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## **Intermediate Project Assignment 2**

0. Create a list of requirements based on the project description.

### **System start-up:**

1. The system must be activated immediately after cruise control is activated.

### **Pedestrian Sensor:**

2. A stereo camera should be placed on the front bumper centered in between the two headlights respectively to capture any wandering pedestrians that might be walking towards the vehicle.

3. The camera's sensors must have a range that covers a range of about 35 meters in front of the vehicle.

4. The camera sensor must detect pedestrians as well as their location relative to the vehicle and their velocity.

5. Pedestrian information must be sent to the Safety Controller every 100 milliseconds.

6. If lenses are covered the camera must stop all readings and warn the driver.

### **Brake-by Wire Actuator:**

7. Responds to braking requests sent by the Safety Controller.

8. Applies brake torque via electro mechanical actuators at all four wheels of the vehicle at the velocity sent over by the Safety Controller.

### **Safety Controller:**

9. Safety Controller reads in the vehicle speed and pedestrian information that was sent over by the Pedestrian Sensor.

10. PCA Algorithm uses the pedestrian information as well as the vehicle

**speed to calculate if a collision will occur.**

**11. If a collision is imminent, then the PCA Algorithm will calculate how fast the vehicle needs to decelerate in order to avoid the pedestrian.**

**12. Once the Safety Controller determines that the collision has been avoided it will reactivate the cruise control.**

**13. If a collision is not imminent, then the vehicle will maintain the cruise control speed.**

#### **Alerts:**

**14. An auditory alert must be issued when the PCA Algorithm detects that a collision is imminent so that the driver knows the reason why the vehicle is braking. This alert should be a high-pitch sound that would last until the braking is complete.**

**15. There must also be a visual. Visual alerts will be in the form of an LED display near the windshield of the vehicle.**

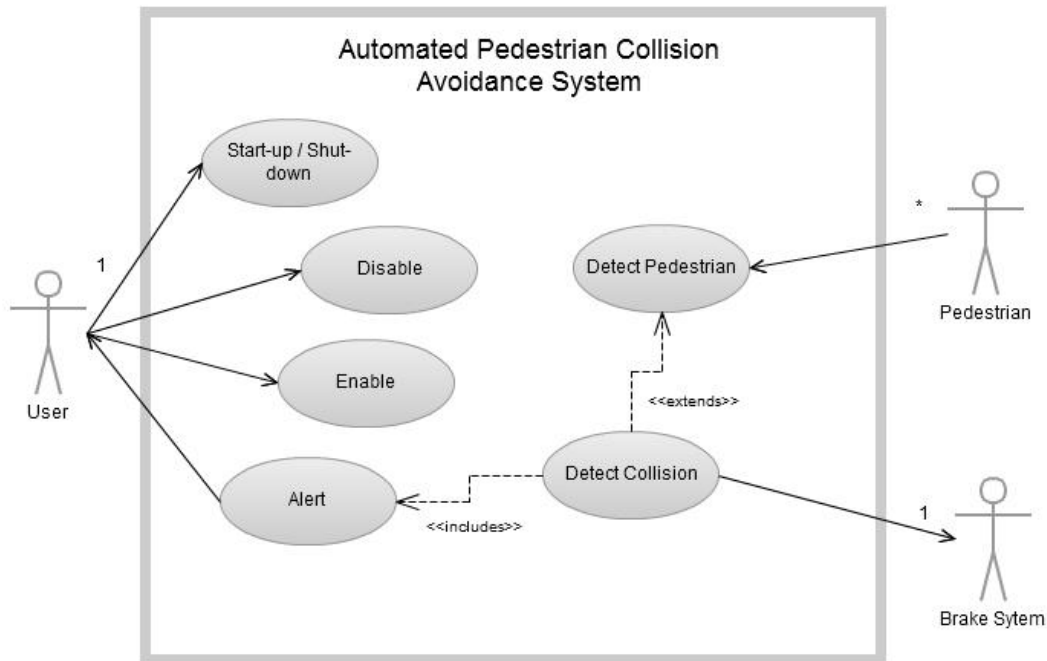
**16. The vehicle's braking action and both alerts must be activated immediately after the PCA Algorithm detects a collision.**

#### **System Shutdown:**

**17. The system must be deactivated immediately after cruise control is turned off.**

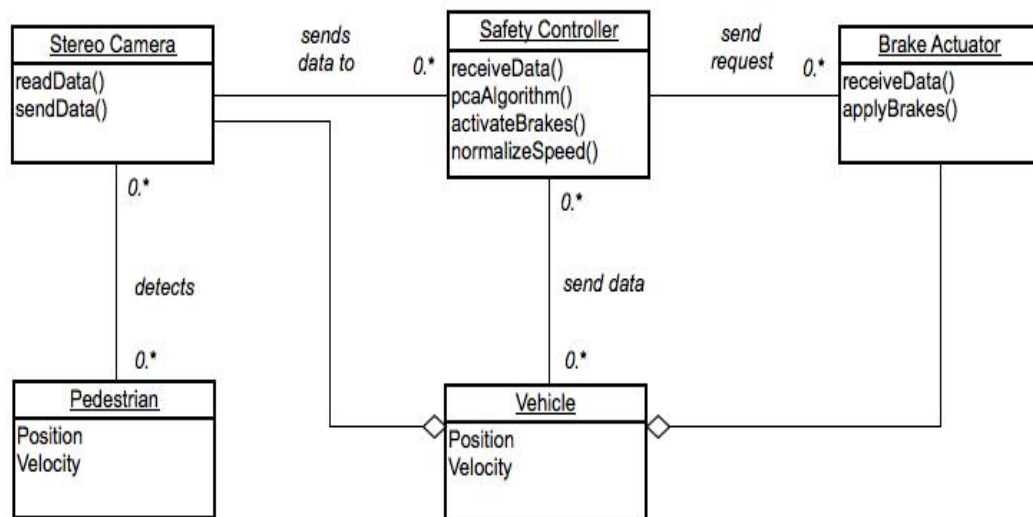
1. Create a first draft of a use case diagram.

#### Team Pedestrian Safety System Use Case Diagram



2. Create a first draft of a conceptual domain model.

#### APCA-1 Pedestrian Safety System



3. During this process, create a list of questions to pose to the customer.

1. When does the system turn on? When the car is started or does the driver have to turn the system on manually?
2. Does the car have to be traveling at a constant speed for the system to work accurately?
3. Will the camera be able to detect pedestrians when it is dark outside?
4. Up to what distance do the cameras detect pedestrians?
5. What happens when the camera lenses are covered in dirt/mud? Should an alert be sent to the driver? Can the system detect if the sensor is working correctly?
6. Will the sensors be able to distinguish between objects? If so, will the system behave differently depending on the object detected?
7. How stable are the sensors? Will the system be able to detect if the sensors are malfunctioning and how will it be handled if they are?
8. Where is the camera placed on the vehicle?
9. Will the system alert the driver if there is about to be a collision or will the system just brake to avoid the collision and carry on without notifying the driver?
10. What does the user interface look like?
  - a. When system is first powered on what default information do you want to display?
11. What kinds of security precautions are being taken?
12. How is the system intended to behave in different weather conditions?
13. Are there any legal constraints to be aware of?
14. What interactions will a user have with a system?