Team Mobis
CSE 435
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Initial Objectives

Name: Tyler Maklebust
Example System: Ford Pre-Collision Assist with Pedestrian Detection Technology

Features in common with project:

1. Both use a camera system
2. Both systems identify pedestrians from a range of different roadside objects
3. Both systems can directly activate braking to avoid collision

Features different with project:

1. Ford system uses radar in addition to camera sensors
2. Ford system provides warning for the driver to react before applying brakes
3. Ford system is designed to reduce severity of pedestrian collisions and possibly avoid them, while the project must avoid all pedestrian collisions that match given scenarios.

Questions:

1. Is the autonomous vehicle driverless or is there a driver that can take over control in emergencies?
2. If it is not driverless, should the system give a warning for driver to react before braking must be applied to avoid collision?
3. Even if not driverless, should a warning be given to passengers before hard braking? What should this warning be?
4. Is the given cycle time of the pedestrian sensor a limit of the system? Or, could it be increased in order for possible collisions to be detected quicker?
5. Vehicle length might come into play in deciding whether a pedestrian will strike the side of the vehicle at their current velocity. Should we only worry about front end collisions? What should we assume the length to be?

Safety Requirements:

1. Pedestrian identification needs to be accurate
2. Calculation of pedestrian path and vehicle path needs to be accurate in order to properly detect collisions before they happen.
3. Braking needs to occur reliably and quickly when a possible collision is detected.

Security Requirements:

1. Link to brake by wire system should not open a vulnerability.
2. Are there any other systems that the project will have to interact with, where security will be a concern?
3. What kind of channel would the project use to communicate with brake-by-wire? (This needs to be secure)

Name: Mark Velez

Example System: Pedestrian Collision Avoidance Systems

Features in common with project:

1. Both systems monitor the path in front of the vehicle
2. Describes use of a camera system to avoid pedestrians
3. Both the car and pedestrians are moving
4. Both systems aim to avoid collisions entirely through the use of automatic pedestrian avoidance

Features different with project:

1. The UCSD system considers using lasers and radar to track pedestrians.
2. The UCSD system can detect pedestrians using a variety of methods such as motion, shape, and head detection.
3. Our system describes the braking actions taken when a pedestrian is detected.

Questions:

1. What kind of computing systems will be used for the implementation.
2. After braking, should the system resume by itself or wait for human interaction/acknowledgment. If automatic, this could lead to a situation where the driver has lost consciousness which made the car take emergency action but them starts accelerating again leading to more possible injuries.
3. What kind of schematics/diagrams would be most useful to go from concept to implementation.
4. Do outside variables such as tail-gating cars need to be taken into account.

Safety Requirements:

1. Pedestrians cannot be hit.
2. The car should sustain little to no harm.
3. When possible, emergency braking should be avoided.
4. Swerving to avoid pedestrians should also be avoided to prevent swerving into an even more dangerous situation.

Security Requirements:

1. Does the system have an open network that could be exploited?
2. Could the sensors be spoofed into a 'false alarm' situation?
3. The system should run a diagnostic when the car starts to check all systems are functioning properly.

Name: Wan Kim

Example System: Automatic Pedestrian Collision Avoidance (Toyota)

Features in common with project:

1. Seek to avoid any collisions with pedestrians
2. If a collision is unavoidable, the function will brake in order to reduce the impact
3. Utilize a camera in order to gather data relative to the car and potential pedestrians

Features different with project:

1. It uses lasers to detect pedestrians
2. This system works in an accelerating speeds
3. If the pedestrian might collide with a pedestrian, the system will assist in braking

Questions:

1. Does this system only operate under cruise control settings?
2. Will this system automatically brake?
3. What should the system do if it cannot detect a pedestrian before it is too late.

Safety Requirements:

1. Will the system brake when not in cruise control
2. Will the system brake be harmful to the pedestrian
3. The function should alert the driver of an potential collision

Security Requirements:

1. The communication between the sensors and the actuators should be secured
2. The vehicle will never collide with a pedestrian
3. Should the system shut down if a crash is inevitable?

Name: Christopher Cummings

Example System: Autonomous Pedestrian Collision Avoidance Using a Fuzzy Steering Controller

Features in common with project:

1. Our project needs are the same – to recognize and immediately take some action to avoid possible collisions.
2. The use of a controller to carry out autonomous actions such as braking or steering is used.
3. Both utilize onboard stereo sensors for input to decision making processes (does the car need assistance or not).
4. Planned cases of action for when detection occurs is the same in pre-proposed scenarios.

Features different with project:

1. The intended result is far more reaching in the research paper as in our project as they follow the system through development and deployment.
2. We are not able to test our system in a real world fashion.
3. The mentioning of lane keeping in the research paper is not within our project description.
4. We are focused on brake-by-wire pedestrian avoidance where this research primarily focuses on steering maneuvers with additional control characteristics.

Questions:

1. In the sub-systems provided, is break-by-wire the only method of pedestrian avoidance possible?
2. Are there any possible delays due to the safety controller or any important specifications for it?
3. Are there times when the stereo sensors do not work properly and we need to deactivate the autonomous control?
4. In the fail-safe requirement, can we make all of the same assumptions as the non-fail operational mode?
5. In what circumstances would the fail-safe mode take precedence over normal operation?

Safety Requirements:

1. There must be zero collisions in any of the test cases.
2. Does this system have enough redundancy to protect against edge cases where pedestrians may behave strangely?
3. Make sure the system works based off of factors that will not change with location or outside factors.

Security Requirements:

1. What measures can we take to prevent attacks against this system that could compromise its effectiveness?
2. Is this system encapsulated and modular enough to protect against other system failures?
3. How might a potential failure (handled by our system or not) affect the functionality of other systems?
4. What is the risk associated with a compromise in our system?

Name: Sam Chung

Example System: Toyota Pre-Collision System with Pedestrian Detection

Features in common with project:

1. Both seek to reduce pedestrian collisions in autonomous driving systems
2. Both track the location of pedestrians and determine if collision is possible
3. Both feature a brake-by-wire system that automatically brakes in certain conditions

Features different with project:

1. Toyota uses a single front-grille mounted camera and a radar, while our system uses stereo cameras
2. Our system seeks to handle the whole problem of pedestrian avoidance without driver intervention but only while in autonomous driving mode, while Toyota's system seems to be a system that warns drivers first and takes action if needed.
3. Our system has a steady-state speed that it returns to, while Toyota's system does not have a steady-state speed

Questions:

1. Will our system function to avoid pedestrians when the user is driving manually?
2. Will our system include steering assists to avoid collisions?
3. How will our system respond if the object is too close for braking?
4. Does our system provide visual, audio, or tactile cues when it performs its job?

Safety Requirements:

1. There should be zero collisions in the scenarios defined in our project description.
2. It should not put the driver or the pedestrian in danger
3. The system should account for slippery roads and brake safely

Security Requirements:

1. The system should not allow unsecured remote access
2. The system should not be able to be manually configured by anyone
3. All data transfer between the sensors/cameras and the control unit should be secure