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CSCD 350
Task #1

1. Actuator: Component that is responsible for controlling any mechanism or a subsystem. Requires a source of energy to send a control signal to the actuator that is then transferred to some sort of motion. Actuators have many applications with respect to trains. For example, there are brake actuators within train car brakes. There are also actuators for train rails that will change the direction of that the rails.

    a. Source: https://en.wikipedia.org/wiki/Actuator

    b. Data: An actuator itself is static, once it is in place it does not change. Within the actuator there are moving parts that will be dynamic, will also cause dynamic changes in the system that the actuator is controlling, whatever that may be. There will be some sort of source of energy. There will also be something that converts that energy into something that can cause the change in the system.

    c. Control: Actuator can cause some change to occur within the system. i.e. on/off, left/right, etc.

    d. Behavior: Energy is converted into some motion to cause a mechanical change in a system(that the actuator is controlling).

    e. Role: Processing, because it takes input and converts it to output.

    f. Pattern: Behavioral because the entire point of an actuator is to perform some action to change something.

    g. Concern: Control because it is in fact controlling two different things that are not compatible.

    h. Difficulty: moderate because there are going to be a lot of things to consider, yet the application of any actuator is probably not difficult.

    i. Risk: Really depends on where the application of the actuator resides. Most cases would indicate a very high risk. Usually the actuator will be controlling some important system.

    j. Presentation: Possibly some top-down, door-like line, that indicates open or closed.

2. Cab Signaling: A safety system that tells the crew information about the condition and status of the track.

    a. Source: https://en.wikipedia.org/wiki/Cab_signalling

b. Data: This is a static component; every train will have some sort of cab signaling system. There is a small display that tells various useful information to the crew. Various lights will indicate the information

c. Control: Suppose to show information clearly to the operating crew.

d. Behavior: Simply lights up displays to indicate the information.

e. Role: Output, just displays information.

f. Pattern: This I would say is structural since it is a part of the train.

g. Concern: View, because this just shows us things.

h. Difficulty: Easy, all this is, is various electrical components. There are probably a few sensors as well.

i. Risk: High risk, because without this, the crew might not know very valuable information that could cause accidents.

j. Presentation: Maybe a small box with some blinking lights.

3. Catenary wire: Overhead wire system that gives power to certain trains that utilize the wire system.

    a. Source: http://blog.amtrak.com/2014/01/catenary-wire/

    b. Data: Static since the wires are there and always there. These are big systems of wires that have many connections, intersections, etc. Located off the ground above the train.

    c. Control: Provide power to the train.

    d. Behavior: Train runs along the wire system and the wires provide power to the train.

    e. Role: Output, because it just is there to provide power to the train.

    f. Pattern: This is structural, because it just simply a giant wire system.

    g. Concern: Model, because it gives power to the train

    h. Difficulty: I imagine this system is very hard to create, due to all the complexity in how the electricity is transferred, the structure has to be stable and robust, have to consider weather temperature, etc.

    i. Risk: High risk, because the train needs power to work and these wires provide the power.

j. Presentation: Something of a web-like structure of lines of various lengths.

4. Failsafe: A device or system that is to remain safe in the event of a failure.

    a. Source: https://simplicable.com/new/fail-safe

    b. Data: Static, because the fail-safes are something that are in place and do not change. Could be many different things within a railway system. For example, all trains have an air braking system that engages when the main braking system fails. There are also many different signal systems that could be fail-safes if something happens so that conductors can be aware of what has happened.

    c. Control: Has to work when bad things happen.

    d. Behavior: Engages when some system fails. Could be many different applications in a railway.

    e. Role: This is output. Once something fails the fail-safe has to perform(output) something to replace the output of the failing entity.

    f. Pattern: Behavioral, because the fail-safe has to behave in some manner to keep things safe no matter the application of the fail-safe.

    g. Concern: A fail-safe could be all three, because there could be something important to display, could be something that that has to be controlled, etc.

    h. Difficulty: Could range, just depends on what exactly the fail-safe is and does.

    i. Risk: This is massively high risk, because no matter what happens to a system this has to work.

    j. Presentation: A explanation point icon.

5. Interlock: Basically, a system with a set of signals that prevents trains from having conflicting routes. In other words it is a routing mechanism for the trains.

    a. Source: http://www.railwaysignalling.eu/railway-interlocking-principles-railwaysignalling

    b. Data: Dynamic, because the routes are always changing.

    c. Control: Can lock routes in for trains.

    d. Behavior: A worker locks the route in place. Could be mechanical, digital, solid state, or there are other ways that interlocking happens.

e. Role: This would be input because the interlock has to have some sort of input to know the route so it can then set the route.

f. Pattern: This would be creational, because it creates a route for the train.

g. Concern: This would-be controller, because the system controls the routes od the trains.

h. Difficulty: Moderate, depending on the actual implementation could be harder than others.

i. Risk: High risk, if the system screws up trains could end up running into each other.

j. Presentation: A series of levers all in a row.

6. Latitude: Distance north or south from the equator of a point on earth's surface.

    a. Source: http://www.dictionary.com/browse/latitude

    b. Data: This is static, latitude is something that has been around a very long time.

    c. Control: Can be used to navigate.

    d. Behavior: Person uses latitude with longitude to find locations around the world.

    e. Role: Input because, user inputs latitude with the longitude to pinpoint locations.

    f. Pattern: This would be creational, because it is used to create some sort of navigation.

    g. Concern: This is view, because it is used to create views of navigation.

    h. Difficulty: Easy, because there is nothing to do.

    i. Risk: Low, but navigation is important when routing trains.

    j. Presentation: A line.

7. Diesel-electric locomotive: A locomotive at which a diesel engine drives an electrical generator to power the train. This allows for the train to not rely on any other system for power like overhead wire systems or a third rail.
    a. Source: http://www.railway-technical.com/trains/rolling-stock-index-I/diesel-locomotives/

    b. Data: This is static, because it is a type of train, it does not change.

    c. Control: Is the train itself, used for transporting goods along railways.

d. Behavior: Crew drives train along track.

e. Role: This is processing, because it takes the drivers input as well as energy, etc. Then it turns that into movement.

f. Pattern: This would be behavioral, because the locomotive is the entire behavior of the railway system. It is the center of attention, so to speak.

g. Concern: This would be control I think, because the locomotive is controlling the entire transfer of goods, which is the entire point of having a railway system.

h. Difficulty: This would be hard. A locomotive is just a giant engine and engines have lots of parts. The engineering that goes into creating a massive engine is quite large.

i. Risk: High risk, because without the locomotive, we have no way of making the entire system worthwhile.

j. Presentation: A rectangle would work fine.

8. Rail yard: A complex series of tracks for sorting, storing, loading/unloading, rail cars or locomotives.

    a. Source: https://en.wikipedia.org/wiki/Rail_yard

    b. Data: This is static, a rail yard just sits there for use by the crews.

    c. Control: Can be used to store, sort, organize things for a railway system.

    d. Behavior: The crew uses the rail yard however they see fit.

    e. Role: This would be input, because it really does nothing, it is just in place for crews to use as they see fit. It is a versatile space for many operations within a railway system.

    f. Pattern: This would be structural, because it is just that, a structure.

    g. Concern: Would be model, since it is in place to be used and manipulated as the crew needs.

    h. Difficulty: Moderate, has many complex rail systems that have various intersections.

    i. Risk: Moderate, this makes every operation a lot easier for the railway system to function as it needs to. Many aspects of the railway have to very organized to work without fault.

    j. Presentation: Large box with tracks inside of box.

9. Railway signaling: For controlling railway traffic to prevent colliding and to adjust distance and speed for proper braking time and management.

    a. Source: http://www.beldensolutions.com/en/Solutions-Markets/transportation/Railway_and_Train_Stations/railway_signaling/index.phtml

    b. Data: This is dynamic since signals are always changing, being updated, etc. There are many different types of signaling including onboard, wayside, and control center signals.

    c. Control: Signals can serve a variety of information to the train crew. Various lights or icons can display at different stages of train departure/arrival to certain areas.

    d. Behavior: Depending on the type of signals, lights will flash, colors are displayed, icons appear, etc. when the train comes to a certain place that needs to tell the train crew something important.

    e. Role: This would be output, since these are just things that show up for the crew to see.

    f. Pattern: This is structural, since these displays are just items that are in place.

    g. Concern: View, since the signals are just there to view information.

    h. Difficulty: Easy, just show the information based on certain events.

    i. Risk: High, these signals need to work or else the crew within the train is left clueless about valuable information.

    j. Presentation: A tall rectangle with a few lights on it.

10. Sensor: A device that detects or measures a physical property and records it in some fashion. There are many cases where sensors are used within a railway system. One big application sensor is to record the track conditions, then send that information to where it needs to go to get the information to the right people.

    a. https://en.wikipedia.org/wiki/Sensor

    b. Data: This is static, since the sensor does not ever move or change, it just sits in place and senses things.

    c. Control: Information can be recorded by the sensor and then sent to somewhere else.

    d. Behavior: An event happens and the sensor tracks the change and reports to a database, switch, etc. Depending on the application of the sensor, it could do a lot of different things based on the event that triggered.

e. Role: This would be input, since the sensor only is responsible for getting the information.

f. Pattern: This would be structural, because the sensor is set in place and then never really does anything other than its intended use in that location.

g. Concern: This, I think, would be a controller, because there is a mechanism that basically controls how information is recorded.

h. Difficulty: Easy, since all it requires is placement of the sensor.

i. Risk: Depending on what the sensor is sensing, this could range from low to high. In most cases I would think it would be high risk since the information is probably valuable at some capacity.

j. Presentation: A little red circle.

11. Signal light: A electrical or mechanical device that sits beside the railway to pass, yet again, information to the train crew. Also this can signal car traffic for railway intersections with roads.

    a. Source: https://en.wikipedia.org/wiki/Railway_signal

    b. Data: This is static since the signal does not move, it changes state so that is somewhat dynamic, but overall this is a static thing.

    c. Control: Needs to display a certain signal depending on the state of the track to train crew or to the public that a train is coming.

    d. Behavior: Sensors catch an event or reading and pass it to the signal lights.

    e. Role: This is output since the lights simply output the correct indication.

    f. Pattern: This would, again, be structural. The signal light is just set on a stand of some sort and never leaves that spot.

    g. Concern: This would be view, since the signal light just serves to display information.

    h. Difficulty: Easy, since you only place the signal light in the correct area. Maybe some measuring involved, but this is very easy.

    i. Risk: High, since this signals traffic or the train of very vital information to prevent accidents from happening.

    j. Presentation: A bank of three lights on a stand.

12. Simulation, time-stepped: Tool that allows you to specify operating conditions and obtain solutions for a set of points in time. In a railway there will be tons of areas at which we need

to record time so a time-stepped solution will be very common for problems within a railway system, since train operation is mainly organized by time. Being able to simulate this in a controlled environment is very vital for testing a train railway before millions of dollars are spend actually making the railway.

a. Source: https://www.powerworld.com/WebHelp/Content/MainDocumentation_HTML/Time_Step_Simulation.htm

b. Data: This is dynamic since it is based in time and time is ever-moving.

c. Control: Needs to be able to have a start time and stop time and let all components run based on the time interval set up by the simulation.

d. Behavior: User of the simulation tool will input the time and then the system will simulate for that given time.

e. Role: This is input, processing and output, since the time is input and then the simulation is carried out, probably results and views, etc. would be output to the user.

f. Pattern: This is probably behavioral, since it is a simulation that behaves in a certain manner.

g. Concern: This would be view since the simulation will be viewed by the user. There could be elements of all three here but I think since the end user will be the one interacting with the timed simulation, then they would only really care about the view. Plus the entire simulation is to SHOW how something works.

h. Difficulty: I would say this is hard, since creating a simulation requires all the parts within the system to act realistic.

i. Risk: This is a high risk. Since the simulation is ultimately what the user will use to base their designs off of, the simulation has to be accurate so that the user gets all the information that they need.

j. Presentation: This could be a simple looking watch face.

13. Stock, rolling: Any vehicles that move on the railway.
    a. Source: https://en.wikipedia.org/wiki/Rolling_stock

    b. Data: This is dynamic, since vehicles within a railway are constantly moving, being added, being subtracted, etc.

    c. Control: The rolling stock could do whatever the vehicle is supposed to do. A worker truck with the right wheels to be able to go along railways is supposed to help with things that broken or need fixing. The locomotive is used to transport things. Etc.

d. Behavior: Rolling stock will be driven by someone.

e. Role: This is output since the driver is providing input and the rolling stock just producing the output, in all cases, movement along the rails.

f. Pattern: This would be behavioral, since the stock to moving along the track.

g. Concern: Controller, since it is being controlled by the driver.

h. Difficulty: Easy, it is just a vehicle.

i. Risk: High, since all the vehicles that belong on a railway have a duty in some form, so that duty will always be important. Not important things usually do not end up on a railroad.

j. Presentation: Various sizes of boxes.

14. Track: Is the structure that allows for trains to move about.

    a. Source: https://en.wikipedia.org/wiki/Track_(rail_transport)

    b. Data: This is static, once the tracks are laid out they do not move.

    c. Control: Tracks need to hold the trains up and in place.

    d. Behavior: Trains runs along tracks.

    e. Role: This is input maybe? Hard to say since the tracks just sit there. I say input because there is a train that inputs mass and motion and the track has to support that.

    f. Pattern: This is structural, since the track is just a piece that is laid down.

    g. Concern: Tracks are just a controller, since they dictate the direction that the train goes.

    h. Difficulty: Hard, the tracks need to be laid out on all types of terrain, not to mention valleys have to be crossed via bridges, so laying down track could present huge challenges based on where they go to and from.

    i. Risk: High, this is the foundation of the entire system. Without tracks no trains could get anywhere.

    j. Presentation: Lattice-type icon.

15. Transponder: Is a device that sends some sort of radio frequency to pass data along to other components of a system. In a railway system there could be many uses for a transponder.

Once of which would be a Balise which is a transponder placed between the rails of a railway as part ATP system.

a. Source: https://en.wikipedia.org/wiki/Transponder, https://en.wikipedia.org/wiki/Balise

b. Data: This is static, since the transponders are set in place and never move.

c. Control: Needs to relay information.

d. Behavior: Transfers information via a radio signal to and from desired locations.

e. Role: This would be output since the transponder only outputs the information from place to place.

f. Pattern: This would be behavioral, since the transponder has to relay information by sending a signal.

g. Concern: This would-be controller, the transponder controls what and how information is exchanged.

h. Difficulty: Easy, since the device just has to be installed in the correct place.

i. Risk: High, since this is, again, information that is send to different locations amongst the system.

j. Presentation: Little radio tower icon with waves coming off it.

Categories:

Information

Cab signaling
Latitude
Sensor
Signal light
Simulation
Transponder
Railway signaling

Organization

Latitude
Rail yard
Railway signaling
Cab signaling

Safety

Failsafe
Sensor
Cab signaling
Signal light
Interlock

Parts

Track
Rolling stock
Locomotive
Catenary wire
Interlock