Disclaimer

Any similarity with real-life or fictional entities is purely coincidental.

Introduction to your CSC436 Project

The aim of the project is to apply the concepts discussed in class in a small-scale development project. This project simulates a common scenario, where a car manufacturer, Blundai, develops safety-critical driver assistance systems for their flagship SUV, the Saint Jose 2.0 4WD Sport. Over the next couple weeks, you and your partner(s) will:

- gain an in-depth understanding of the hardware and software properties of the driver assistance systems;
- conduct requirements engineering for one of four driver assistance systems:
    - a blind-spot detection system with “safe-exit” feature;
    - a rear-view camera with cross-traffic detection, rear collision avoidance, and smart trunk hatch;
    - a smart cruise control with forward collision avoidance; and
    - a lane assist system with driver attention warning.
- conduct safety analyses to ensure that the likelihood of humans and external systems to suffer injury, damage, or death is sufficiently low.

Two homework teams will partner up for the milestones (i.e. 4 students per group). There will be a total of three to four milestones. The first one is outlined below.

Milestone 1:
System Scope, Natural Language Requirements, and Hazard Analyses for Automotive Driver Assistance Systems

Due: Friday, 3/3/2023, 23:59h

Blundai is a car manufacturer that has been struggling a lot these past few years. Somehow, the (former) managers of the company neglected the advance of automotive software systems. Until recently, most of Blundai’s cars would be mainly mechanical devices with strings and cables, while other car manufacturers have long recognized that modern automobiles are basically rolling software systems.

To stay competitive, Blundai must act quickly. After having fired all managers for gross incompetence (and in some cases: poor personal hygiene), the company is now completely

employee-owened and -operated. Blundai knows that nowadays, cars aren't being sold through nice paint jobs, but through gadgets, safety components, and convenience features, all of which are basically software systems. Especially in the area of driver assistance systems, Blundai wants to do better.

Unfortunately, Blundai does not have much experience with driver assistance systems. On the other hand, through ~~industry espionage~~ market research, they found out that their top competitor, Hyundai, is quite good at developing these types of software-intensive systems. A small group of highly trained special operations ~~mercenaries~~ requirements engineers have … "obtained" a top-secret document, the user manual of the latest Hyundai Santa Fe 2.0 AWD Limited. This SUV directly competes with Blundai's top product, their Saint Jose 2.0 4WD Sport.

The requirements engineers decide that the best way to increase market shares is by simply copying Hyundai's work into Blundai's SUV. However, it's not that easy: they need to reverse requirements engineer how the systems work. They split up into teams and decide that each team engineers the requirements for one of four driver assistance systems.

Task 1

Research the Top Secret Document[1], aka "Owner's Manual". Find out everything you can about:

- the blind-spot detection system with "safe-exit" feature;
- the rear-view camera with cross-traffic detection, rear collision avoidance, and smart trunk hatch;
- the smart cruise control with forward collision avoidance; and
- the lane assist system with driver attention warning.

Note that not all information might be in the same place. The manual might treat the "safe exit" feature as a driver comfort system and the blind-spot detection feature as a safety system, yet realistically, they are the same system that makes use of the same sensors. So, relevant information might be spread out across the document.

Decide which system your team wants to do

Task 2

Find the IEEE 830 template on Blackboard. Read it and the instructions therein. Then, document your findings from Task 1, 3, 4, and 5 in the appropriate sections. Be advised that IEEE 830 is merely a guideline to structure your requirements specification. You may deviate from the

[1] https://carmanuals2.com/hyundai/santa-fe-2020-owner-s-manual-115083

structure, add, remove, or modify sections, or move them around. If you do this, however, be sure to document your reasons for doing so. If you feel that a section is necessary, but you don't have the relevant information yet, place a note in the specification document.

Task 3

Educate yourself which road traffic rules may be relevant for your system. Research how they work in different countries or states (e.g., US vs. Germany; New York vs. Texas). Find out about laws, procedures, or whatever else you feel relevant. For example, the lane assist system will need to know how lanes are marked. Document all information you find relevant.

Task 4

Now that you have done the preparatory ground-work, document the natural-language requirements for your system. Do this generically, not specifically with regard to the Hyundai Santa Fe example. Specifically, you should have:

- goals, scenarios, and solution-oriented requirements
- functional and quality requirements, and constrains
- context aspects for each context facet

For each of the above, document the same properties as outlined in Homework 1 (i.e., requirement type, artifact type, quality property, etc.). Relate requirements to one another by "breaking them down," as outlined in class. Furthermore, be sure your requirements are of high quality themselves, by checking their completeness, consistency with one another, necessity, etc. Avoid ambiguity and transformational effects.

Task 5

Identify the system functions and conduct a Functional Hazard Analysis. Add the FHA results to your requirements specification in one central and reasonable section.

Hints

- To help you with this, it may help to think about the following:
    - What are external systems' expectations?
    - What are external users' and systems' expectations?

- It may also help to use the resolution strategies for “bad” requirements outlined in class.