Laboratory

Case Study

EcoScooter: Scooter management system

Ingeniería del Software

ETS Ingeniería Informática

DSIC – UPV

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The electric scooter company EcoScooter wants to develop a fleet management application that is easy to deploy in the cities where it obtains operating permits.

EcoScooter installs electric scooter collection and deposit stations in the cities where it operates, so your scooters must be collected and deposited in these stations. The stations have solar panels, from which most of the electricity used to recharge the scooters comes. For this reason, EcoScooter offers its services to cities with the premise of being an environmentally friendly and non-polluting company.

Customers pay a standard fare per minute of use (0.015€), but that is lower for young people between 16 and 25 years (10% discount). In addition, the company establishes a maximum speed of use (30km/h), sanctioning users who exceed it. The company reserves the right to modify the amount, the discount and the maximum operating speed of its scooters.

The company wants customers to be able to register via its website or a mobile app. To do this, customers must provide their personal data, such as their name, ID, date of birth, telephone, email and credit card (card number, month and year of expiry and control code). Children under sixteen years of age cannot register in the system. The system must verify that the card is correct, notifying the user to insert a new one if it is not. Also, the customer must provide a *login* and a *password* that can be used both to be accredited at the stations and to access their customer section through the website or app to review and modify their data, as well as unsubscribe from the service. Therefore, they must authenticate themselves in the system and disconnect from it at the end of their operations. The system must control that the *login* selected by the user is unique in the system.

The management application should also allow to keep a record of the employees of the company (addition, elimination and modification), which will be carried out exclusively from administration. The data provided for employees are their name, DNI, date of birth, telephone, e-mail, PIN and IBAN account number. Each employee has a position in the company and may receive a different salary. To interact with the system, they only need to enter their DNI number.

The registration of the scooters will be carried out by the company's maintenance service. Each scooter will be assigned its serial number as an identifier and the date on which it was registered will be recorded. In addition, its status must always be known among the following possible values: *available*, *in maintenance* or *in use*. The scooters in use will always be located through their GPS coordinates (latitude and longitude). This information will be updated periodically and automatically every 5 minutes using the GPS and communications system installed on each scooter. Along with the GPS coordinates will also record the time, date, battery level of the scooter and the speed at which it was going at that time.

The administration will keep a record of the installed stations, indicating for each of them their address (street, number and city), as well as their GPS coordinates (latitude and longitude). In order to make it easier for customers to identify them, a name related to their location will be assigned as an identifier (e.g. "polytechnic-computer science school"). Employees will be able to modify the station data, as well as unsubscribe them.

To rent a scooter, customers can consult from the app or the web the stations near their current position with scooters available. At the chosen station, the customer must enter his

login and *password* in the control console. At that moment, the system will check that the credit card has not expired, cancelling the operation in that case and notifying the user of it. If everything is correct, the system will assign the available scooter with the highest battery charge of the station. When the scooter is picked up, the system will change its status from *available* to *in use*. In addition, it will record the date and time in which the customer begins his tour.

When the user wants to return the scooter, the user simply goes to the desired station and selects the return option. The system will ask the user if there has been any incident that he wants to record. If so, the customer can enter a description of what happened, being able to indicate the instant of time in which it happened (date and time). When finally depositing the scooter, the station will emit a sound message to inform user that the scooter has been parked correctly. At that moment, the system will modify the status of the scooter, going from *in use* to *available*.

Clients will be able to know the price of the trip in their client section. The price of the journey will be calculated by the system after delivering the scooter, considering the time of use and the rate per minute. In addition, the system will check whether the client is entitled to the young fare or has exceeded the maximum speed allowed at any time during the journey. If it exceeds the maximum allowed, it is sanctioned, increasing the total price of the tour by 10%. Finally, the system will charge the customer's credit card for the final amount.

Furthermore, clients will be able to know the history of the tours they have made through their client section. They will be able to indicate a start date and an end date, and the system will have to show a table in which they will indicate the date and time of start and end of the route, its price, the identifier of the start station and of the end station and the average speed during the route. In addition, in case the route has been sanctioned for exceeding the speed limit, all the locations on the route that have exceeded the will be indicated limit (instant of time, GPS position and speed).

In a similar way, the company's employees will be able to know all the routes made by a client or a specific scooter. The information displayed will be the same as in the case of customers, but in this case, the employee must enter the identifier of the scooter or the customer's DNI, as well as the start and end date.

Maintenance of the scooters will be carried out periodically. To do this, the scooters to be checked from the station will be picked up and taken to the workshop, modifying their status from *available* to *in maintenance* through the corresponding option in the station console. To do this, the system will ask the employee to indicate his or her DNI, PIN and the identification number of the scooters to take out.

Upon arrival at the garage, a maintenance order will be created for the retired scooters, creating an identifier and assigning the employee in charge of carrying it out. In addition, the current date and time will be assigned as the start time of the maintenance.

Afterwards, the employee will be able to select this maintenance order from among all those assigned to him, in order to add the description of the tasks he has performed on each scooter, as well as the time spent on each of them. When the maintenance of all the scooters is finished, the

employee will have access to the option to close the order and the system will assign the date and time of that instant as the end time.

Finally, when the scooter is returned to a station, the operator selects the return option. The system will detect that the scooter was *in maintenance* and change the status of the scooter from *in maintenance* to *available*.

At any time, employees can obtain a report of the status of all scooters in the company, so that if the scooter is in use, will indicate the user's DNI who has rented it. If the scooter is *available*, the station identifier will be displayed. Finally, if it is *in maintenance*, the employee's DNI who is performing the maintenance will be displayed.