Mount Usher Navigator

The application of new technology to engage young people in Natural Tourism.

Stand Number: 2206

Project: Mount Usher Navigator

The application of new technology to engage young people in Natural Tourism.

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Comments

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Summary/Abstract

Mount Usher Navigator is a project that uses Technology to empower and engage young people with Natural Tourism. Visitors of gardens like Mount Usher are primarily adults. Children are usually bored when taken for a walk around the gardens. This thought that drove me to start this project since I spent lots of time visiting the gardens.

The project is made up of three parts; the Application, iBeacons and a Survey Device.

The **Application** currently runs on iOS devices but I plan to make a similar application on Android devices. It can identify all the tree species of the trees on the “Tree Trail”. Instead of using the paper map given to visitors, the application has a built-in interactive map. It shows your current location marked on it and you can follow the trail.

There is a Digital Brochure included in the application which replaces the printed one. It explains the history and importance of Mount Usher Gardens and also saves trees by replacing the paper brochure.

With these features it would be a better experience for young people than without the app, but I felt that that wasn’t enough. The app has an added Game Mode to challenge and to engage a competitive aspect. You can play against your friends by seeing who can find the most trees quickest by following the clues which are given.

The **iBeacons** are BLE (Blue Low-Energy) beacons made for indoor location and advertising. They have not been widely used as yet considering they were introduced by Apple in 2013. I always have my eyes open for new technology to discover and the iBeacon are ideally suited for this application. In the project they are used to identify a tree’s location and to act as an index to the database.

When you are in the proximity of an iBeacon it sends the data from the iBeacon to the phone. The phone searches the database for the matching information and displays this information to the user.

The **Survey Device** is necessary for identifying if the application has improved the engagement of young people in Mount Usher Gardens. To do this I have made a pedestal with an old iPad installed on the top with the survey on it. This stands at the entrance to the gardens and both advertises the application and collects the results. It is made completely out of recycled materials, saving trees once again.

The early results from the survey are promising but unfortunately due to it being Winter and the low season for Mount Usher, I did not receive as many responses as I would have liked to get. Bearing in mind that the sampling size was not a good representation nor sufficient in size, there was still a clear trend that Mount Usher Navigator did improve the engagement of the Youth as well as the adults.

Introduction

This project started from my interest in Mount Usher Gardens and my frequent visits to the gardens. I am an exception in that as most children that I observed were viewing the gardens with adults and not adventuring on their own. I often followed the “Tree Trail” in the brochure and wanted to have the ability to follow a digital map instead. If this interested me, I thought it might engage other young people’s interest.

The application grew out of this original idea and the thought of a method to recognise the trees along the tree trail. What I wanted was something that would put all of the information about a particular tree on the phone when in its proximity. This information could be generic about the species of tree, but also contain information about this particular tree, for example its age.

I began to think of other features that might empower young people and bring them closer to Nature. The idea of making a game out of the experience which could spark an interest in tree recognition seemed just the right thing. The competitive nature of a game to challenge you to recognise and find trees, increases this engagement.

It was important to find the right technology that could be used to locate the trees. In the beginning I considered using GPS location as the application was outdoors. From experimentation I concluded that the GPS was not accurate enough. The best case accuracy was 2 meters and if you were under the shelter of trees, it significantly reduced the accuracy. If you were inside a building, you would have poor or no location.

I thought about using NFC (Near Field Communication) but dismissed this idea very quickly. NFCs range is only centimetres and would not be suitable for this application.

iBeacons have an adjustable range and are ideal for this purpose. They are BLE (Bluetooth Low-Energy) technology which can work from ranges of 1/2 meter to 300 meter depending on the beacon. The accuracy gets better the closer you get to the beacon. They have been commercially used to make an indoor location system, or in advertising. The normal use would be to locate the phone inside using triangulation with multiple beacons.

Once I had the iBeacons functional and the software written to detect them, I used the minor ID as the key to a local SQLite database which contains the tree information. I photographed many of the actual trees and put them in the database but as Winter approached many lost their leaves. I abandoned the idea of photographing them myself and used stock images. It also became clear to me that a good improvement would be to detect the season and have different images for each season.

My original idea was to get the statistics of children's ticket sales and compare these to those sales after my app was released. However, this would not have made a good proof of my hypothesis, "Technology can be used to engage young people in Natural Tourism". This method would only reflect how often they visit Mount Usher Gardens, not their enjoyment. As well, the application may be used by all ages to enhance the experience.

Instead I decided to create a survey for visitors to fill out but there was a problem finding counter space in the Ticket Shop. This resulted in me designing my own Survey Pedestal which served two purposes, to host the survey and advertise Mount Usher Navigator.

The survey results are automatically compiled on the iPad and displayed in the form of graphs and charts. I wrote the survey in an unbiased way so that I can collect data to prove my hypothesis.

I hope that after the BT Young Science and Technology Exhibition to re-install the Survey Device in the shop at Mount Usher and continue to collect more representative results.

Experimental Methods/Development

My project has both a scientific portion and a technology portion. The parallel to experimentation would be development by the Iteration Method and it is necessary for me to have the hardware and software complete before being able to conduct this experiment. The hypothesis that I developed was that this technology would improve the engagement in of young people in Natural Tourism. It was my goal to create an application and technology to support this hypothesis.

The first part of the development was to experiment with iBeacons. I previously investigated iBeacons with an earlier previous project. I have a collection of many different brands of iBeacons which was useful to compare them to find the ideal iBeacons for this the needs of this project. What I was looking for was an iBeacon with long battery life, low cost and low range. After much experimentation with the iBeacons I finally decided on an iotton iBeacon which had the characteristics I desired. Once I decided on the iBeacons, I ordered 50 beacons sufficient for the trees at Mount Usher Gardens in the first phase.

I started to develop the application on iOS using Xcode and writing in Objective C. There was considerable work to be done to get the iBeacons working correctly for the application as normally one would expect to broadcast at larger distances. The code to detect and debug the beacons is as follows.

```
--(void)locationManager:(CLLocationManager *)manager didRangeBeacons:(NSArray *)beacons
inRegion:(CLBeaconRegion *)region {
    NSString *message = @"";
   if(beacons.count > 0) {
        CLBeacon *nearestBeacon = beacons.firstObject;
        globals.currentBeacons = beacons;
        NSArray *treeresults = (NSArray *)[DBManager searchDatabase
(int)nearestBeacon.minor.integerValue];
        if (nearestBeacon.minor.intValue != CurrentIbeaconMinor  && treeresults.count!=0) {
            CurrentIbeaconMinor = nearestBeacon.minor.intValue;
            [tfViewController beaconFound:treeresults];
        }
        int beaconNumber = (int)beacons.count;
        int i = beaconNumber;
        while (i<beaconNumber+1) {
            CLBeacon *beacon = (CLBeacon*)[beacons objectAtIndex:i-1];
            NSString *detailLabel = [NSString stringWithFormat:@"Major: %d, Minor: %d, RSSI: %d,
UUID: %@",beacon.major.intValue, beacon.minor.intValue, (int)beacon.rssi,
beacon.proximityUUID.UUIDString];
            NSLog(@"%@", detailLabel);
           i++;
        }
```

```
        self.lastProximity = nearestBeacon.proximity;
        switch(nearestBeacon.proximity) {
            case CLProximityFar:
                message = @"You are far away from the beacon";

                break;
            case CLProximityNear:
                message = @"You are near the beacon";
                break;
            case CLProximityImmediate:
                message = @"You are in the immediate proximity of the beacon";
                break;
            case CLProximityUnknown:
                return;
        }
    } else {
        message = @"No beacons are nearby";
    }

    NSLog(@"%@", message);
    [self sendLocalNotificationWithMessage:message];
}
```

This procedure is installed in the location manager of the application and is called whenever it detects one of my beacons. The beacon has a minor ID which is sent to searchDatabase and used as the key to the local SQLite database on the phone. This data is displayed to the user in the routine beaconFound.

The application has two modes; Game Mode and Tree Identification Mode. Originally I had only the the Tree Identification Mode which would display the trees information when a particular tree was approached. This did not seem to have enough engagement for all users, as there is no competitive aspect to it.

The Game Mode was added which allows for multiple people to play competitively against each other. Clues are given for finding a random tree. These clues can be any of the following; tree image, leaf image, name. Name comes in two difficulties; Latin name and common name. At the end of the game, it gives you a score and other information like trees found, time taken, total distance walked, average time taken per round.

There are several other features that were implemented during the Development Iteration process. The Interactive Map is an important part as it allows you to see an overview of Mount Usher Gardens with the trees marked. Your position is shown on the map in relation to real position. This was done by using an Apple map and overlaying the pdf of the Tree Trail on

top. It gets the location of the map in real space via two anchor points which have both the pdf coordinates and the GPS coordinates (latitude and longitude). (See Appendix for step 1 - Anchor Points).

The problem with this implementation was that it orientated the map by default, North. Which meant that the Tree Trail Map was diagonal, was zoomed very far out and was very easy to get lost on the map. The Apple maps satellite background was visible. To fix this, I change the default orientation to match the maps non-geographic orientation. I set the zoom to be just the same size as the map. Whenever you pan the map, I recenter the map on the Tree Trail location, making it so you don't get lost. I turned off the satellite image and set the background image to be white. (The images shown in the Appendix are only visible in the debug mode).

I added a Virtual Brochure which gives the History of Mount Usher and some of the details on the gardens. I also added a feature where you can browse any of the trees. This completed the development of the application.

I created a survey to gather information on the success or failure of the project. To do this it was necessary to create a device that could sit in the limited space available at Mount Usher Gardens. This would serve a dual purpose of advertising and collecting data. It was made out of fully recycled parts; Wine boxes, old iPad first generation (restored by me), old fence post, repurposed lights, repurposed wires (See Appendix).

Results

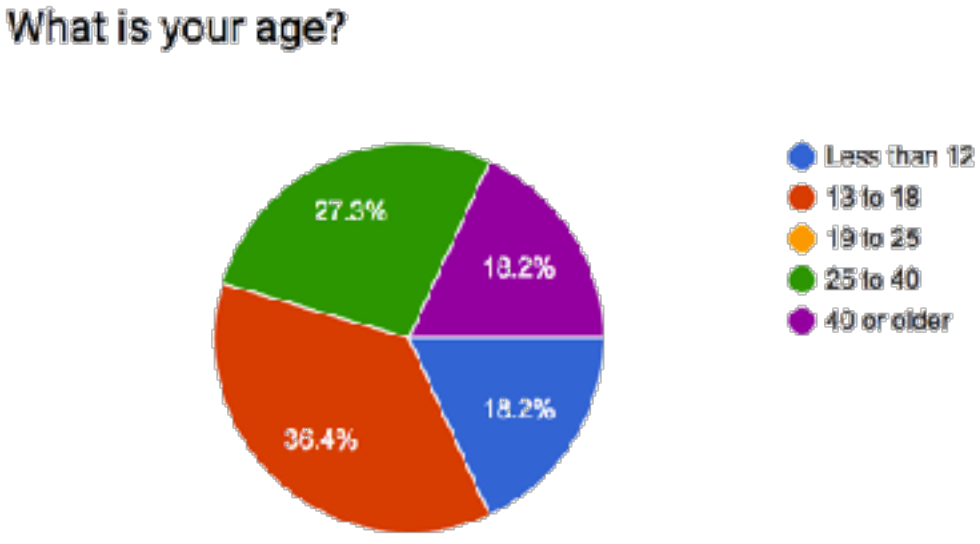
The results of the project are the Survey results collected and the creation of the Mount Usher Navigator application which will be used by Mount Usher Gardens.

The survey's purpose is to prove the hypothesis, "Mount Usher Navigator improves the engagement of young people in Natural Tourism".

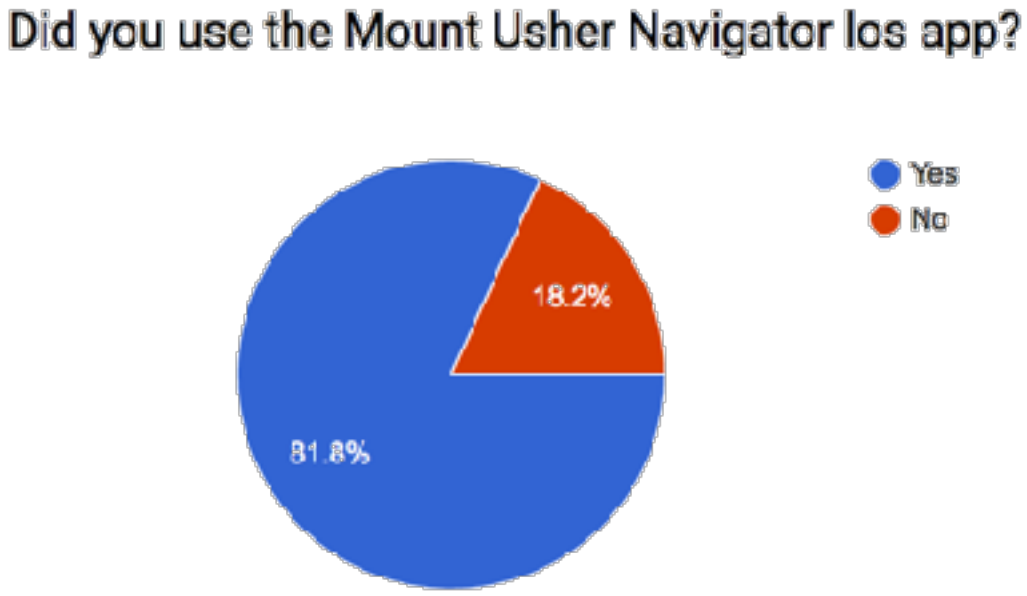
The early results from the survey are promising but unfortunately due to it being Winter and the low season for Mount Usher, I was not able to collect as many responses as I would have liked to get before the exhibition. The collection of data will continue in the Summer.

Bearing in mind that the sampling size was not a good representation or sufficient in size, there was a clear trend that Mount Usher Navigator did improve the engagement of the Youth as well as Adults.

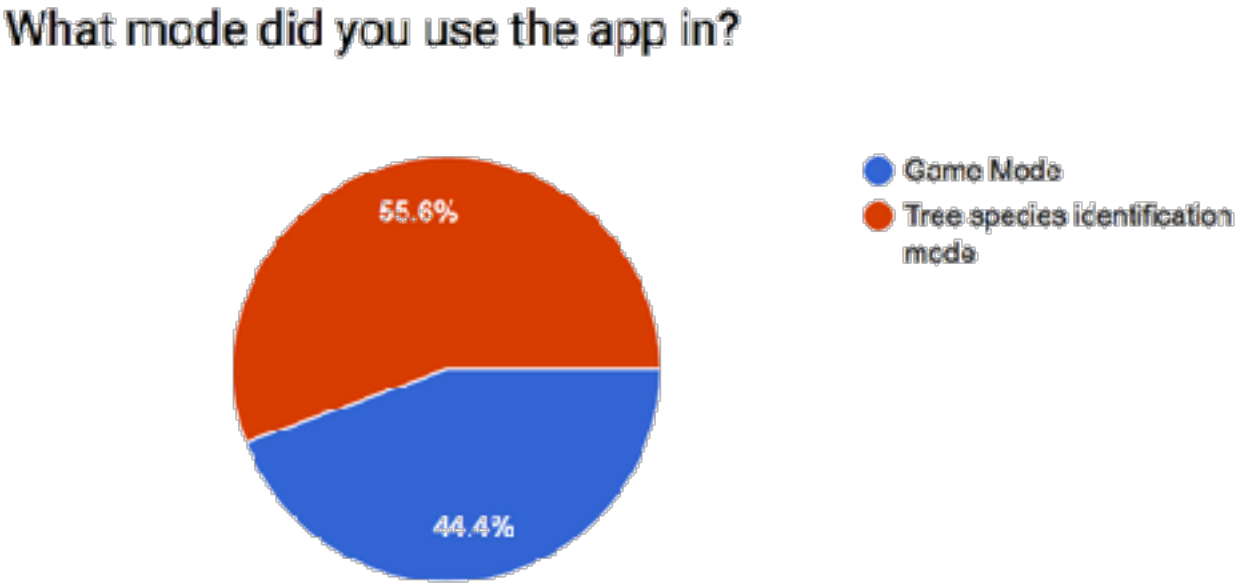
These are the results so far.



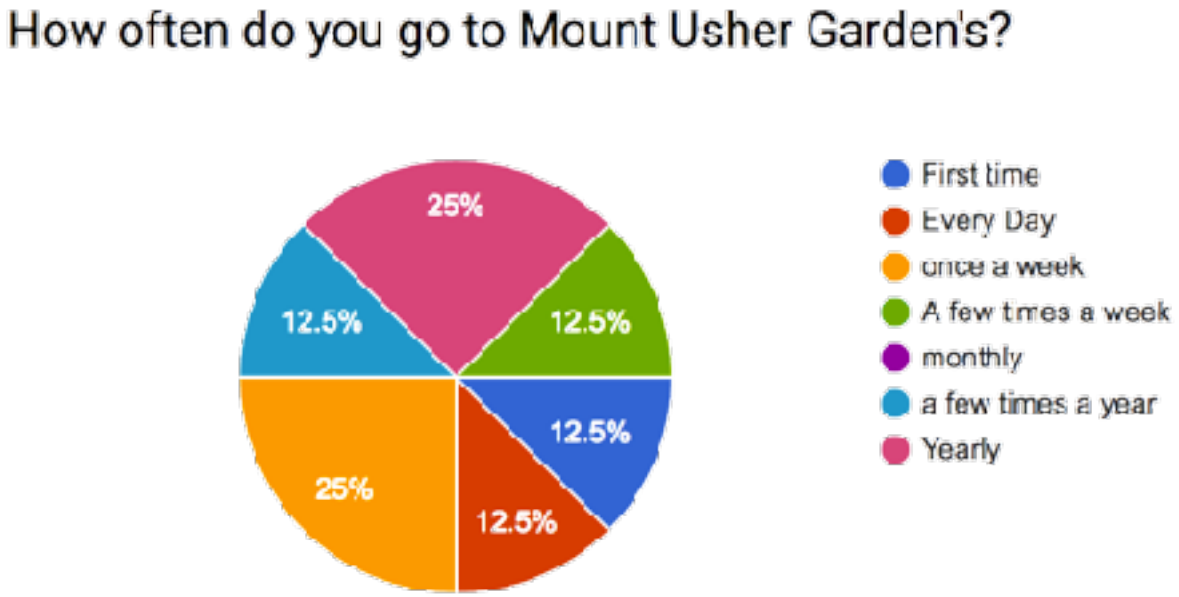
Over 1/2 of the users were youth which is expected.



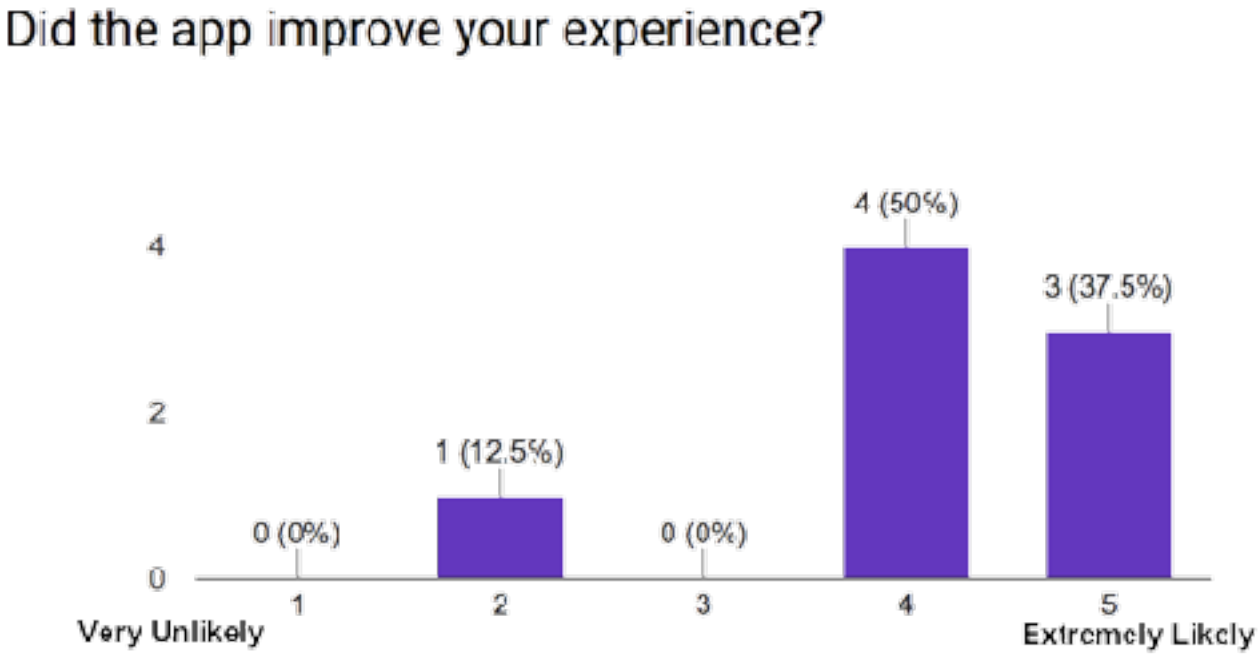
Of the people that filled in the survey, the application was widely used.



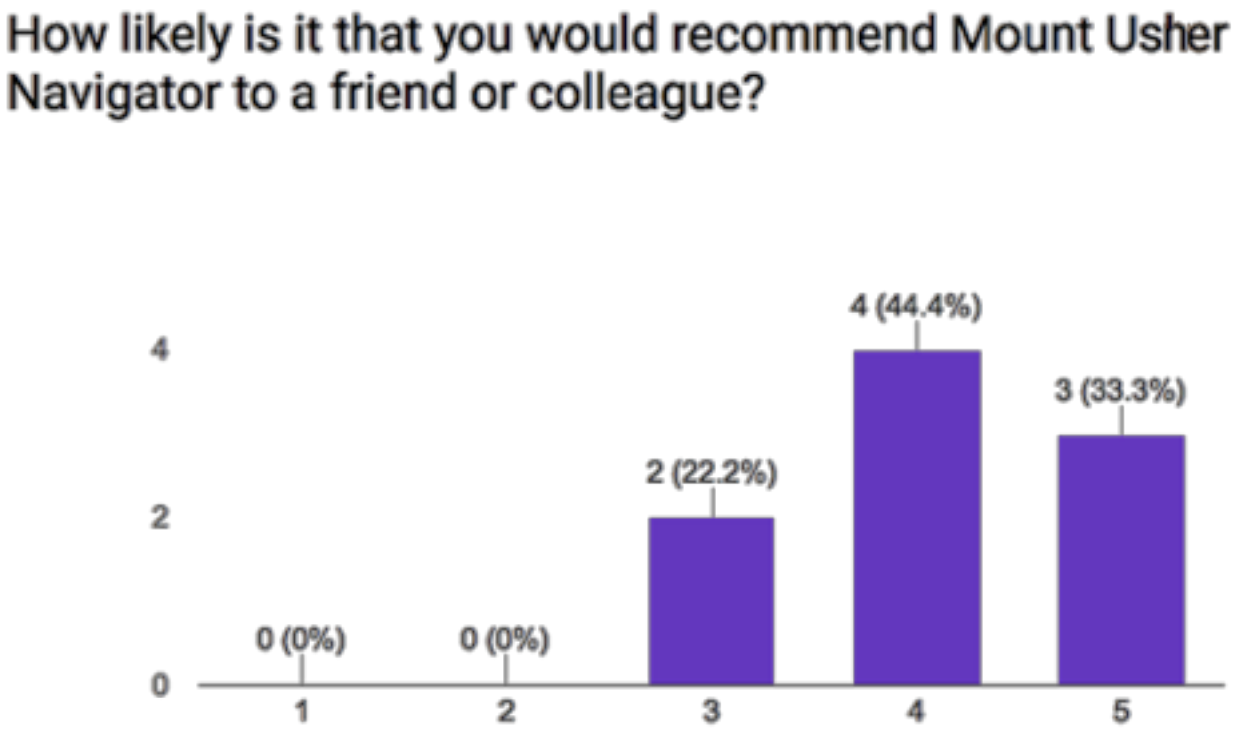
Young people tended to use the Game Mode more than the Tree Species Identification Mode.



These results reflect that the sample size was not large enough as it is very even. There are as many people who go everyday as go a few times a year, which seems very unlikely.



This result supports my hypothesis showing an interest in Dendrology (the identification of species of plants and trees).



Again very promising results for supporting my hypothesis.

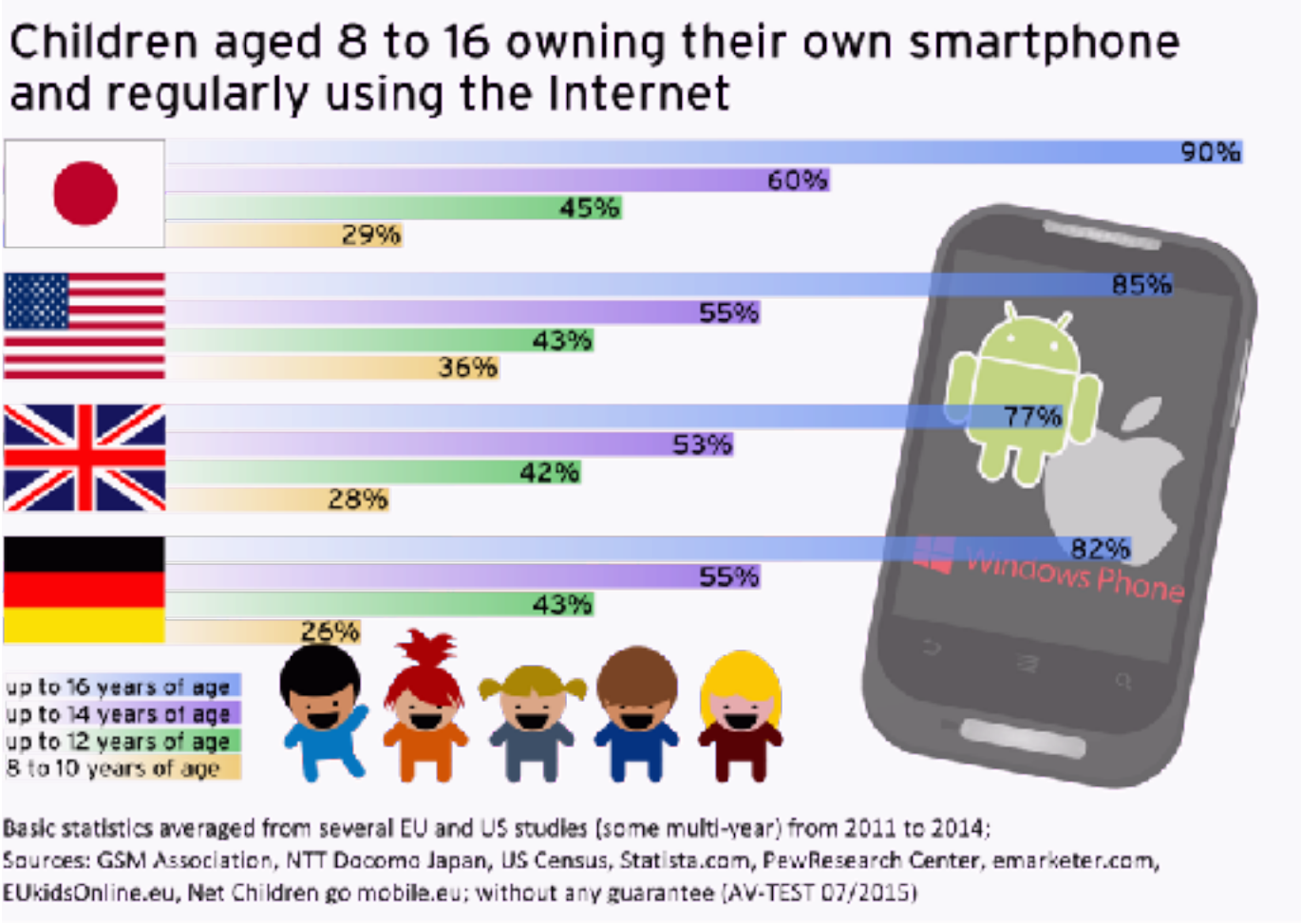
Conclusion and Recommendations

This project has worked quite well and is I believe a success in its ability to enhance the experience of visitors to Mount Usher Gardens.

I plan to work more on the project and develop it further. I would like to make the application recognise the current season and switch all the images to the appropriate images. Because of size of the images, I would need to have a standard image pack (Summer) and have the rest of the Season Packs automatically switched to, according to the Season. I would also like to use only my own images so that they are all photos of that exact tree.

I realise that the application would be applicable to other outdoor public gardens, Museums, and other Tourist Attractions. It would be good to develop some of these ideas.

Because of the low season for Mount Usher Gardens, I would have liked to have a much bigger sample size at this time. I will be gathering more survey results and I am anxious to see these results.



The study of behaviour of young people and their use of Smartphones and the Internet is just beginning. It is astonishing how widespread Smartphone are among youth, as shown in the chart. It also indicates that young people spend a lot of time on their smartphones. This is often instead of being outside and engaged with Nature.

Gathering of statistics which show that mobile phones and technology used in the right way can engage young people in Nature, adds to general knowledge of the issue of youth's singular focus on technology. Having applications like Mount Usher Navigator helps youth to be outside instead of on the couch.

Acknowledgements

I would like to acknowledge help from the following persons and thank them.

Matthew Weiss - Father and Electrical Engineer

Mr. Richard Murawski - Teacher and Advisor at East Glendalough School

Konrad Jay - Owner Mount Usher Gardens

Donald Pratt - Avoca Handweavers (Leaseholder Mount Usher Gardens)

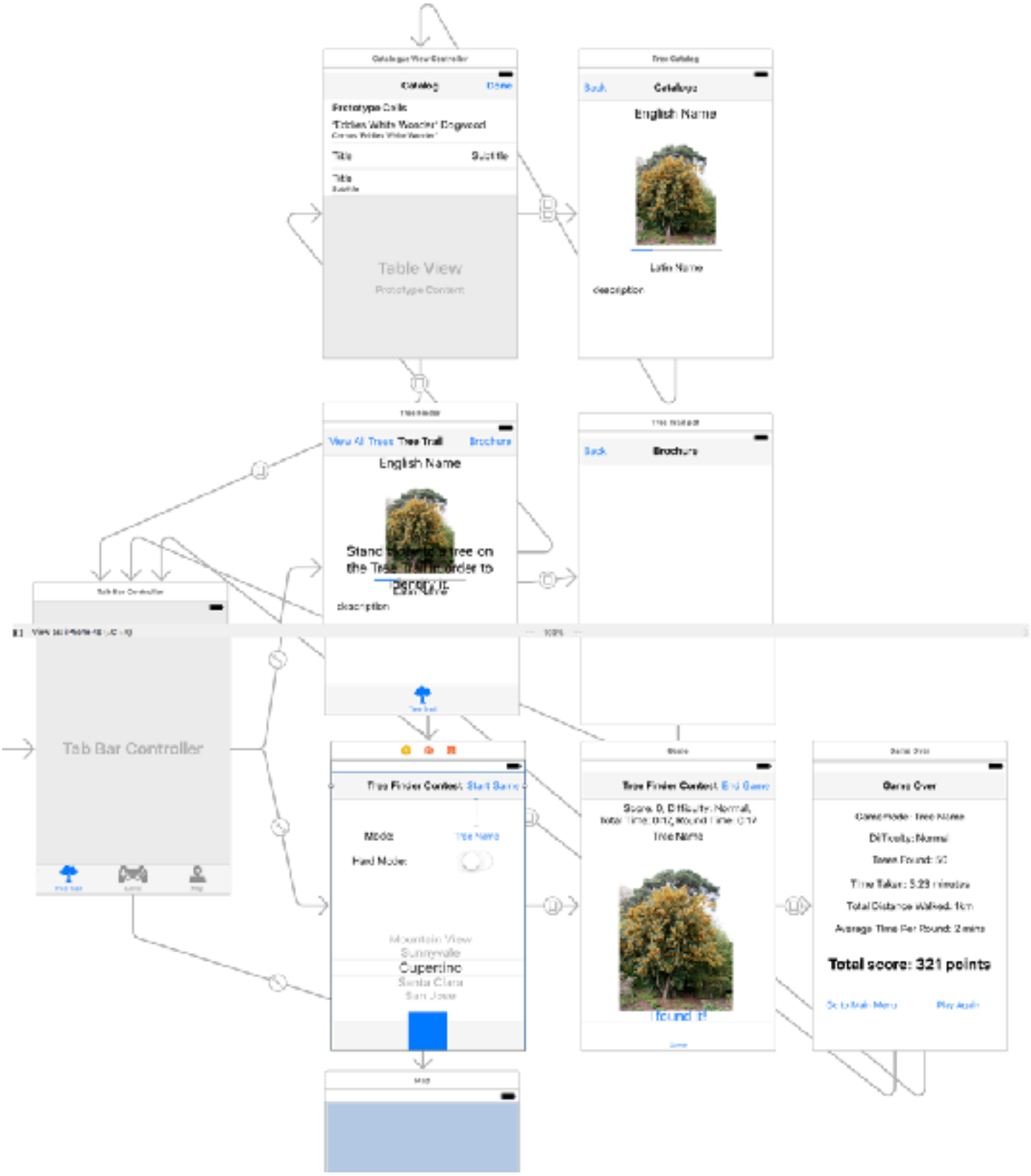
Simon Pratt - Avoca Handweavers (Leaseholder Mount Usher Gardens)

Sean Weiss - P2S Technologies Ltd.

Appendices

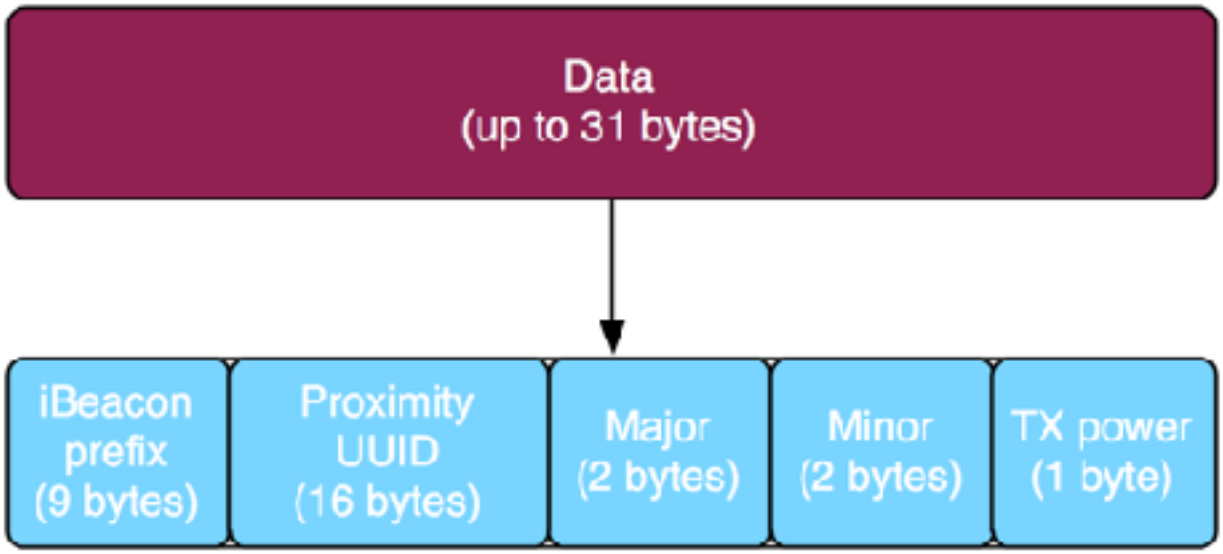
Application - Mount Usher Navigator

The application has 9 views in the Storyboard which host the UI. When a iBeacon is detected the appropriate data will be show in the Tree Trail view.



iBeacons

iBeacons constantly transmit their data at a set interval, for example every 200 milliseconds. If the application is switched on and is within the range of the iBeacon, it receives this broadcast.



The iBeacon prefix is used for the human readable name, for example, “Japanese Maple”. The Proximity UUID is a unique identifier which only Mount Usher beacons will have so that they will not be confused with other beacons. The Major ID is the location identifier and Minor ID is the trees ID. TX power is the RSSI at 1 meter. The RSSI (Received Signal Strength Indicator) Value which allows calculation of the proximity distance of the iBeacon.

Survey Device

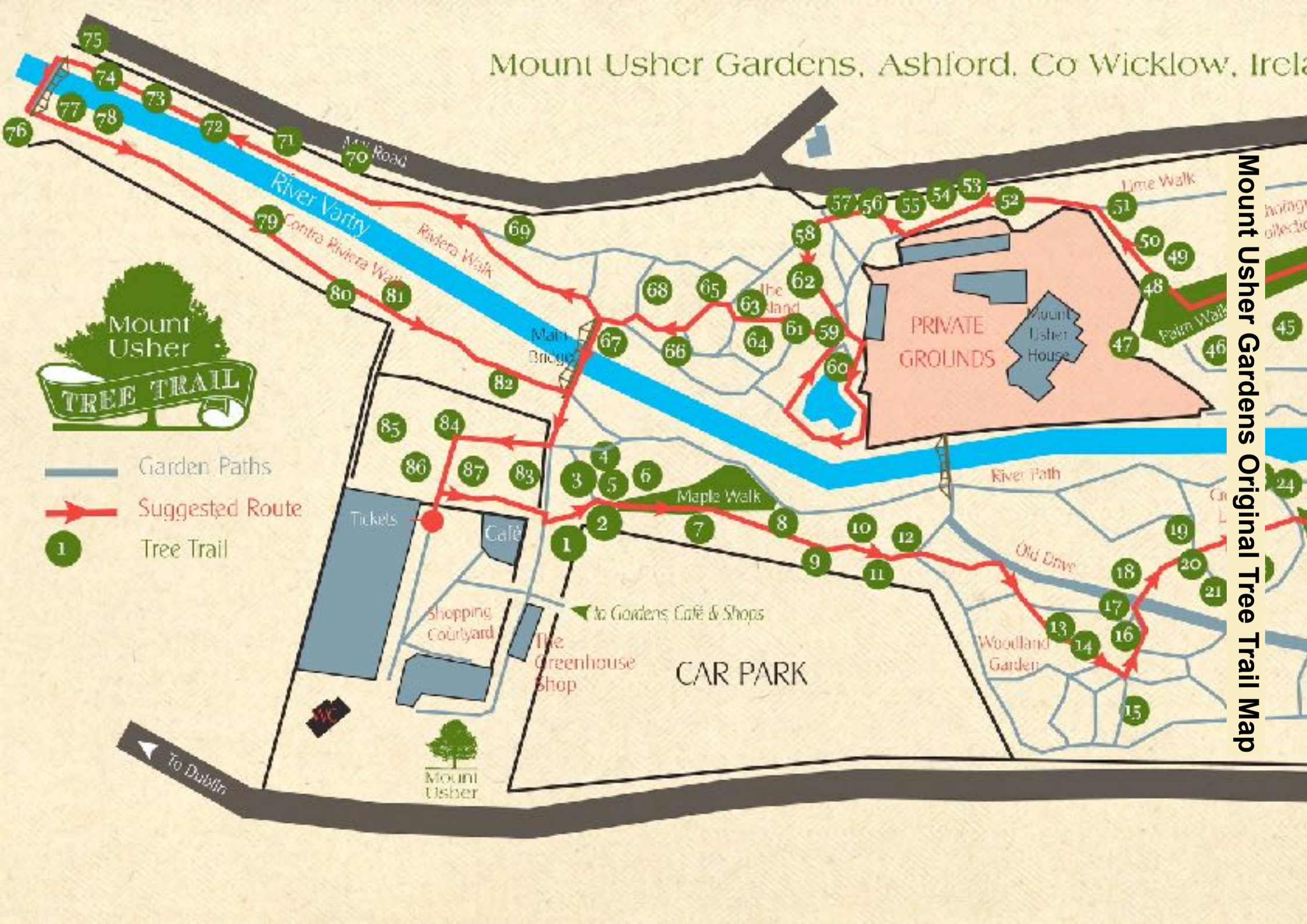
The Survey Device is made out of Recycled materials and is used at Mount Usher Gardens. It advertises the Navigator application and collects the survey data.

Anchor Points (Debug Mode)

The Tree Trail Map in the debug mode shows how the anchor points tie the image to Apple Maps with North Orientation.

Anchor Points (Normal Mode)

The Tree Trail as seen in the application with non-geographical orientation.


Mount Usher Gardens, Ashford, Co Wicklow, Irela
Mount Usher Gardens Original Tree Trail Map
Mount Usher TREE TRAIL
Garden Paths
Suggested Route
Tree Trail
River Vartry
Rivera Walk
Contra Rivera Walk
Main Bridge
The Island
PRIVATE GROUNDS
Mount Usher House
Lime Walk
Palm Walk
Maple Walk
River Path
Old Drive
Woodland Garden
Tickets
Café
Shopping Courtyard
The Greenhouse Shop
to Gardens Café & Shops
CAR PARK
WC
Mount Usher
To Dublin

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