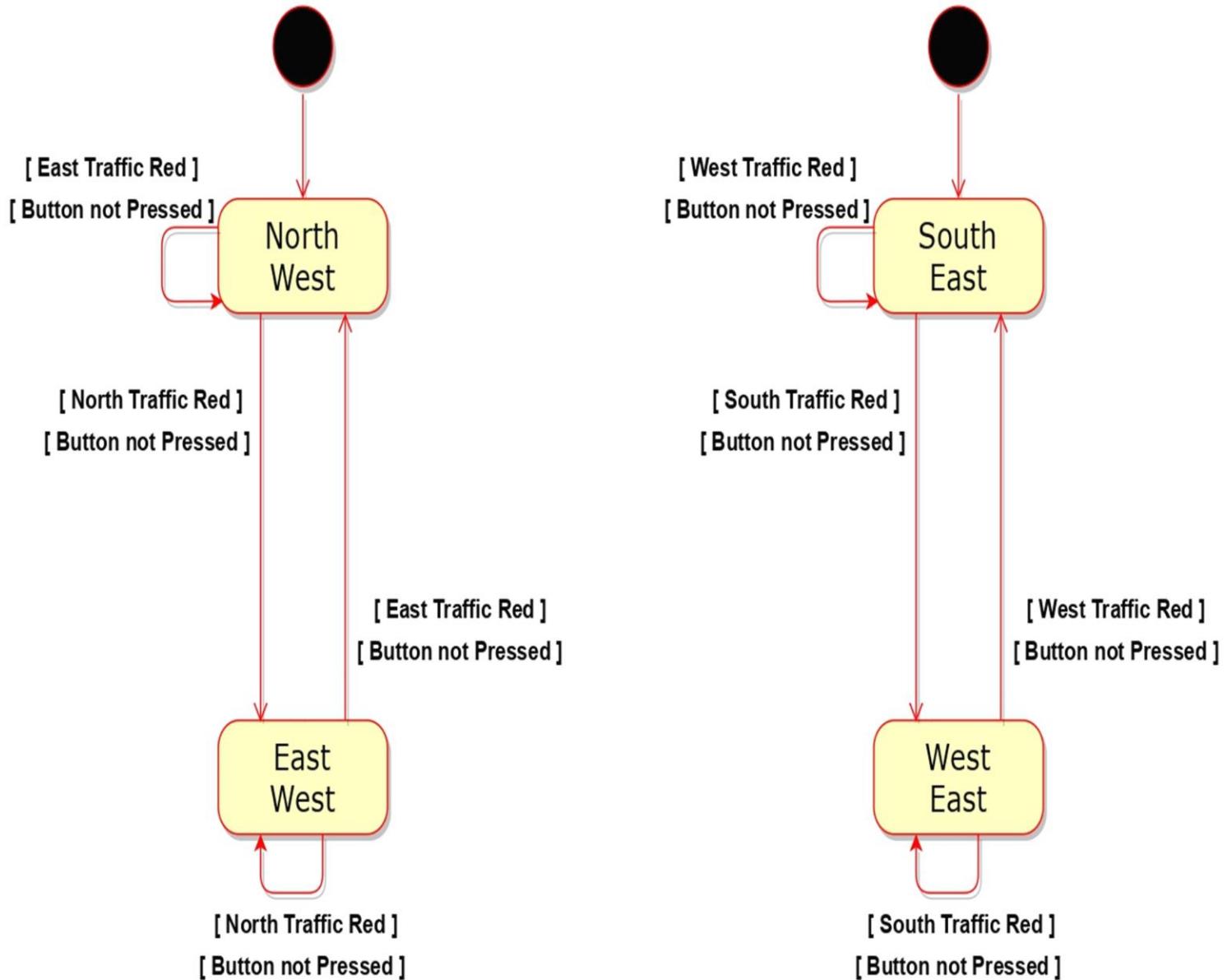
Sequence Diagram (Part 4)



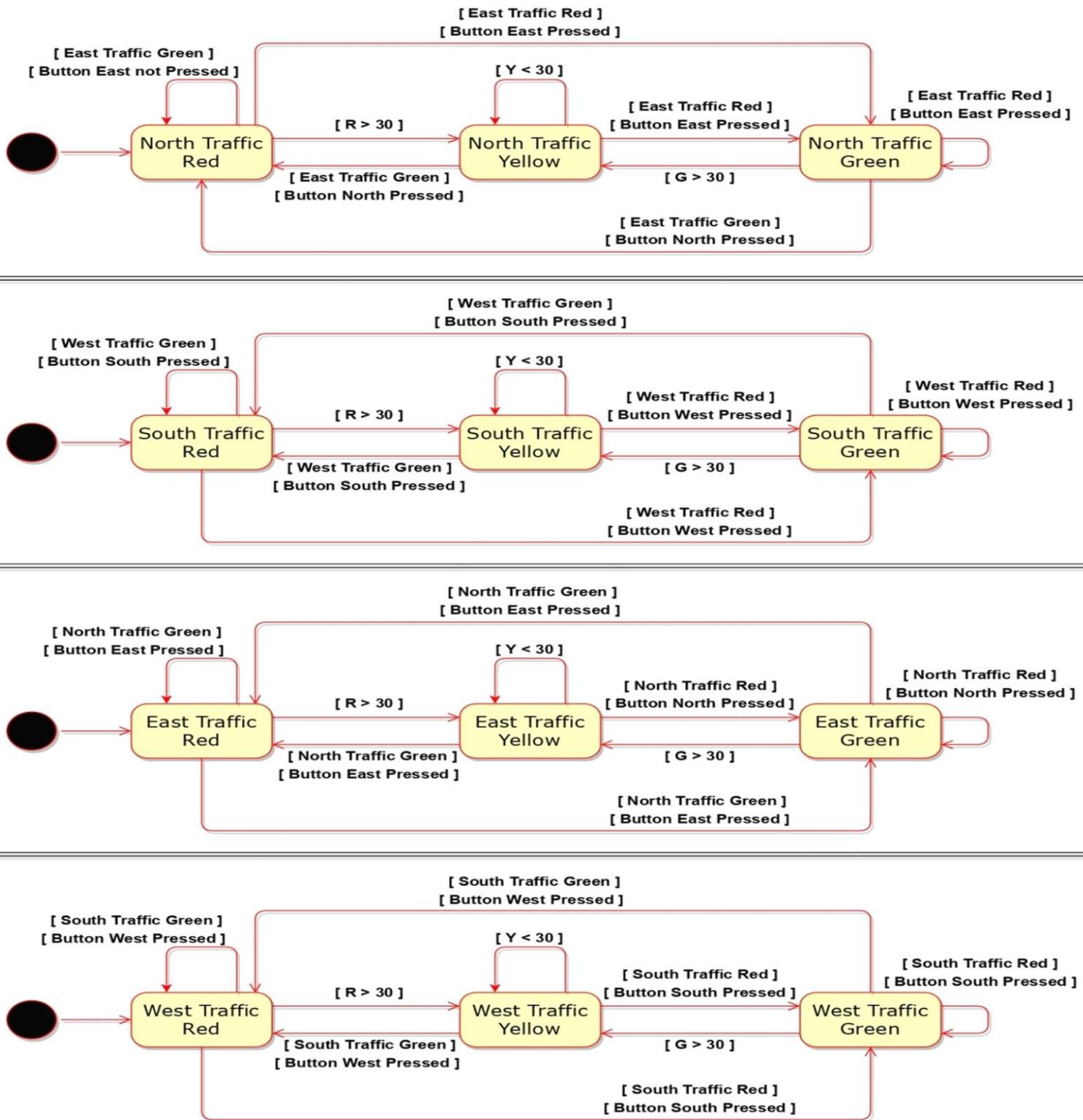
Sequence Diagram (Part 5)



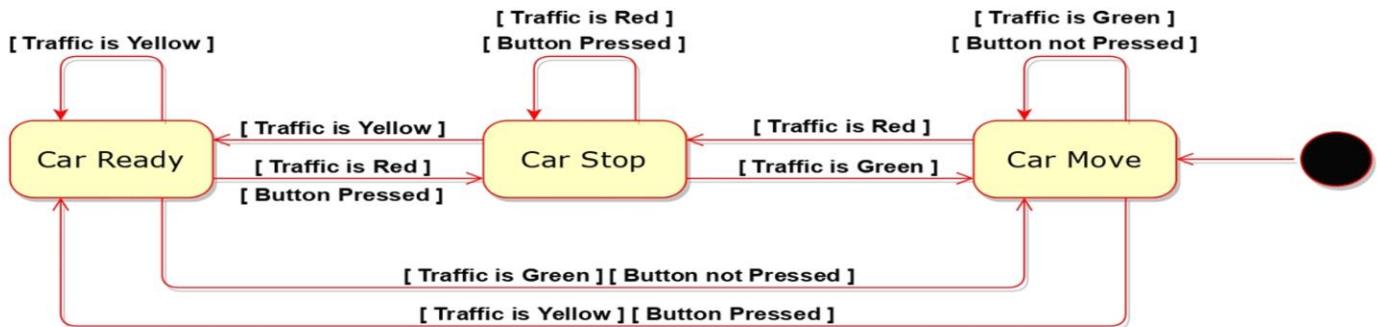
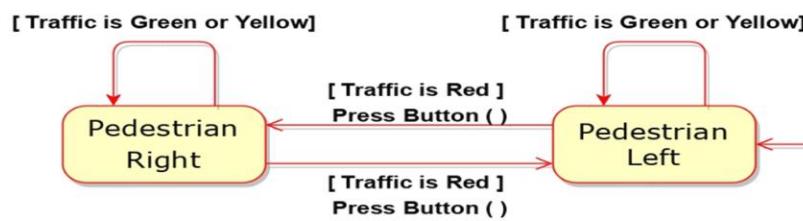
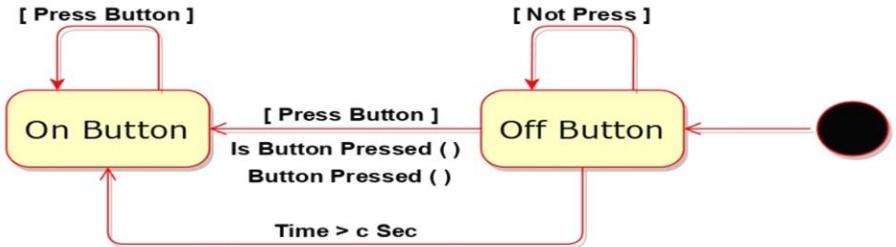
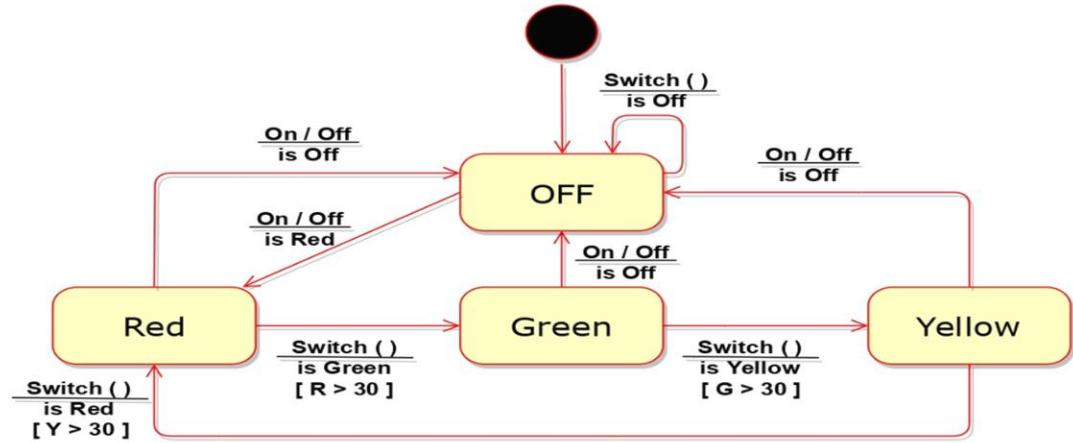
State Machine Diagram (Part 1)



State Machine Diagram (Part 2).



State Machine Diagram (Part 3).



● Transition Table:

| Current State / Next State | North West | East West | South East | West East | North Traffic Red | North Traffic Yellow | North Traffic Green | South Traffic Red | South Traffic Yellow | South Traffic Green | East Traffic Red | East Traffic Yellow | East Traffic Green | West Traffic Red | West Traffic Yellow | West Traffic Green | Pedestrian Left | Pedestrian Right | Car Move | Car Stop | Car Ready |
|----------------------------|---|--|---|---|---|----------------------|--|-------------------|--|---------------------|--|---------------------|---|------------------|---------------------|---|--------------------------------------|---|-------------------------------------|--|-----------|
| North West | East Traffic Red, Button not Pressed / North West | North Traffic Red, Button not Pressed / North West | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| East West | East Traffic Red, Button not Pressed / North West | North Traffic Red, Button not Pressed / East West | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| South East | — | — | West Traffic Red, Button not Pressed / South East | South Traffic Red, Button not Pressed / West East | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| West East | — | — | West Traffic Red, Button not Pressed / South East | South Traffic Red, Button not Pressed / West East | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| North Traffic Red | — | — | — | — | East Traffic Green, Button East not Pressed / NTR | R > 30 / NTY | East Traffic Red, Button East Pressed / NTG | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| North Traffic Yellow | — | — | — | — | East Traffic Green, Button North Pressed / NTR | Y < 30 / NTY | East Traffic Red, Button East Pressed / NTG | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| North Traffic Green | — | — | — | — | East Traffic Green, Button North Pressed / NTR | G > 30 / NTY | East Traffic Red, Button East Pressed / NTG | — | — | — | — | — | — | — | — | — | — | — | — | — | |
| South Traffic Red | — | — | — | — | — | — | West Traffic Green, Button South Pressed / STR | R > 30 / STY | West Traffic Red, Button West Pressed / STG | — | — | — | — | — | — | — | — | — | — | — | |
| South Traffic Yellow | — | — | — | — | — | — | West Traffic Green, Button South Pressed / STR | Y < 30 / STY | West Traffic Red, Button West Pressed / STG | — | — | — | — | — | — | — | — | — | — | — | |
| South Traffic Green | — | — | — | — | — | — | West Traffic Green, Button South Pressed / STR | G > 30 / STY | West Traffic Red, Button West Pressed / STG | — | — | — | — | — | — | — | — | — | — | — | |
| East Traffic Red | — | — | — | — | — | — | — | — | North Traffic Green, Button East Pressed / ETR | R > 30 / ETY | North Traffic Green, Button East Pressed / ETR | — | — | — | — | — | — | — | — | — | |
| East Traffic Yellow | — | — | — | — | — | — | — | — | North Traffic Green, Button East Pressed / ETR | Y < 30 / ETY | North Traffic Red, Button North Pressed / ETG | — | — | — | — | — | — | — | — | — | |
| East Traffic Green | — | — | — | — | — | — | — | — | North Traffic Green, Button East Pressed / ETR | G > 30 / ETY | North Traffic Red, Button North Pressed / ETG | — | — | — | — | — | — | — | — | — | |
| West Traffic Red | — | — | — | — | — | — | — | — | — | — | South Traffic Green, Button West Pressed / WTR | R > 30 / GTY | South Traffic Red, Button South Pressed / WTG | — | — | — | — | — | — | — | |
| West Traffic Yellow | — | — | — | — | — | — | — | — | — | — | South Traffic Green, Button West Pressed / WTR | Y < 30 / GTY | South Traffic Red, Button South Pressed / WTG | — | — | — | — | — | — | — | |
| West Traffic Green | — | — | — | — | — | — | — | — | — | — | South Traffic Green, Button West Pressed / WTR | G > 30 / GTY | South Traffic Red, Button South Pressed / WTG | — | — | — | — | — | — | — | |
| Pedestrian Left | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Traffic is Green or Yellow / PL | Traffic is Red, Press Button () / PR | — | — | — | |
| Pedestrian Right | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Traffic is Red, Press Button () / PL | Traffic is Green or Yellow / PR | — | — | — | |
| Car Move | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Button not Pressed, Traffic is Green / CM | Traffic is Red / CS | Traffic is Yellow, Button Pressed / CR | |
| Car Stop | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Traffic is Green / CM | Button Pressed, Traffic is Red / CS | Traffic is Yellow / CR | |
| Car Ready | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | Traffic is Green, Button not Pressed / CM | Traffic is Red, Button Pressed / CS | Traffic is Yellow / CR | — | — | |