

What problem the project addresses and why it matters?

Currently, there are three main systems of bike rental (and their associated problems):

- Systems like BlueBikes that are set up in a large scale by a company with fixed stations throughout the city and payment plans that vary from single rides to day passes to monthly passes and even yearly passes
 - There is no guarantee that a bike will be available when it is needed most
 - The fixed stations may make locations somewhat inconvenient depending on the places you are biking to and from
 - Systems like these are only offered in major cities
- Companies like lime bikes or jump bikes where there is no central docking system and people leave bikes throughout the city
 - There is no guarantee that a bike will be available when it is needed most
 - Leaving bikes throughout the city can cause people to leave them in [inappropriate or even dangerous places](#)
 - These types of bikes are mainly offered in larger cities
- Rental bikes targeting tourists who want to explore a city on a bike
 - The price for these bikes can get pretty expensive
 - You have to go out of your way to pick up and drop off the bikes as these bikes are mainly targeted at tourists
 - Systems like these are only offered in major cities

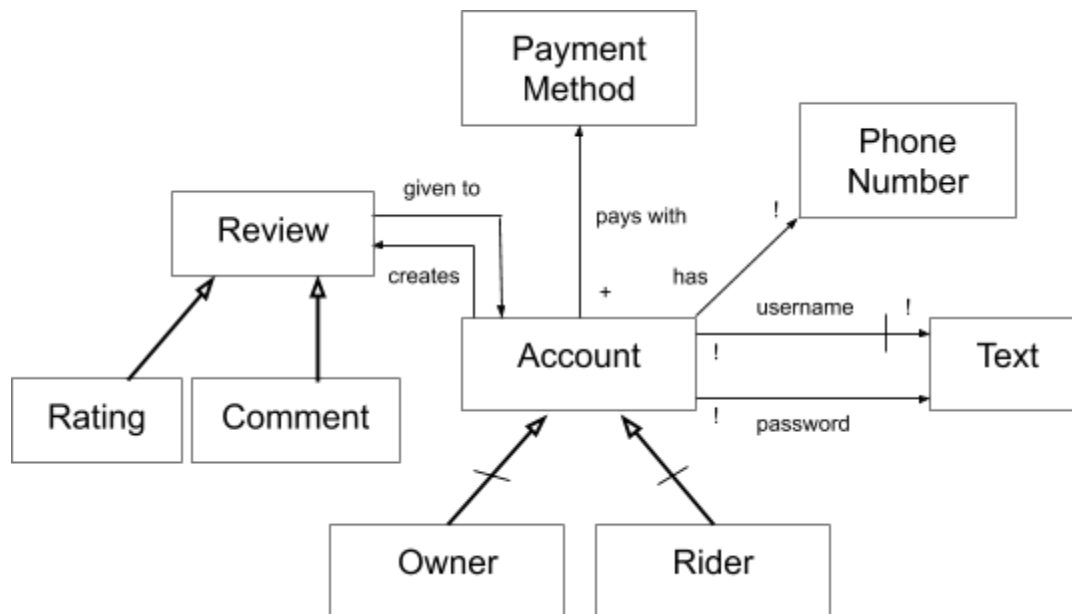
None of these existing systems address the use of bikes outside of major cities. For example, people in the suburbs who want to rent a bike are out of luck unless they go into the city or find an alternative rental service (which is rare). Further, around 15 million bikes end up discarded by their owners every year and many still function fine. Plenty of people who own bikes rarely end up using them. Focusing on getting more people to use pre-existing bikes would reduce the waste caused by creating and discarding bicycles.

How the app will work, expressed in terms of some key concepts and their purpose, structure and behavior (For the concepts, full specifications of the actions are not required.)?

Account:

Purpose: ensure credibility of users

Structure:



Actions:

- CreateAccount(username: Text, password: Text, phone_number: Number)
- DeleteAccount(username: Text)
- AddPaymentMethod(pm: PaymentMethod)
- AddUserReview(r: Rating, c: Comment, rider: Account, owner: Account)

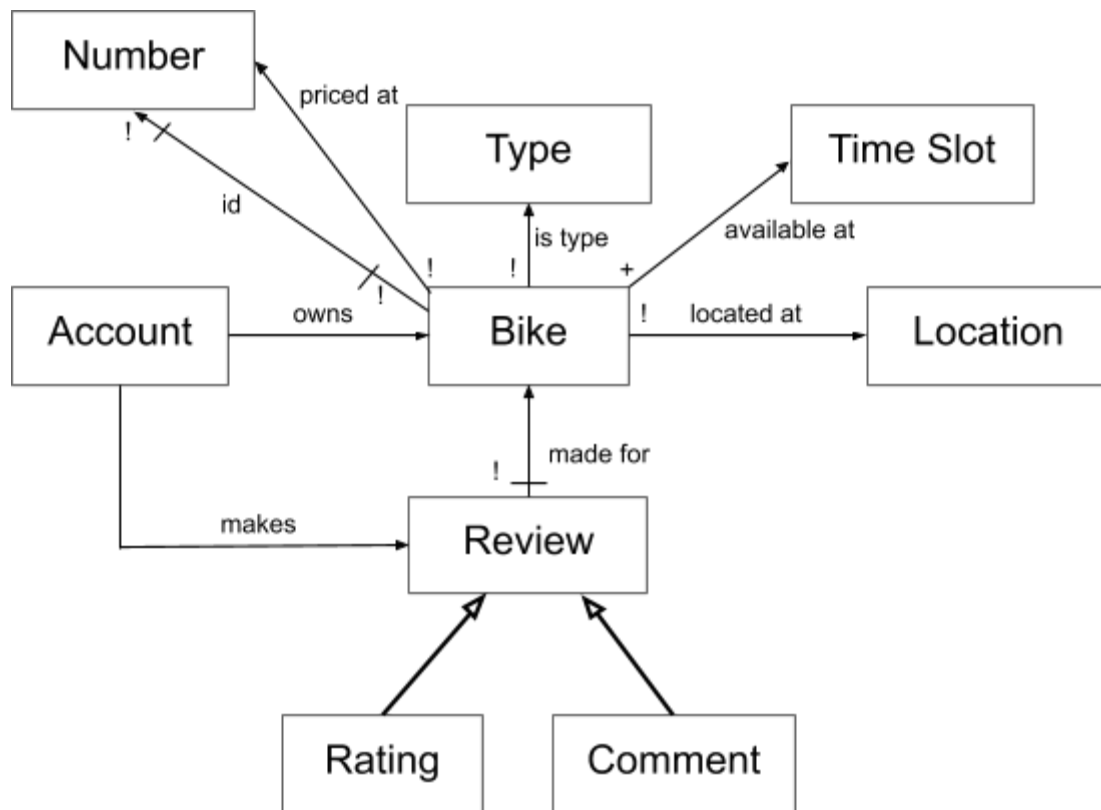
Tactics:

- If CreateAccount is successful, AddPaymentMethod
- After CreateAccount and finishing their ride, the user decides to AddUserReview for the owner of the bike; Later, the user buys their own bike that they don't want to lend out, so they DeleteAccount

Bike:

Purpose: exchange reliable method of transit for currency

Structure:



Actions:

- CreateBike(a: Account, t: Type, bike_id: number)
- DeleteBike(bike_id: number)
- SetLocation(l: Location, bike_id: number)
- SetAvailability(availability: TimeSlot, bike_id: number)
- SetPrice(p: number, bike_id: number)
- CompleteTransaction(p: number, owner: Account, rider: Account)
- AddBikeReview(r: Rating, c: Comment, bike_id: number)
- SeeBikes(l: Location) - see available bikes based on location

Tactics:

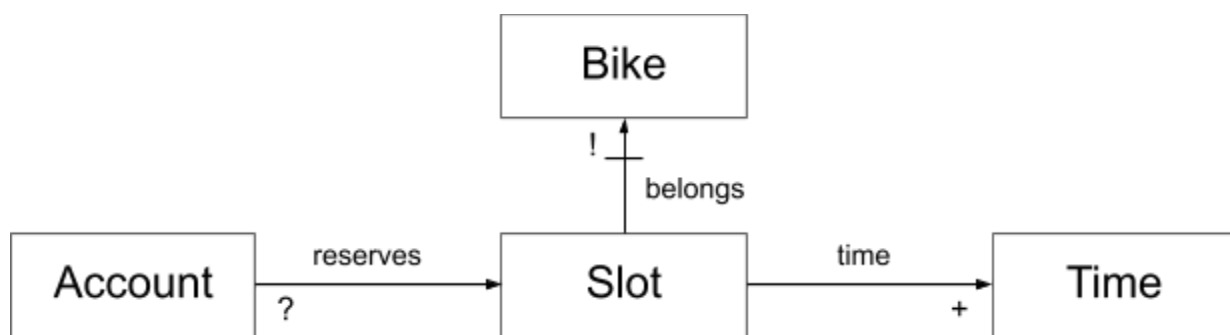
- Owner:
 - If CreateBike is successful, the owner SetPrice, SetLocation, and SetAvailability of the bike to start lending bike out to other users
 - If the owner wants to update their bike information, they can once again SetPrice, SetLocation, and/or SetAvailability to meet their circumstances
 - If bike becomes permanently no longer available, DeleteBike

- Rider:
 - While the rider is looking for a bike, they can SeeBikes nearest to their desired location; after the rider has completed their ride, they CompleteTransaction and decide to AddBikeReview for others' reference

Ride:

Purpose: guarantee a bike for a specific time frame and location

Structure:



Actions:

- CreateRide(b: Bike, s: Slot): Ride
- ReserveRide(a: Account, s: Slot, b: Bike)
- CancelRide(a: Account, s: Slot)
- UseRide(a: Account, s: Slot, b: Bike)

Tactics:

- If CreateRide is successful, and ReserveRide and no CancelRide, then can UseRide and pick up the given bike at the given time slot and location

Why the project will involve interesting and substantive conceptual design work that (in particular that the app is more than just CRUD; that it involves at least one concept that is not already widely used; and that the design problem is non-trivial)

The solution to the problem of bike sharing requires significant design work and is an interesting challenge because of the complexity surrounding the bike concept. Specifically, the bike needs to relate to multiple accounts via different relationships at different times, while also using location data related to it correctly. For example, a user may begin a ride on a bike, during which time the location of the bike will need to be hidden from the bike's owner. Once the ride has ended, to prevent the bike from being stolen, the location can be made accessible to the owner. This interplay with the physical world through the bike location makes the problem more complicated. Additionally, the need for a user to connect with the bike at a physical location in the world, which is a part of the ride interaction, is another non-CRUD way the user interacts with the bike concept. As a result, the design work required becomes much more complex and interesting.