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November 3rd, 2022
CSE 435
PCAS1

Initial Customer Meeting Summary

Customer: Mr. Chris Capaldi, Project Manager, Dataspeed

Our Questions

1. Who is the user for the PCAS system and how do you want the PCAS system to interact with the user?
    1.1. Ideally, the driver is the user that is interacting with the PCAS system. The PCAS system is meant to assist the driver.
    1.2. How exactly the user will interact with the PCAS system is up to us to decide on and design.
    1.3. There are automatic brake systems out there. We are welcome to look into them and model the PCAS system after them or make improvements/changes to them.

2. When would the failsafe PCAS system need to be activated? How does the failsafe system being initiated change how the system behaves?
    2.1. We are to assume that there is another sensor that enables the failsafe system.
    2.2. The failsafe system increases the response time from 200ms to 900ms, allowing the vehicle more time to respond.
    2.3. The failsafe system implementation within the PCAS system is up to interpretation.

3. How far in front of the pedestrian do you want the autonomous vehicle to come to a stop?
    3.1. The collision zone is 2 meters, so we will be keeping the vehicle outside of this collision zone.
    3.2. Research what a comfortable deceleration value, what is extreme and what is achievable.
    3.3. We should assume that we won't be swerving, only stopping before the vehicle reaches the pedestrian.

4. What should the PCAS system do if the pedestrian is not following one of the test cases? For example if the pedestrian is not in the 2.5 second window.

4.1. The idea here is to demonstrate our system's behavior within our 10 scenarios given.
4.2. If the customer has questions about cases outside the given scenarios, it would be good to give information on where performance drops off.

5. What would happen if a pedestrian walked out in front of the autonomous vehicle without enough time for the vehicle to slow down?
   5.1. We are not required to think about cases like this.

6. Should the driver be alerted when a pedestrian is detected?
   6.1. Yes, the driver should definitely be alerted. There are many ways to alert drivers, whether it be vibrating the steering wheel, flashing lights on the dashboard, or certain sounds coming from the speakers.
   6.2. We should go with what we determine to be intuitive when deciding how the driver should be alerted.

7. As a customer, what do you see to be the biggest concerns and challenges with developing the system?
   7.1. Demonstrating 100% success rate without obnoxious additions can be a tough thing to balance.
   7.2. Communicating that it works and creating an impactful demonstration is very important.

8. If the driver overrides the system and is heading towards a pedestrian, should the car or user have control?
   8.1. We are left to make this decision. "What would you want your new car to do?"

9. Anything we should be considering with the system that we haven't discussed?
   9.1. No, just looking forward to how creative we are and what we can think of.
   9.2. "Up to us to put together functional system, and then demo that system and say 'this is why you should buy this system'"

PCAS Team 2 Questions

1. What is the system boundary, specifically, there are a lot of subsystems. Which of those are included in the system itself vs one's we're interacting with?
   1.1. For purposes of this project, the scope is limited to the pedestrian collision avoidance task. We have sensor and braking commands.
   1.2. We should not be including other safety subsystem tasks, for example adaptive cruise control systems.
   1.3. Only include subsystems needed to perform pedestrian collision avoidance.

2. What are some current cyber security protocols in the automotive industry? How effective are they in mitigating security breaches opportunities that could endanger pedestrians? What additional protocols could be added?
    2.1. Do research on the current state of cyber security in the automotive industry. Look into reasonable actions to take and look at where there are existing vulnerabilities.
    2.2. This area of study changes every year and is always evolving.
    2.3. Be creative and look for security vulnerabilities and reasonable actions to take
    2.4. Think: “What systems are affected? Still safe to operate? Do we need to kick it back into manual driving mode? Do we still have the ability to bring the vehicle to a stop?”

3. Can we include additional sensors, such as adding external lights for night time?
    3.1. Aside from the pedestrian detector and failsafe detector, you can add sensors if you want to, not necessary.
    3.2. You should assume radar is functioning 100% at all times.

4. What constitutes a pedestrian: bikes, children, animals? What does the sensor pick up as a pedestrian?
    4.1. For our means, the radar tells us if there’s a pedestrian there or not. If there’s a pedestrian, we take action if it’s gonna be in our path.

5. How far away can the sensors detect a pedestrian, and what is the width of detection?
    5.1. Look at an industry standard radar sensor. There normally seems to be an effective detection range of around 200 meters, so something around this range would be reasonable.
    5.2. As far as how wide, do your best to research what’s realistic. For longer range sensors, you’ll have a narrower field of view. For shorter range sensors there is a wider view.

6. Can you explain how the failsafe mode works
    6.1. It’s something that we’ll have to define how it works.
    6.2. Assuming there’s another sensor on the car that says “failsafe mode on because of external factors”, how does your system change its behavior in that case?

7. How does the 900ms increase affect the system while in failsafe mode
    7.1. It takes longer to apply brakes, thus more time to slow down.
    7.2. You need to adjust other factors of the system to avoid the collisions. You might also want to point out how that affects the driver as well.

8. Realistically, do you think it would have an effect on the system if the driver is going super fast? Should there be a limit on velocity for the system to work?

8.1. This is another one of the factors we'll need to tweak as it is open to interpretation.

9. How should the system behave if the pedestrian refuses to move?
   9.1. Something that we should design into the system. First thought is at that point, it's best for the human/driver to take over. However it should be handled, whether that be alerts, that's for us to think through and define.
   9.2. It is not in the scope to include an automatic move around, which is a whole different project.

PCAS Team 3 Questions

1. In what scenarios are we expecting our system to work in regards to weather?
   1.1. We should assume that we are working with ideal weather conditions.
   1.2. We are assuming that we are getting good data from the sensor, though we are not responsible for explicitly constructing a reliable sensor from scratch.
   1.3. Distances should be consistent and failsafe mode can be considered in inclement weather.

2. Are we to assume that this is going to happen all the time or is collision inevitable?
   2.1. Ultimate target is zero collisions, in scenarios/demonstration, pedestrian collision must be avoided at all costs - 100% time.
   2.2. In order to ensure avoiding 100% of collisions, you could demonstrate an unrealistic speed limit for certain scenarios for example.

3. In case the driver wants to turn the system off, how should that be handled?
   3.1. This is open for discussion. "What is intuitive to that driver?" should be considered when going about how this should be handled.

4. Are we expected to do reasonable pricing or anything at our disposable?
   4.1. Look at automotive use, look at devices that are either in production or mention they have past production. Cost is a factor you will want to consider.
   4.2. You are assuming there is a sensor, pedestrian or not, or failsafe or not.
   4.3. If you want to add more, this is acceptable but is not a requirement.

5. Are there other competitors that have a functional model for the collision avoidance?
   5.1. Yes, there are systems that are in production. Do research and see how it compares to the real world.
   5.2. https://www.tesla.com/ownersmanual/modely/is_is/GUID-8EA7EF10-7D27-42AC-A31A-96BCE5BC0A85.html
   5.3. If we want to research how other OEMs deal with collision avoidance as a benchmark, we are encouraged to do so.

Career Questions

10. What do you like about being a project manager?
    - 10.1. “I like being a part of the whole process of creating the project.
    - 10.2. Nice to see full project come together when working with different teams and work together
    - 10.3. It's tough in that you need to get all these different groups to be on the same page and work together.
    - 10.4. Takes a lot of people skills to understand different behaviors and habits of different teams and people.

11. What was your favorite project?
    - 11.1. Offroading project, put sensors on Ford Raptors, testing remote control and safety features.

12. Are there NDAs and stuff that you’re not allowed to talk about?
    - 12.1. Signs NDAs with almost all of his customers. Has done defense contract stuff with the army, most automotive companies are in an arms race, so we do NDAs.

Closing Notes

Our customer has allotted the PCAS teams a relatively large amount of creative freedom regarding various design choices of the PCAS system. We need to make sure that we document any decisions that we make. This includes documenting the research we conducted to arrive at these decisions, as well as alternatives that we considered for each decision.