Use case:	**Green wave**
Description:	Early detection of vehicles and therefore optimized waiting time
Actor:	Vehicle

Preconditions:
1. Camera-detection: detection logic is trained for the particular background

2. V2I: Passing vehicle informs Traffic light system about number of approaching vehicles from behind

Basic flow:
1. Vehicle drives up to a traffic light

2. Traffic light System detects traffic flow with camera or by V2I message

3. Information exchange between consecutive traffic light intersections

4. Optimizing signal cycles

Use case:	**Dynamic traffic light signal cycles**
Description:	Avoiding static traffic light signal cycles
Actor:	Vehicle, Pedestrian
Preconditions:	Camera-detection logic is trained for the particular background

Basic flow:
1. Road user reaches traffic light

2. Traffic light system checks if crossing is possible

3. Crossing is possible, traffic light switches to green

4. Traffic light stays on green as long as there are following vehicles and no pedestrian is noticed

Alternate flow:

1. Road user reaches traffic light

2. Traffic light system checks if crossing the intersection is possible

3. Crossing is not possible, so traffic light stays on red and saves the pedestrians crossing request

4. After a defined time the traffic right switches to green for the pedestrian and to red for the vehicles

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Use case:	**Traffic light status request**
Description:	Road users can request the traffic lights current status
Actor:	Road user: vehicle, pedestrian and other
Preconditions:	Air-interface receives a status request
Postconditions:	The road user has information for improving its individual and overall traffic flow, saving fuel and reducing CO_2 emission

Basic flow:
1. Road user connects to the traffic light via radio interface

2. Road users sends request

3. Traffic light system responds with a response containing the current signal cycle time, traffic light state and predicted waiting time

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Use case:	**Crossing priority for emergency vehicles**
Description:	Rescue vehicles can safely cross an intersection without waiting time
Actor:	Rescue vehicle, police car
Preconditions:	Air-interface receives an emergency request
Postconditions:	System is back in regular operation mode

Basic flow:

1. Rescue vehicle sends emergency request via radio interface

2. Traffic light turns red for pedestrians and vehicles

3. Traffic light ignores crossing requests of pedestrians and vehicles

4. The emergency vehicle sends a message to the traffic light system that it has left the intersection

5. Traffic light system switches operation back to normal

Use case:	**Numeric signal cycle indicator for pedestrians**
Description:	The traffic light shows the signaling cycle to pedestrians
Actor:	Pedestrian

Basic flow:

1. The current signaling cycle time is displayed on a numerical display

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Use case:	**Communication interface for pedestrians**
Description:	Pedestrians can indicate their wish to cross the road
Actor:	Pedestrian
Preconditions:	Traffic light system is not in emergency mode

Basic flow:

1. Pedestrian uses a button to indicate his wish to cross the road

2. Traffic light turns green on next occasion

Alternate flow:

1. Pedestrian uses the radio interface (smartphone, wearable) instead of the button

2. Traffic light turns green on next occasion

Use case:	**Simplified crossing for handicapped pedestrians**
Description:	Handicapped pedestrians can indicate their wish to cross the road and receive additional time for crossing
Actor:	Pedestrian with reduced mobility
Preconditions:	Traffic light system is not in emergency mode

Basic flow:
1. Pedestrian uses the air interface (wheelchair computer, wearable, smartphone) to indicate his wish to cross the road and his requests for extended cycle time

2. Traffic light turns green for a extended time period on next occasion

Use case:	**Road toll collection**
Description:	The traffic light logs passing vehicles for toll collection
Actor:	Vehicle
Postconditions:	Toll data is transmitted to a central storage entity

Basic flow:
1. Vehicle sends its ID to the traffic light via radio interface

2. Traffic light verifies and stores timestamp and number plate ID in a database

3. Road toll is transmitted to a central storage and processed

Use case:	**Traffic education**
Description:	Custom reaction based on the speed of road users
Actor:	Vehicle with excessive speed
Postconditions:	Driver is trained, that speeding is useless

Basic flow:

1. Vehicle detection measures the speed of approaching vehicles

2. If the vehicle exceeds the permitted speed, the traffic light turns red

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Use case:	**Augmented reality advertisement**
Description:	Advertisement about local stores are transferred to vehicles and stores are highlighted by augmented reality
Actor:	Vehicle
Preconditions:	Car accepts advertising data

Basic flow:
1. Traffic light system sends advertising data to passing by or waiting vehicle

2. Vehicle displays and emphasizes stores in the local environment