COM413 Mobile Application Development

Car Parking Project Report

Group Members

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Introduction

Daily commute is a common routine that almost everyone must do on getting to either work or education. There are many methods of transport people take on their commute, such as public transport through buses or trains, or if close enough some will travel on foot or by bike. Others will travel by car either themselves or by carpool. Commute can often feel quite tedious and sometimes stressful if running late due to a late start, delays from buses, or road works. Another aspect that can be frustrating is parking. Being at the destination but spending five or ten minutes circling around the car park for space and not knowing if there is one or not. It can be an unpleasant time.
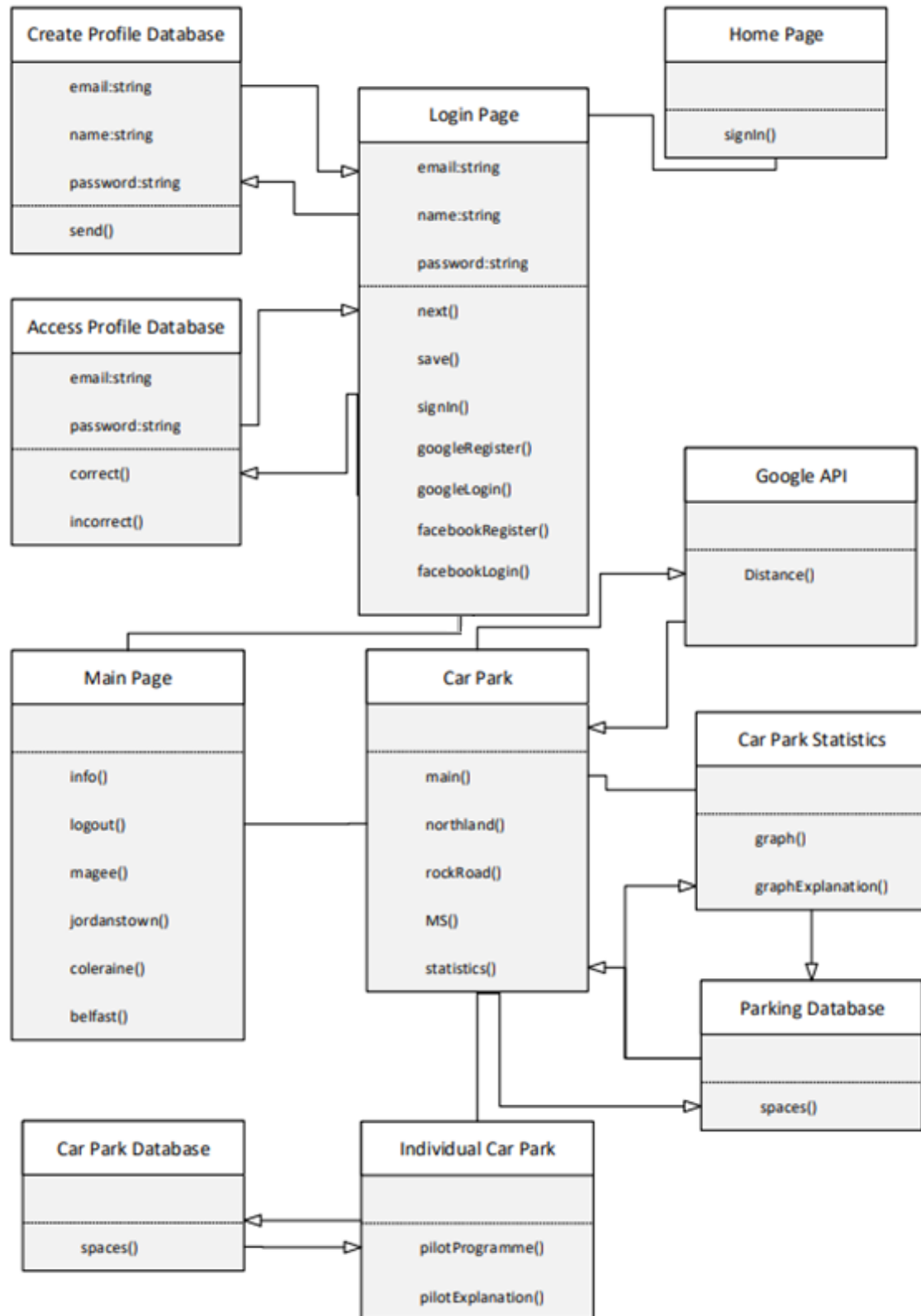
There are different solutions some car parks have in place to ease the problem through electronic signs telling of the number of car parks spaces left or just a staff member indicating when a car park is busy there is no spaces left. We aim to create a mobile application to help solve the frustration and ease the process of parking. Our application will be specifically for the Ulster University car parks, available to all staff members and students at the university to provide a quicker experience for parking and to reduce both the time and the stress of parking. It will provide the number of spaces available at each individual car park at each Ulster University campus. The application will have several features to allow a better parking experience.

It will incorporate a registration and login so that only faculty and students will gain access to the application and its information. Firebase will be used for login authentication. This adds a layer of security to the application and also means that it is a perk of only students and staff. The application allows the user to find the amount of spaces available at each individual car park with detailed statistics also given on parking at the university. Again, firebase will be in use to give information on current car park numbers. Currently, the school is testing having individual space sensors, and it is being put on trial in a small car park. This will possibly be available in the next few years if trials are successful, further improving the application.

Team Members Contributions

Technical Analysis & Design

A UML class diagram for the application:

Create Profile Database
email:string
name:string
password:string
send()

Home Page
signIn()

Login Page
email:string
name:string
password:string
next()
save()
signIn()
googleRegister()
googleLogin()
facebookRegister()
facebookLogin()

Access Profile Database
email:string
password:string
correct()
incorrect()

Google API
Distance()

Main Page
info()
logout()
magee()
jordanstown()
coleraine()
belfast()

Car Park
main()
northland()
rockRoad()
MS()
statistics()

Car Park Statistics
graph()
graphExplanation()

Parking Database
spaces()

Car Park Database
spaces()

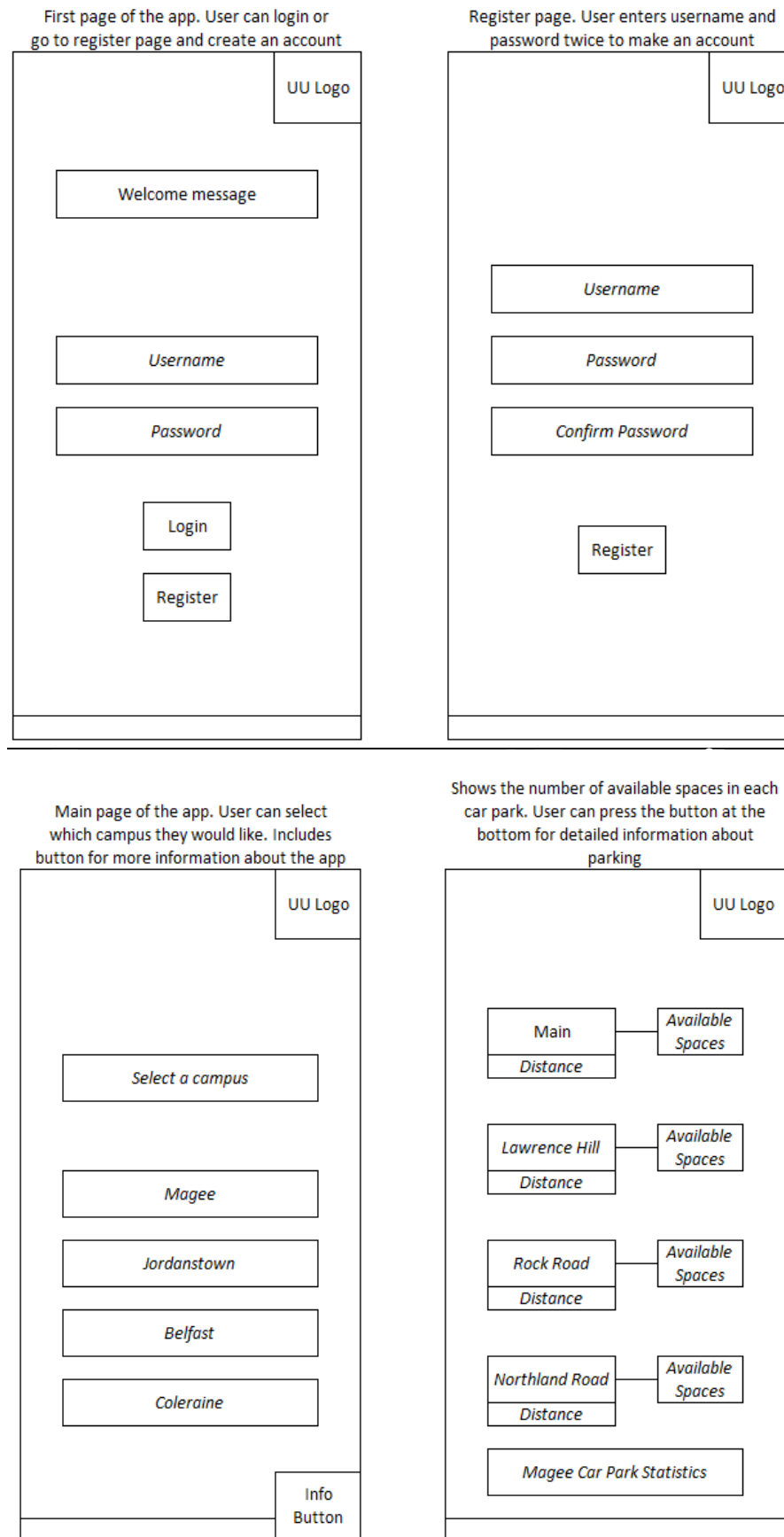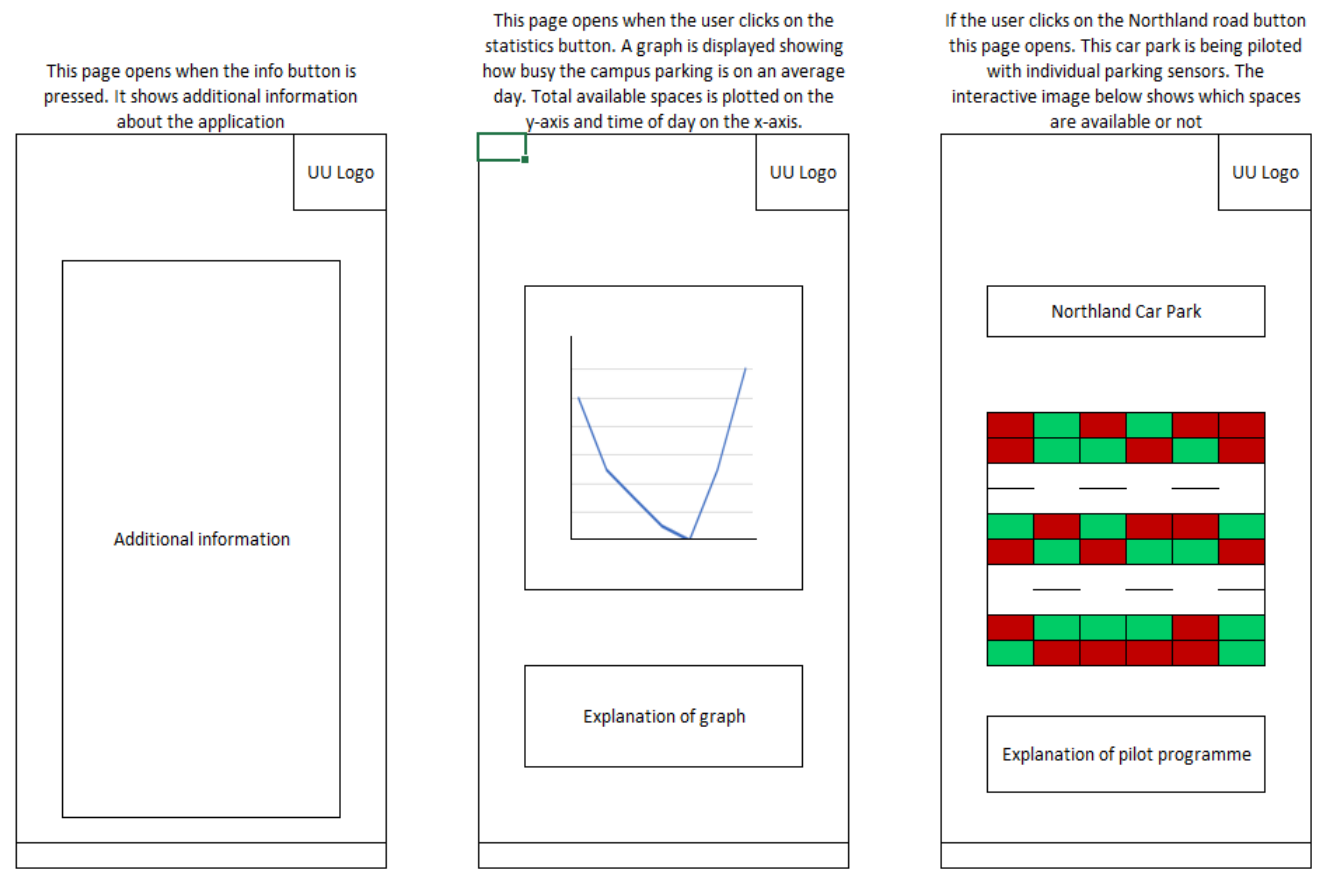| Individual Car Park |
| --- |
| pilotProgramme() |
| pilotExplanation() |

A Flow chart of the overall architecture, the components, their interaction, and the functionality:
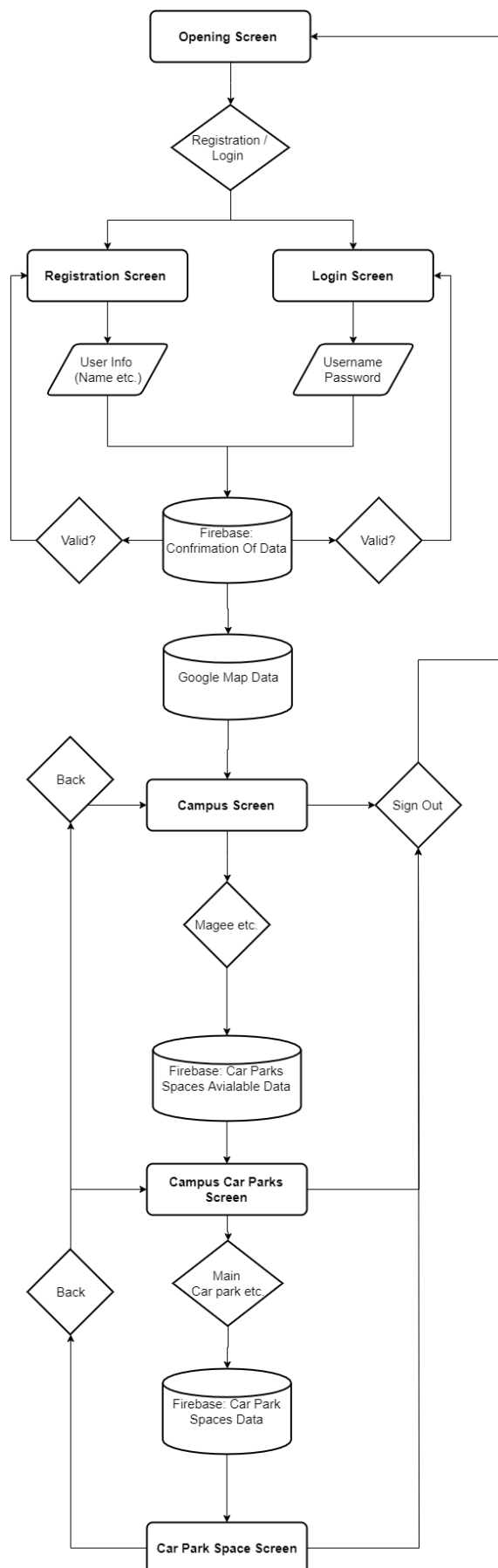
Below are screenshots showing how clicking on different UI elements navigate among the mock-up storyboard layouts:

First page of the app. User can login or go to register page and create an account

UU Logo

Welcome message

Username

Password

Login

Register

Register page. User enters username and password twice to make an account

UU Logo

Username

Password

Confirm Password

Register

Main page of the app. User can select which campus they would like. Includes button for more information about the app

UU Logo

Select a campus

Magee

Jordanstown

Belfast

Coleraine

Info Button

Shows the number of available spaces in each car park. User can press the button at the bottom for detailed information about parking

UU Logo

Main | *Available Spaces*
Distance

Lawrence Hill | *Available Spaces*
Distance

Rock Road | *Available Spaces*
Distance

Northland Road | *Available Spaces*
Distance

Magee Car Park Statistics

This page opens when the info button is pressed. It shows additional information about the application

UU Logo

Additional information

This page opens when the user clicks on the statistics button. A graph is displayed showing how busy the campus parking is on an average day. Total available spaces is plotted on the y-axis and time of day on the x-axis.

UU Logo

Explanation of graph

If the user clicks on the Northland road button this page opens. This car park is being piloted with individual parking sensors. The interactive image below shows which spaces are available or not

UU Logo

Northland Car Park

Explanation of pilot programme

The hardware and software of the application:

As mentioned before, Android Studio was used to develop the application. This was then shared using GitHub between group members to view and make changes to the application. Firebase is also used in the application for connecting to a login database and to store live counts of each car park. While using the application, the number of spaces available in each car park is shown to the user. This information will be collected using the barriers at the entrance and exit of each car park. The amount of spaces currently available is then directly updated from the barriers. The pilot programme makes use of individual sensors on each parking space to figure out whether or not the space is occupied. These are small sensors placed on the ground of each individual space and once a car covers the sensor, it relays this information on. This in turn gives detailed statistics on each parking space and further improves the application functionality.

Technical Development

All views that the application can show, the content of the views and the navigation between the views:

When the application is started, a home page is opened showing the school logo and a background image, with a button giving the user the option to sign in with email, google, and Facebook.

By selecting email, a login page is then shown with a text box for entering an email and a button to continue. If an email is already registered and in the firebase database, the user is brought to a new page. This displays a welcome message and prompts the user to enter a password, with a button to sign in and a "trouble signing in" message, which when clicked allows the user to receive instructions to their email on how to sign in. The login functionality is linked to a database of login details, which is filled when someone registers.

If an email entered at login is not registered, the user is brought to a register page where the email is already entered and the user enters their first and last name and a password. Once the button save is clicked, if the details are correct the user is shown the main page of the application, with a toast showing the user's email appearing at the bottom of the page. If the details are invalid, the user is given instruction on how to fill in the boxes correctly.

The main page of the application consists of a header with "campus", a sign out button, and an information button. If the sign out button is clicked, the user is signed out and brought back to the home page. The information button brings the user to a page which consists of further information on the application. The main page is then split into four below the header, with pictures of each campus and text displaying the name of each campus serving as buttons. The user decides which button to select based on the school campuses.

Once a campus is selected, the user is brought to a page consisting of the details of the chosen campus' car parks. This shows the number of spaces available currently in each car park and the distance to the car parks from their current location. These are all buttons which can be clicked to show further details on the individual car park. A button can also be found at the bottom of the page for car park statistics.

When an individual car park is selected, a page is brought up showing the car park name, and a highly detailed overview of the car park consisting of each individual parking space coloured to clearly indicate whether a specific spot is occupied or available. This is currently a pilot programme however and is not in place yet. A button is located at the bottom of the page which leads the user to more information on the pilot programme.

If the user instead clicks on the button for extra details on parking, they are brought to a page with a large graph. This graph shows how busy the campus parking is on an average day. The total available spaces is plotted on the y-axis and the time of day on the x-axis. An explanation of the graph can be found by clicking the button at the bottom of the page.
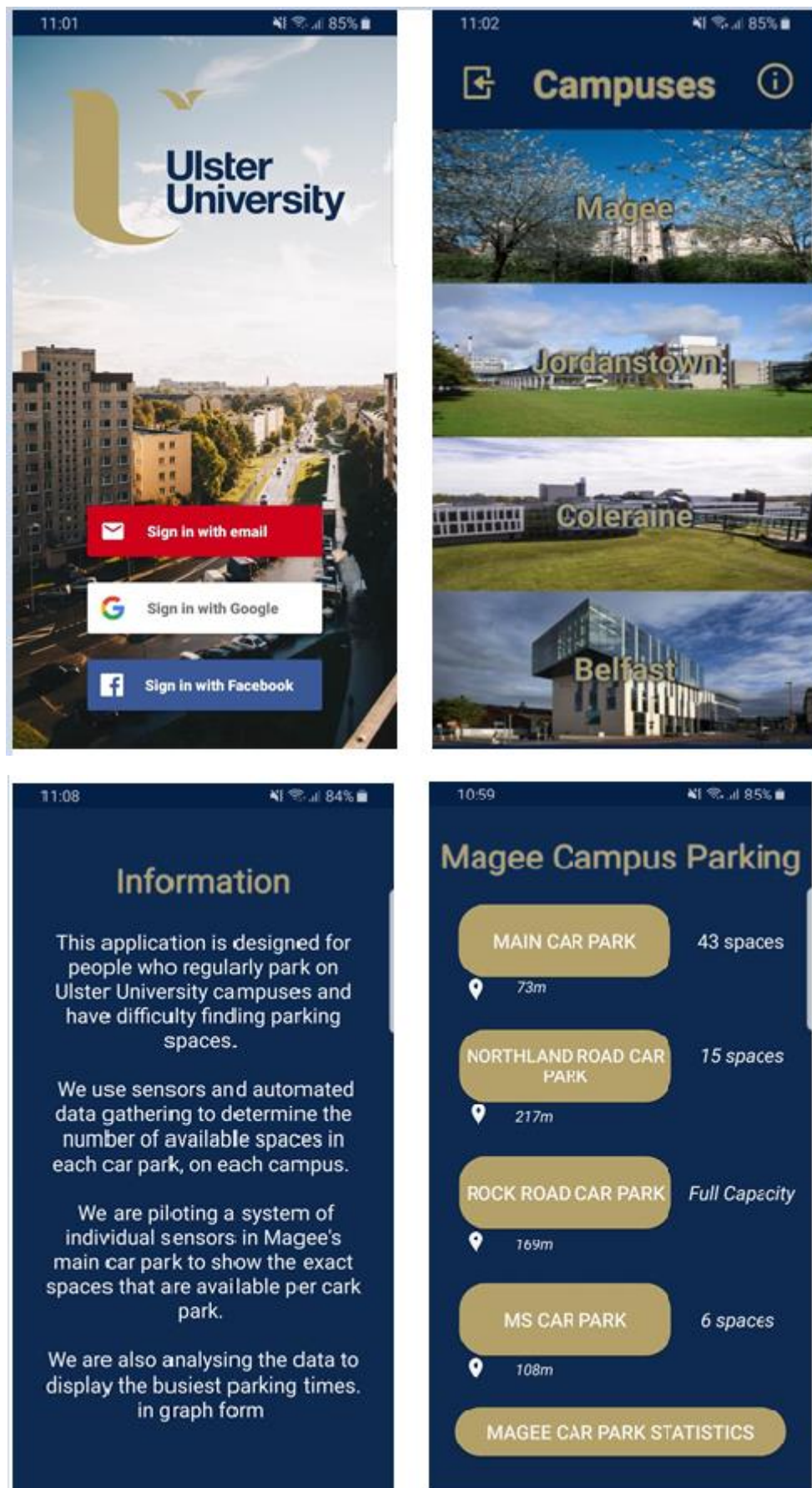
Database details of the application:

For this specific application, we decided to perform our database on Firebase as it allows real-time connection, letting several users identify the changes in the data when the data gets created or edited. With using Firebase, we get fast and secure hosting for the developing side, allowing us to efficiently deploy web applications. In preparation of the database, we realised as a group that Firebase was a quick way to set up the database. One of the main advantages of Firebase that appealed to us was that we were not required to use SQL and that authentication was included. Firebases' real-time database is a very powerful tool for our limited scope.

One of the main purposes for our database is to let the client know how many spaces are available in the car parks near them. So, by simply having the maximum spaces in, each car that enters a car park will then go back to the database and decrease the availability each time, automatically showing the user the updated spaces to avoid disappointment.

Furthermore, the database is set that the user can 'plan their journey' by looking at the graph indicating when the car park is at its peak time and where they should maybe avoid that carpark. Yet on the other hand shows when the car park is basically empty, and the user's best chance at getting a space would be.

Screenshots of the application:

Information

This application is designed for people who regularly park on Ulster University campuses and have difficulty finding parking spaces.

We use sensors and automated data gathering to determine the number of available spaces in each car park, on each campus.

We are piloting a system of individual sensors in Magee's main car park to show the exact spaces that are available per cark park.

We are also analysing the data to display the busiest parking times. in graph form

Magee Campus Parking

MAIN CAR PARK	43 spaces
73m	
NORTHLAND ROAD CAR PARK	15 spaces
217m	
ROCK ROAD CAR PARK	Full Capacity
169m	
MS CAR PARK	6 spaces
108m	

MAGEE CAR PARK STATISTICS

Magee Main Car Park Map

We are piloting a system of individual sensors in this car park to show the exact spaces that are available. As shown in the graphic above, available spaces are coloured green and unavailable spaces are red.

Magee Campus Statistics

The graph above shows the exact available spaces against the time of day.