Homework 1

Team

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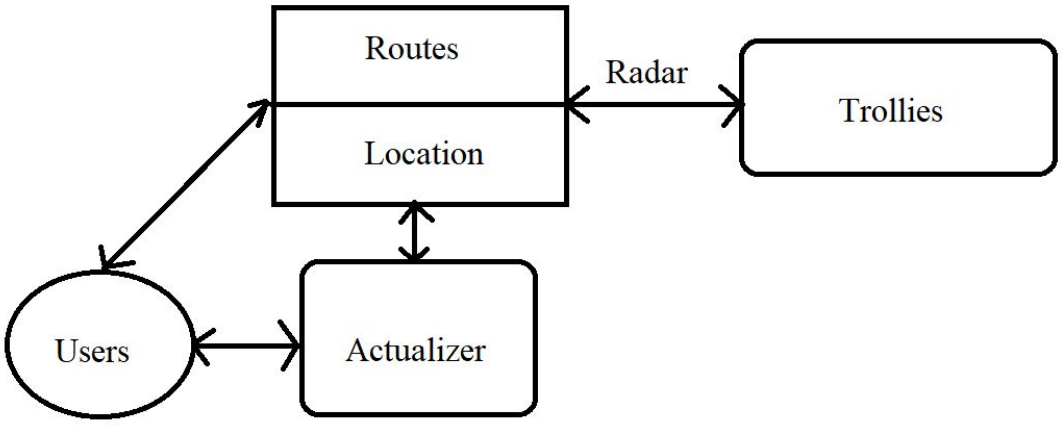
Domain: In-Campus Transportation
Part I: Chapter 1 in SE-VE

1. Domain Entities:
    a. Bus Terminal: atomic
    b. Bus: composite, set of seats, set of passengers
    c. Bus Routes: composite, a set of terminals
    d. Bus Seats: atomic
    e. Passengers: atomic
    f. Driver: atomic
2. Domain Functions:
    a. Look up available seats
    b. Look up available bus routes
    c. Look up time remaining given the bus station:
    d. Reserve Bus Space
3. Domain Events:
    a. Bus receives the reservation
    b. Bus arrives at terminal
    c. Bus leaves terminal
    d. Passenger receives ticket confirmation/receipt
    e. Passenger receives bus location in the bus route,
    f. Passenger receives available bus routes,
    g. Passenger receives time remaining for bus arrival
    h. Passenger boards bus
    i. Passenger unboards bus
4. Domain Behaviors
    a. Bus is enroute to terminal

    b. Bus is waiting at terminal
    c. The app should check for available seats
    d. The app should check for available Bus routes,
    e. The app should check for available Buses,
    f. The app should give time remaining until bus arrival
    g. The app should be able to locate nearest buses,
    h. The app should be able to send push notifications regarding bus arrivals
5. Domain Requirements
    a. The app must allow students to reserve bus seats
    b. The app must allow real time tracking of bus location
    c. The app must maintain an accurate timer for time remaining pertaining bus arrival
    d. The app must maintain an accurate depiction of available bus seats
    e. The app must maintain an accurate itinerary of bus routes
    f. The app must allow students to receive information regarding cancellation of routes.
    g. The app must allow students to receive information regarding full occupancy of bus
    h. Bus stops at terminals
    i. Bus travels between terminals
6. Interface Requirements
    a. The system must allow the user to reserve a spot on the bus.
    b. The system must allow the user to cancel reservation.
    c. The system must allow dynamic change of remaining time.
    d. The system must allow to track buses in the specific route
    e. The system must give the user all the available routes.
    f. The system must update if the bus cancelled the route or not.
7. Machine Requirements
    a. The application (system) should be able to let the user know the location of a bus, given the bus station and the bus route.
    b. The application (system) should be able to let the user reserve a seat in the bus , and receive an electronic receipt of successful reservation or an electronic receipt that says that bus is full.
    c. The application(system) should be able to estimate the time of arrival given: a bus, bus route, and bus stop, and display this time estimation to the user.
8. Software Architecture Design



9. Software Component Design
    a. Software Components Data Structures:
        i. Algorithm for tracking bus location.
            1. Algorithm will be similar to the algorithm used for geospatial tracking, that many popular apps use for navigation.
        ii. Algorithm for estimation of time remaining until bus arrival.
            1. Probably will use a version of Pythagoras and Physics Equation to calculate theoretical remaining time.
        iii. Array n*m for selection and remaining bus seats
            1. Simple selection process like playing tic-tac-toe
        iv. Queues for Bus arrival to a specific bus station.
            1. Let the Bus Stop be named X, and Buses aA,bB,cC,...,zZ, then the Queue will be X:aA,cC,xX,eE, thus gives you how many buses are still left to arrive at the specific bus stop.

Part II: Chapter 2 in SE-VE

1. Informative Domain Development Documents:

The student transportation within the University of Puerto Rico, Mayaguez Campus is based on bus routes without accurate time estimations, causing deviancies in each student's time budget. The idea is to connect the operating buses to each user of the trolley transportation system. The user entity is provided with a map schematic that estimates location, time, and route of each operating bus entity. The bus route infrastructure scopes the university and its surrounding areas, its significant scale adding more fluctuations in each user's arbitrary time budgets. Waiting stations span through elapsed distances of each other, but these do not solve in facilitating the logistics within bus availability.

2. Informative Requirements Development Documents:

A way to estimate location, time, and route of each operating bus, could be through GPS connectivity (a driver's phone). Using the obtained live data to calculate arrival time and estimated waiting time. With this information the user can then choose to reserve a seat. In order to divide this service, we could provide two user categories: driver or passenger, attaching the necessary functions to the user. There is a need within the campus for this system that can track and inform a user of location, time, and route. By partnering with the UPR-Mayaguez bus drivers, we could install our system to their phones, and then market the system's service.

3. Descriptive Rough Domain Sketches:
    a. There are bus terminals on campus roads for buses to pick up or drop off an amount of passengers dependent on the bus' seats.
    b. Buses follow specific bus routes. Bus routes have immutable stops they must pass through regardless of traffic conditions.
    c. Buses have specific schedules to follow (certain standards must be met, routes are not random and likely efficient).
    d. Traffic is unpredictable and therefore time fluctuations occur.
    e. Passengers can look up information such as:
        i. vacant seats
        ii. available bus routes
        iii. available buses
        iv. how long they have to wait for a bus to get to a bus station.
    f. Passengers can reserve a space if there are seats available.
    g. Passengers receive the information they requested along with reservation confirmation and receipt on the application.
    h. The system's application will be able to check for the information requested by the passenger, including:
        i. available seats
        ii. available bus routes
        iii. available buses
        iv. time remaining until bus arrival
        v. nearest buses
    i. System accesses the current user's location to show on the map for reference.
    j. Real time location data will be sent to the user on a map, with the highlighted route of interest.
    k. Application sends notification once the bus enters a minimum arrival radius.
    l. Arrival minimum radius will be significant to assure activation of the push notification.
    m. When users arrive at their destination they get prompted for an optional review.

4. Concept Analysis of Rough Domain Sketch:
    a. Trolley: a trolley may be said to be comprised as a collection of seats, and a collection of passengers, with an attribute occupancy calculated from these two collections.

    b. Route: a route may be thought of as the path followed by trolleys to get from one terminal to the next.

    c. Terminal: a terminal is one of multiple points along a route where a trolley will stop to allow passengers to board and unboard the vehicle.

5. Descriptive Domain Terminology:
    a. Trolley: the core of a “trolley” transportation system, it is the vehicle designed to transport passengers from one destination to another. Also referred to as a “bus” or “the vehicle”.

    b. Terminal: refers to the bus stop; the designated locations at which trolleys will pick up passengers.

    c. Seat: The physical space designated for an individual passenger within a trolley. Also referred to as a “spot” on a trolley.

    d. Route: a pre established expanse of roads connecting one terminal to the next; the designated roads a trolley will follow.

    e. Driver: the designated individual in charge of operating an individual trolley.

    f. Passenger: individual users riding, or planning to ride, the trolley transport system.

    g. Occupancy: an individual trolley’s remaining space; relating to the amount of seats and passengers in the trolley, or having reserved a seat on the trolley.

6. Descriptive Domain Narrative:

    The project consists of developing an application that facilitates the current Trolley transportation system at the University of Puerto Rico, Mayaguez Campus. As mentioned in the scope, the current system causes a gap of continually fluctuating time. User’s are met with this variability and are forced to partition indispensable time to make a decision. With this application the route infrastructure and budget deviances can be accounted for with the data produced by the tracking functionality. Additionally, users would be able to track on-duty trolleys, potentially decreasing the fluctuation of their arbitrary time through time estimates and potential alternative stops.

1. Domain: In-Campus Transportation
2. Domain Entities: Trolley terminal, trolley, routes, seats.
3. Domain Functions: seat availability, route availability, time estimations with the given station, seat reservation.
4. Domain Events: Trolley receives the reservation, passenger receives confirmation/receipt, passenger receives bus location, passenger receives available routes, passenger receives time remaining estimate for trolley arrival.
5. Domain Behavior: check available seats, routes, trolleys, provide time estimates/remaining, locate nearest trolleys
6. Table of Contents
   Possible draft of table of contents of all the documents to be developed during a project that develops a domain description, a requirements prescription and a software design.

Documents:

1. Project overview: Partners, clients and developer document
2. Current Situation, needs, ideas and concept document
3. Scope and span document
4. Contract and design brief document
5. Terminology document
6. Rough Sketches documents
7. Validation document
8. Verification, model checking and testing document