



SOFTWARE REQUIREMENTS

Railway Control Center

Group 1

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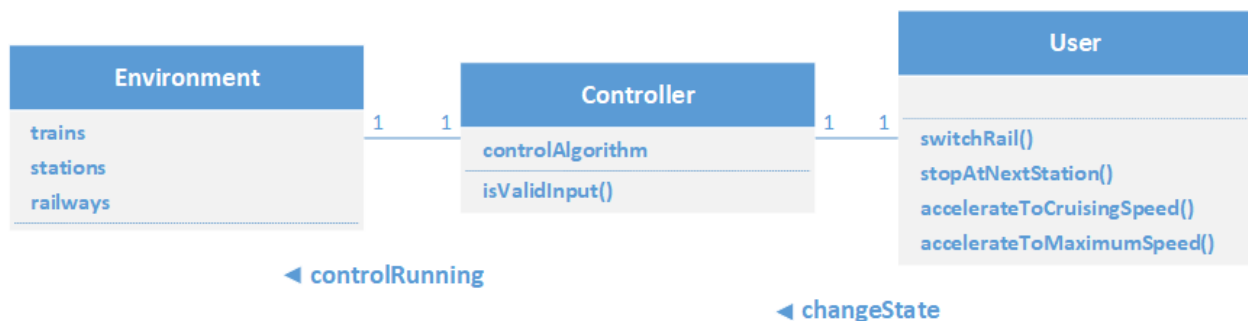
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System Objective

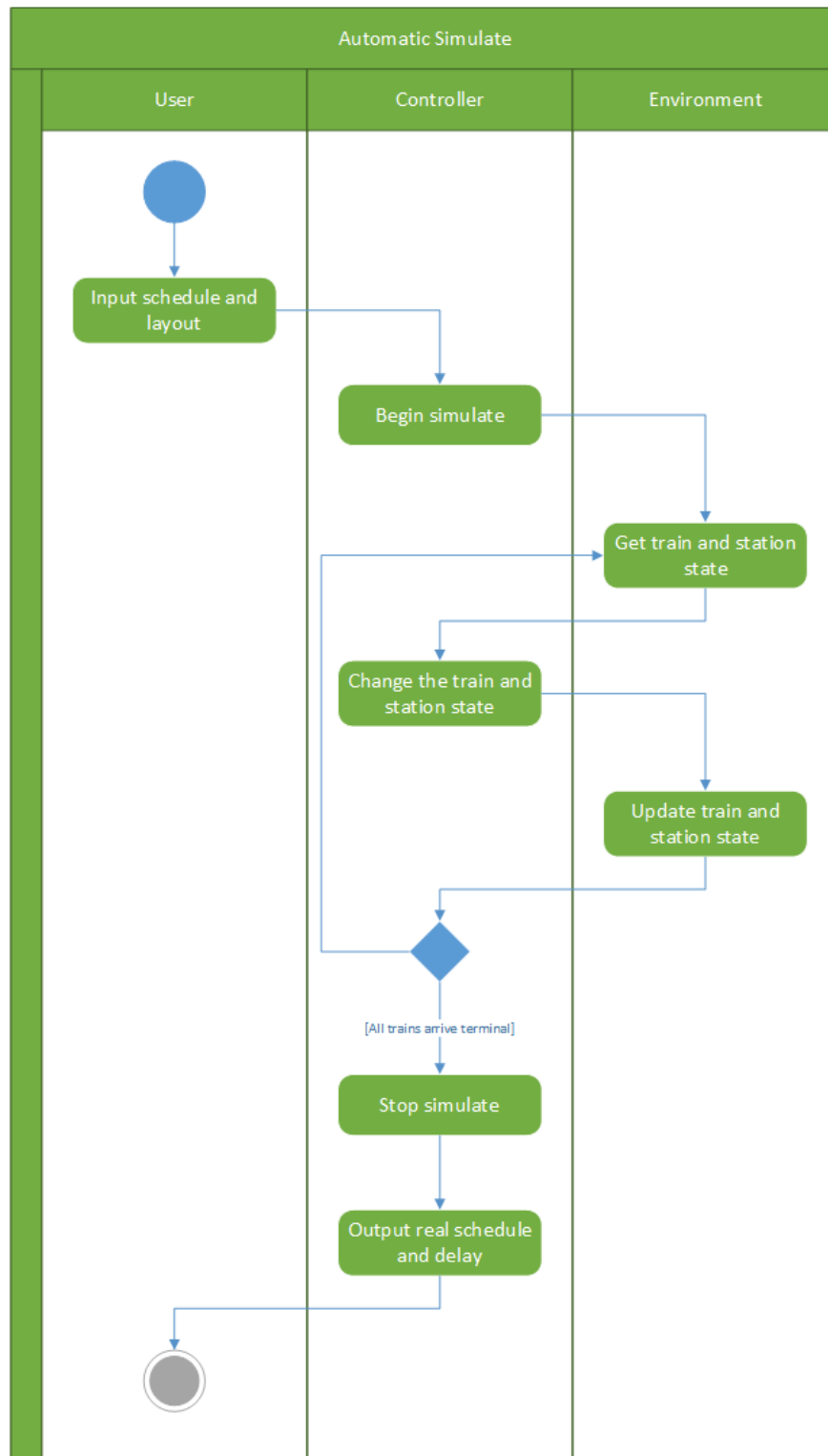
In this project, we are developing a railway control system on a single, one-direction railway. The system accepts the schedule for each train to simulate the running process of trains automatically without collision. After the simulator finished, all trains should reach their terminal and the system should output the real schedule for each train within their max delay time. In addition, the user can send commands manually to change the running process of the trains.

Domain Analysis

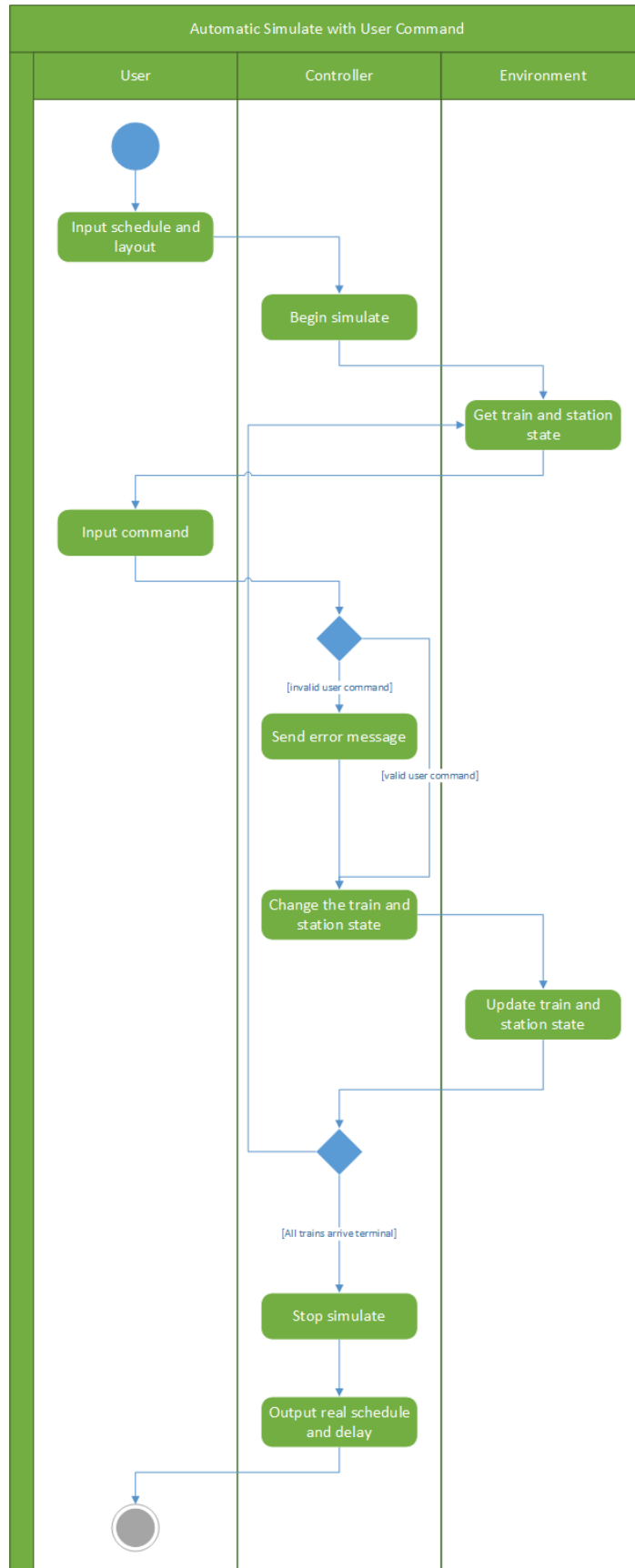
The participants of activities in the railway control system can be categorized into Environment, Controller and User. In automated mode, the User is not involved during the simulating.



Here are the sequence of events for automated controller:



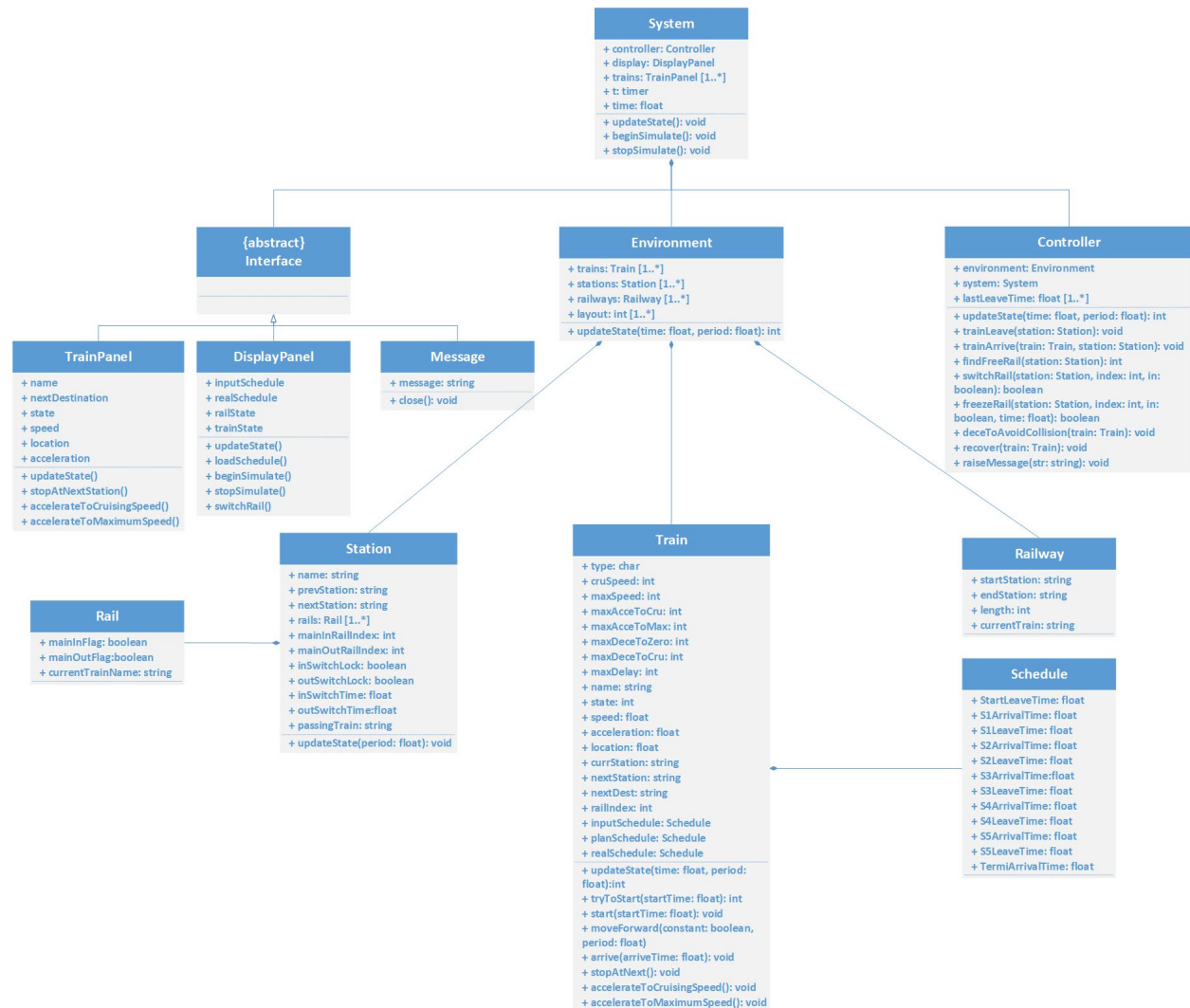
Here is the sequence of events for automated controller with user's manual commands:



System Architecture

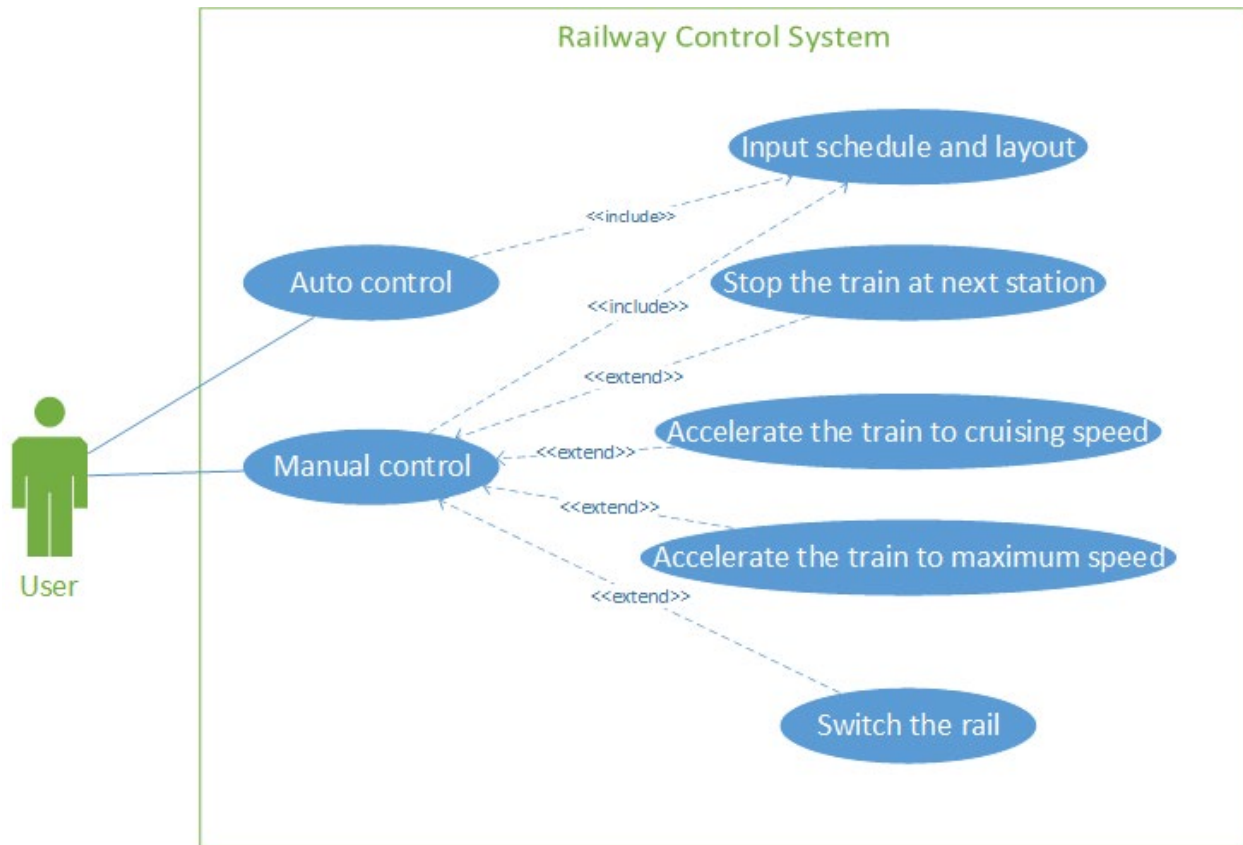
From the information above, we will design a software system which can control the running process automatically while user can send commands manually during simulating.

The system architecture is shown below:



Use Cases

The system can achieve the following use cases from the user's perspectives:



Software Requirements

R1: Display Panel UI

- R1.1: The user should be able to know the operating status of the railway control system.
 - R1.1.1: The Display Panel should show the moving trains along the one-direction railway with several stations on it.
 - R1.1.2: The Display Panel should show the rail state of each station, including the entry and exit switches, the switching time cost and the stopping train on each rail.
 - R1.1.3: The Display Panel should show the real schedule and the cumulated delay in real time during the simulating.
- R1.2: The user should be able to manipulate the rail condition of the stations.
 - R1.2.1: The user should be able to choose a rail to switch at each station's entry and exit.
 - R1.2.2: The Display Panel should show the switch time cost for each station.

R2: Train Panel UI

- R2.1: The user should be able to know the running process of each train.
 - R2.1.1: The Train Panel UI should show the static information of each train, including name, cruising speed, maximum speed.
 - R2.1.2: The Train Panel UI should show the dynamic information of each train, including next destination, running state, speed, acceleration, location.

- R2.2: The user should be able to send commands to each train manually.
 - R2.2.1: The user should be able to send “stop it at next station” command to a train at any time.
 - R2.2.2: The user should be able to send “accelerate to cruising speed” command to a train at any time.
 - R2.2.3: The user should be able to send “accelerate to maximum speed” command to a train at any time.

R3: Controller

- R3.1: The controller should be able to finish the simulating automatically.
 - R3.1.1: In automated simulating, there should be no collision between any pair of trains at any time.
 - R3.1.2: In automated simulating, all trains should reach the terminal after the simulating finishes.
 - R3.1.3: In automated simulating, the cumulated delay of each train should not exceed its max tolerant delay.
 - R3.1.4: In both automated simulating and simulating with manual commands, the speed should not exceed its maximum speed.
- R3.2: The controller should be able to execute or reject invalid user commands.
 - R3.2.1: During the simulating, the controller should be able to check user’s command and reject it with an error message if invalid.