

# Software Engineering

## *City bicycle rental system*

Many cities have deployed a bicycle rental system. The system is composed of many deposits, distributed all over the city. A deposit contains some dozen bicycles in an open area, the deposit has a number of numbered places (one per bicycle) where bicycles are initially stored with a lock/unlock system. The lock/unlock system is connected to the system and works as follows. If a user is authorized by the system, the system opens a lock for a bicycle, the user can get it and becomes responsible for the bicycle until it returns it. When the user wants to return a bicycle, he selects an empty place in a deposit, and inserts the bicycle in it. The lock/unlock system senses the bicycle and automatically locks the bicycle. From this moment the user is not responsible anymore for the bicycle.

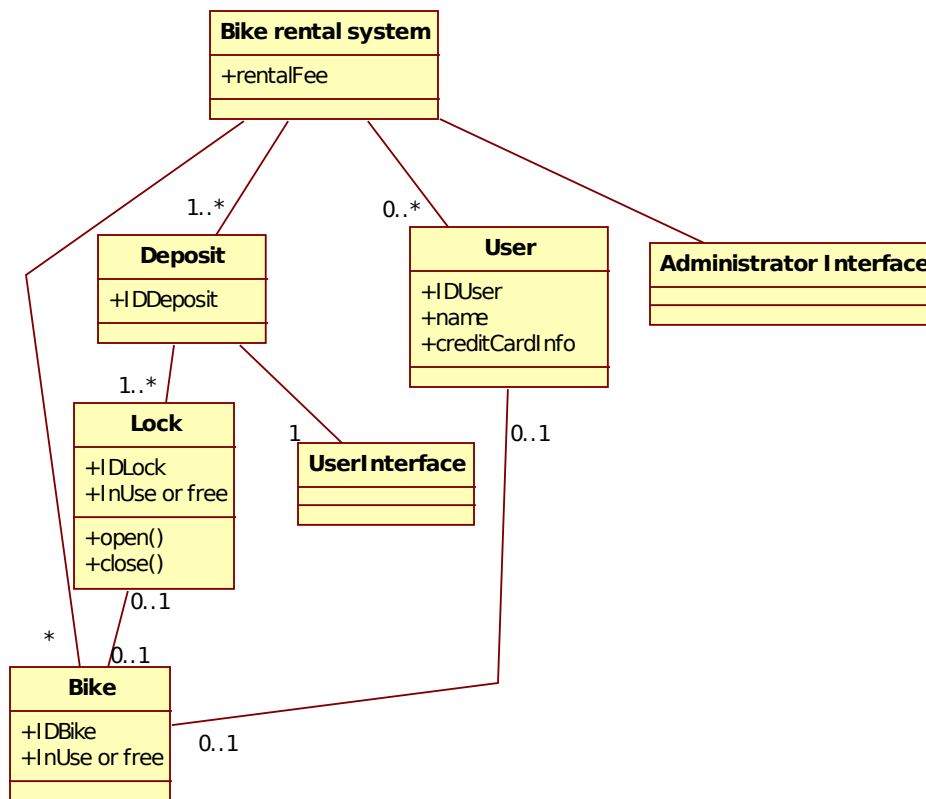
To be able to use bicycles a person must first register with the system, providing his/her name and his credit card information, and obtaining an ID. Next, when a user wants to take a bicycle, he goes to a deposit, inserts in a dedicated interface (made of keyboard and screen) his ID. After the needed checks, the system selects a bicycle available in the deposit and opens the corresponding lock, so the user can take the bicycle. When the user wants to return the bicycle, he selects an empty place in a deposit, and returns the bicycle. No interaction with the keyboard/screen should be needed for return.

The rental system must track the state of all bicycles and rentals. Notably, the user pays for the rental a fee that depends on the duration of the rental. Users are encouraged to take the bicycle in one deposit and return it to any other deposit.

The system should also monitor the maintenance of bicycles (a bicycle never rented is probably broken), the distribution of bicycles in deposits (no deposit should be always empty, no deposit should be always full), the most common paths used (where bicycles are most frequently taken and most frequently returned)

Define the class diagram

User is the class that represents a user inside the system. User Interface represents the very simple keyboard/screen in each deposit, where the user interacts with the system. Lock represents both a place for a bicycle and the lock in this place, so a closed lock means also that the bicycle is in that position. The Administrator interface (one for the whole system) allows to monitor the system.



Define the use case diagram

