STPA EXERCISE: LEVEL CROSSING

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Exercise #1 – Read about level crossing system at Wikipedia to get acquainted with the system to be analyzed in the exercise.

https://en.wikipedia.org/wiki/Level_crossing

Exercise #2 – Read the system description and some considerations for the exercise

System description

In the field of railway traffic control systems, level crossing (also known as grade crossing) is an intersection where a railway line crosses a road at same level. It is estimated that on average, each year 400 people in European Union and over 300 people in United States are killed in level crossing.

The modern trains have a much larger mass relative to their braking capability, and thus a far longer braking distance than road vehicles. This type of vehicle is more prone to avoid accidents in the level crossing than a train. A method to decrease accidents is providing "**passive protection**", using warning signs, and "**active protection**", using flashing lights, warning tones and barriers or gates.

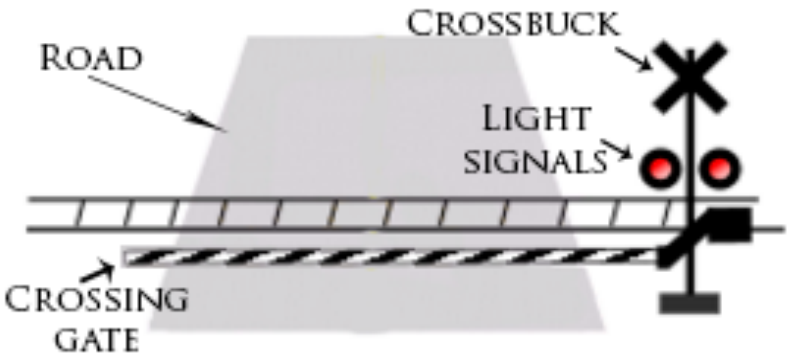

Figure 1. Illustrative image of the level crossing in this system

A crossbuck is a traffic sign used to indicate a level railway crossing. Crossbucks are sometimes supplemented by electrical warnings of flashing lights, a bell, or a boom barrier (boom gate, crossing gate) that descends to block the road and prevent traffic from crossing the tracks.

Considerations

For this system depicted on the Figure 1, consider that:

- The roadway flows just one direction - one way road.
- An automated controller closes the crossing gate when the train is getting closer and opens after the train passed.
- A sensor is capable of identify if the train is getting closer and if it has passed.
- The crossing gate has light signals, but it does not have sound signals.

Exercise #3 – Perform the first step of STPA (Define the purpose of the analysis) for the level crossing system.

Exercise #4 – Perform the second step of STPA (Model the control Structure) for the level crossing system.

Exercise #5 – Perform the third step of STPA (Identify Unsafe Control Actions) for the level crossing system.

Exercise #6 – Perform the fourth step of STPA (Identify loss scenarios) for the level crossing system.

Exercise #7 – Read the abstract of the paper "An Automated Railway Level Crossing System".

https://bit.ly/3QJSg4a

Exercise #8 – Extract from the STPA analysis all requirements identified (functional and non-functional). Use a separate document to document the requirements found.

Good work !