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| Faculty of ACES. 2nd Year. |
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| Course Assignment 2015-2016 |



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## 1 Production Function

The Car Park System will perform the following functions:

* Accept tokens and provide services
* Decrements the number of spaces available in the car park when the car enters
* Accepts payments
* Allow the customer to pay with multiple different types of payment
* Allow customers to reserve spots in the car park
* Increments the number of spaces available in the car park when the car leaves
* Allow companies to offer discount schemas (e.g. fixed price per day or cheaper rate per hour)
* Allow users to insert a coin and apply a certain discount based on the organisation they belong to.
* Shows Available spaces on each floor
* Shows Available spaces on a display’s around the city
* Allow the number of secure parking spots to be displayed separately to standard parking spots
* Offer secure car park services
* Allow admin staff to activate an emergency mode if one occur.
* Allow admin staff to manually control the exits in the car park in case of a power outage or/and maintenance in the car park.
* Allow staff to monitor the entrance and exits of the carpark with CCTV cameras.

## 2 General Constraints

The following design constrains are for the Car Park System:

* The customer cannot access the car park when it is full or in case of emergencies
* In case of emergencies all cars cannot leave or enter the car park to allow the smooth entry for emergency vehicle.
* In case of emergency all cars parking fees freezes until the emergency situation is over.
* The program will be written in C#
* In case of emergency a message will display in the main display and pay machines warning the customers about the ongoing emergency.
* In case of a lost token the customer must contact the management office with the relevant identification documents to issue a replacement for the lost token.
* The secure parking requires the driver to be the only driver in that car to enter and exit the car park.
* The secure parking will require the driver’s face to be visible at entrance and exit to the car park.
* The car park staff will have to check the driver if the software detect a different driver is exiting the car park.
* The entry and exit barrier may not be in operation. Therefore maintenance mode is enabled which requires the staff to manually open/close the gates.

## 3 External Interface Requirements

**User Interfaces**

The car park system will have the following users:

* The car park user.
* The car park management staff.
* emergency services

**Car Park Users**

**Using the Car Park.**

The customer will enter the car park first and press a button then receives a token. The barrier will then raise to allow the vehicle to enter and decrements the number of spaces available in the car park. The customer will then park into an empty bay and park there. When the user wish to leave he/she inserts the token and chooses a payment method and apply a discount if applicable. The customer can then leave the car park and the number of available spaces increments.

**Car Park Management Staff.**

**Using the Car Park.**

The management and staff acting as customers will use the car park system the same way a typical customer would use the system however the staff have the ability to activate different emergency modes. The management staff will also be able to create a customer coin if the number plate of the car is given. The staff will also be able to create new carparks on the system and specify properties about that car park (e.g. number of exits and number of pay machines).

**Internal Operations.**

The car park management staff will be able to raise / close barriers manually which it could be used in emergency situation for example to allow the emergency vehicle to enter and exit smoothly. The management staff can also issue a token in case the customer lost his/her token by tracking the plate no of the car, and management staff may also prevent overcharge if applicable. They can also issue discount card for certain customer that match certain criteria.

**Emergency services**

**Using the Car Park.**

When an emergency has being activated the entry and exit barriers will be raised to allow the emergency vehicle to enter the car park there the vehicle will help resolve the emergency

**Internal Operations.**

the emergency service vehicle will drive through the entrance if the barrier is open if not then the driver will press a button to request that the barrier open. the emergency vehicle will not be issued a coin and will not require a coin to exit the carpark after the emergency situation is resolved after that the carpark will exit emergency mode

## 4 Performance Requirements

* The response time for the menu changes will be no more than (2) seconds.
* The customer will have 30 seconds to reply before screen goes to main menu there will be warnings message 15 seconds before that happens.
* The time to read token should not exceed (3) seconds.
* The displaying time for the camera feed should not exceed more than 3 seconds after the user has clicked the relative camera button.
* The camera display must be frequently refreshed to allow the displayed image to be accurate.
* The time between clicking the barrier open/close button and the actual response time for the hardware must not exceed 3 seconds.
* The delay in response of the menus will not increase by more than 15 seconds when the car park is full.
* During peak time the software will be able to cope with the increase of customers and no operation will take longer than 30 seconds to complete.
* The software will be able to run on ARM devices however optimizations in X86 will make the software perform better on that platform.
* The software will not fail for more than 95% of customer using the system.
* The software will be able to scale up to supporting carparks with 40 floors, 600 parking spots and 400 secure parking spots.
* The software will require 512MB of memory to effectively function on the platform.

## 5 Design Constraints

* When the user clicks a button the button will animate to show that it has being clicked
* The screen will update when changes have being made.
* the text display of the pay machine will display the remaining balance to be payed as coins or notes are inserted
* the city display will update when a parking spot is taken or freed
* the display by floor will update when a parking spot is taken or freed
* the city display will update when a secure parking spot is taken or freed
* the display by floor will update when a secure parking spot is taken or freed
* the admin panel will update as customers enter and exit the car park
* the entrance and exit status will update as the barriers are open or closed
* the admin panel will display notifications when an emergency has being activated
* the images of cars entering and exiting will be securely stored
* the details of reservations will be securely stored
* the car park can be updated to add floors or exits if the physical carpark is updated
* in the event of a power failure the customer details will be saved and the time will be saved to the disk allowing the application to resume from the saved data after power is restored
* the button’s will have clearly readable text on them to make it easier for customer to understand what to do
* the pay machine will display all possible payment options on the screen
* The discount device will beep when a coin has a discount applied to confirm that the coin had a discount applied.
* The city display and display by floor will be displayed in a clear and readable font.
* The software will be menu driven. The interaction with the software will be made by touch screen for the customer and by the computer’s keyboard by the staff management.
* Confirmation of every major action taken by the customer e.g. paying, secure parking or discount will be displayed after each input.
* Error message will be displayed when the customer enters a wrong password in the secure carpark password field followed by a warning and the number of attempts left.

## 6 Quality Attributes

**Introduction**

The user interface is design to be easily understandable and to allow user to know what to do without having to read the user guide. The user interface will be easy to navigate by hiding admin only operation from the user. The application will display messages when there is a problem with the action the user have taken.

**Reliability**

The carpark system will be fully tested by the time of the final product delivery to prevent any computational error to occur. The system will have unit tests created to check the each function in the program returns the correct output for the given input. The key functionality of the system will be tested as critical requirement requiring all the test involving them to pass otherwise the software will not be considered safe for the car park. The system will be tested with simulated customer to see how the system will handle a large volume of customer entering and exiting the carpark.

**Maintainability**

The carpark system will be maintained by the management staff of the carpark. Software documentation will be supplied by the software developer that will provide the management staff quick instruction on use and maintenance of the system software. The software developer will be available for consultation regarding maintenance. The application will also be easily maintainable by allowing newer versions to be easily installed over the top of the application. The application will be easily maintainable by allowing newer versions to be easily installed over the top of the application. The application will also display notifications when a new version is available.

**Software Security**

The user of the car park system will be issued with unique token that allows then to pay for their stay.

The CCTV footage records will not be shared with anyone except when the police ask for it.

An alarm will sound when a theft is suspected.

The admin will be required to login to perform admin operations. The admin login will timeout after 15 minutes of inactivity.

Carpark’s lights will be on 24/7 to discourage burglars from entering the carpark.

**Robustness**

The Carpark system will continue to function accurately despite incorrect user input. Under no circumstances will the system crash or fail because of a user error. Error handling procedure will be in effect during all operations of the system and all level of system design and code to prevent user error from happening. The system will also work if the clock jump forward or backwards displaying the correct amount the customer should pay.