

CS 350 Task 1: Project Grounding and Conceptualization

This task establishes a guided introductory framework for the primary elements of the quarter project. In real life, you would have to assemble the equivalent of such a list yourself. It would be far larger, more complex, and messier. Based on the high-level context being discussed in class at this point, your job is to perform preliminary background research on each element in this outline. At this inception phase in the top-down development process, your answers will necessarily be general. In real life, it would be your responsibility to compile something to the effect of this list based on a subjective breadth and depth of coverage. Nobody would ask to see it, but it would be clear if you had not done it. This list establishes the vocabulary for understanding of the problem domain and the initial design thinking for the solution domain to come.

1. Briefly discuss what each element means to you so far with respect to your current understanding of the project as a toolkit for modeling and simulating railway operations. Do not just provide a blanket definition or something factually correct but useless; e.g., dogs bark, or the APU does APU stuff. Your interpretations ultimately may not be relevant to our actual solution later, but they must be arguably within its purview. You must address each element separately as structured here and cite its primary source in the format `[@url]`, where *url* is the complete text link to your reference (minus any `http[s]://`). (Do not make it a dynamic embedded link.) Use at least six sources; Wikipedia is acceptable, but it serves better as a starting point (a resource) than actual information (a reference). Put the term in bold. Indicate your name at the top of the document and the total word count at the bottom.
2. For each element, briefly address these aspects from a consistent, coherent, practical, computational perspective. If multiple interpretations are possible, choose the most representative. Include the head words:
data: what it is; properties that describe its existence. For each, indicate whether it is **static** (unchanging) or **dynamic** (changing) and why
control: what it can do; actions that describe its capabilities
behavior: what it actually does or is done with it; appropriate actions to satisfy a goal; user stories or use cases
The entries need to be consistent. In other words, if control acts on something, then corresponding data is needed.
3. For each element, indicate the *role(s)*: **input**, **processing**, or **output** and why.
4. For each element, indicate the paradigm(s) of design *pattern*: **creational**, **structural**, or **behavioral** and why.
5. For each element, indicate the *concern(s)* of an MVC architecture: **model**, **view**, or **controller** and why.
6. For each element, indicate the expected relative *difficulty* to manipulate it programmatically: **easy**, **moderate**, or **hard** and why.
7. For each element, indicate the expected relative *risk* of not being able to do it or doing it wrong: **low**, **moderate**, or **high** and why.
8. For each element, describe a plausible (for this course) two- or three-dimensional visual *presentation* of the content.

For example:

1. **landing gear, main**: supports and stops an aircraft while on the ground; retracted in flight

source:	[@en.wikipedia.org/wiki/Landing_gear]
data:	wheels (static because they do not need to rotate in our project); strut (dynamic because it needs to extend and retract)
control:	wheels have braking; strut can extend and retract
behavior:	the pilot commands the gear to retract after takeoff and to extend before landing
role:	output because it is a mechanical device that supports and stops a plane
pattern:	creational because it must be defined; structural because it connects to the airplane
concern:	model because it is something manipulated; view because we need to see the state
difficulty:	moderate because it involves motion between two states
risk:	high risk because it involves code for motion; not having this prevents the gear from functioning
presentation:	a down-arrow for extended, up-arrow for retracted

A. Address all the following elements in order:

1. actuator
2. cab signaling
3. catenary wire
4. failsafe
5. interlock (safety)
6. latitude (world coordinate system)
7. locomotive, diesel-electric
8. rail yard
9. railway signaling
10. sensor
11. signal light
12. simulation, time-stepped
13. stock, rolling
14. track
15. transponder

B. Transfer the bold designations from 2 through 7 for each element into the spreadsheet posted with this task. Put a lowercase **x** in each corresponding cell.

C. Add three elements related to this element respectively in the Related Elements columns. Limit each to a word or two, and do not clarify with parenthesis or commas. Do not reuse any of the elements from (A).

D. Group the elements from (A) (by name only) into a higher-level organization that makes sense to you. For example, *head, body, tail, legs, teeth, eyes, claws, paws, ears, nose, bark* for a dog could be organized as:

senses

eyes

ears

nose

movement

legs

paws

defense

claws

teeth

communication

bark

tail

paw

and so on...

Some terms may belong to more than one category. Be sure to account for all elements. There is no order within a group.

The real world is very messy with ill-defined boundaries. Not everything here will fall cleanly into the specified partitioning. Use your best judgment. Team collaboration would iron out the inconsistencies to establish a consensus.

Start early. Do not underestimate the time it will take to do this work. The analysis stage of a project is critical to do as completely and correctly as possible. Nobody is born knowing this stuff, and there are no shortcuts to learning something about it. This course is not about railroads; it is about applying software engineering to a concrete example that we can work with. This same process works with any project.

Deliverables

Submit Parts A and D in a PDF document. Submit Parts B and C in CSV format. Incorrect formats are worth no credit. Do not modify the document outside of the instructions.