

The Lapworth Museum iOS Application Report

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This report details the development of the Lapworth Museum App produced by Adedayo Omosanya whilst working at the IT Innovation Centre, University of Birmingham.

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Introduction

The main purpose of the Lapworth Museum Application is to bring the museum to life i.e. immerse the user in an engaging experience. Thus, several key features were identified early on:

- 3D objects
- Tours
- A curated list of objects on display in the museum

Additional features included:

- A quiz
- What's new page
- About page

Features

3D Visualisations of artefacts (not currently available)

I initially considered using augmented reality to achieve 3D visualisations as another team in the SMAC competition had demonstrated its effectiveness. However, due to the high cost and complexity of such technology, it was later decided that 3D models, which were already being produced by the museum, would be a more cost and time effective solution.

I then decided to use NinevehGL (<http://nineveh.gl>) an open-source library for OpenGL ES 2.0 rendering in iOS. Although successful in implementing the technology, it was discovered in the release stage that the library does not support x64 bit architecture. As support for this architecture had recently become mandatory in recent versions of iOS software, it has not been possible to include this feature in the current release.

There is currently no resolve to continue using NinevehGL as the library has not been maintained for at least 3 years and there is no indication it ever will be again. Thus to include 3D visualisations in the application another OpenGL ES library would need to be used. My recommendation is Apple's own GLKit Framework. The framework seems sufficient for the job although I have not used it myself so cannot guarantee its effectiveness.

Furthermore, if 3D models are to be used, the files representing the models (.obj and .mtl files) should be further compressed. The current size of the application exceeds Apple's recommendations (for other reasons latter discussed) and if these are to be included in a later version, it will only augment the issue.

Tours

The application currently features 4 tours provided by the Lapworth Museum. Each tour is presented as an ordered collection of items in the museum which the user is guided through sequentially.

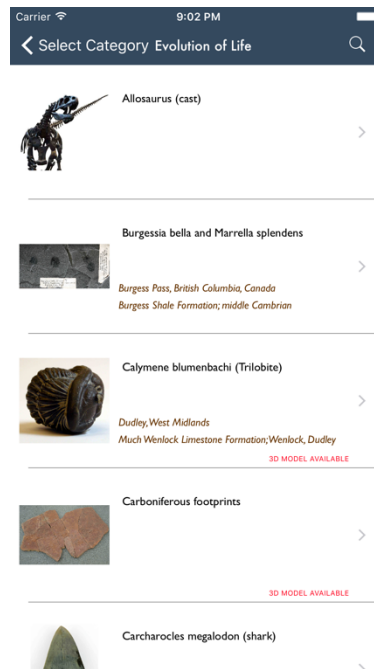
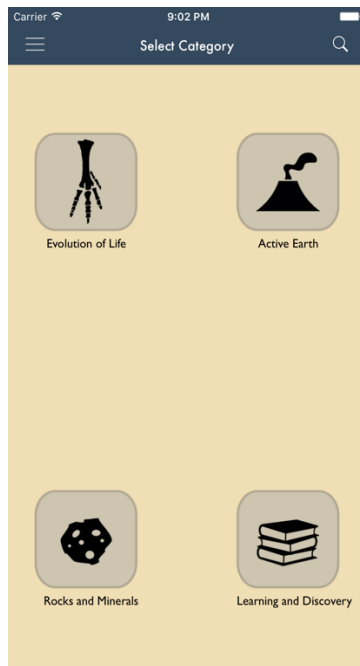


The top part of the tour display is a non user interaction enabled image demonstrating where the current item is located in the museum. The bottom half is user interaction enabled and allows the user to click the arrows (or swipe) to navigate the tour or swipe up to see more information about the current item.

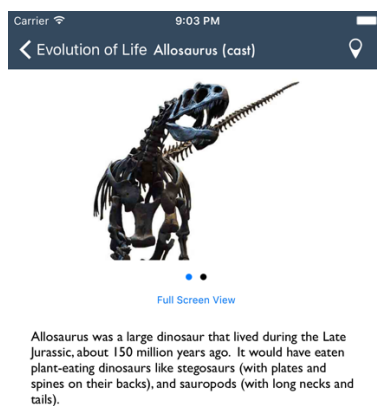
The user is also able to click the list button in the top right hand corner to see the whole tour as a list of items which is merely an alternative display. To exit this view, they must select an item in that list.

Collections

The collections section features a curated list of items on display in the museum. They are currently split up into 4 sections and then items in each section are presented in a list. Both pages offer search functionality at item level, that is you can search for a specific item on both pages. However, the search is restricted to the current section in the latter case.



The item description page features a scrollable panel of images as well as the ability to maximise these images to full screen resolution. The page also includes a short description of the item as well as a map icon in the top right hand side which will show the user where the item is located in the museum.

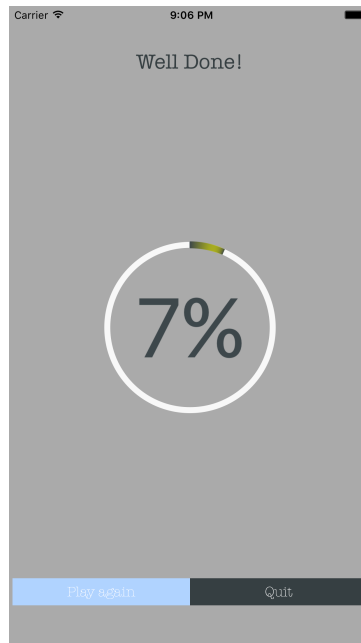
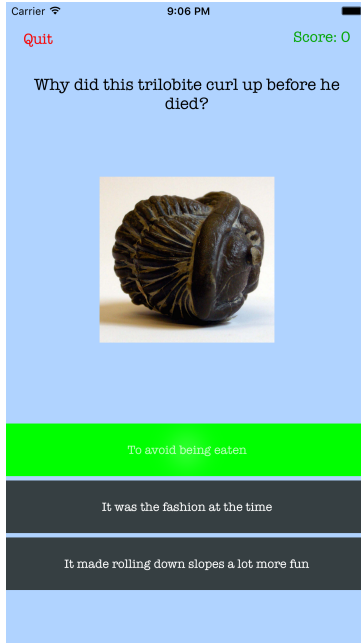


Quiz

The quiz includes 15 questions provided by the museum. Each question is presented to the user as a question, an image of the item in question and a choice of 3 possible answers. On selection of an answer, the UI alerts the user of the result by turning their selection red or green to indicate it being correct or incorrect. The score is

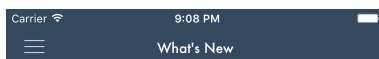
displayed in the top right hand side of the screen and there is an exit button in the top left hand side which navigates back to the home page.

On completion of the quiz, a graphic alerts the user how they have done and their score is saved.



What's New

The original purpose of this page was to contain a feed where the museum could relay information to their visitors. This could be done simply as a replica of the museum's twitter feed for example. However, at the time of development and as it later explained, the museum decided not to require internet connection in any part of the application. Thus in the current release, this page contained hard-coded text taken from the museum's web page regarding its redevelopment.



The Lapworth Museum is now closed until early summer 2016 for a major redevelopment. Please follow Twitter or Facebook, or check our website for regular updates about our exciting redevelopment project.

A major redevelopment of the Lapworth Museum of Geology started in December 2014 following the award of a £1.56m Heritage Lottery Fund grant.

The work, part of a £2.5m redevelopment, will greatly improve access to the Museum's fantastic collections and provide a unique public visitor experience as well as continuing to maintain a valuable learning and research resource for students.

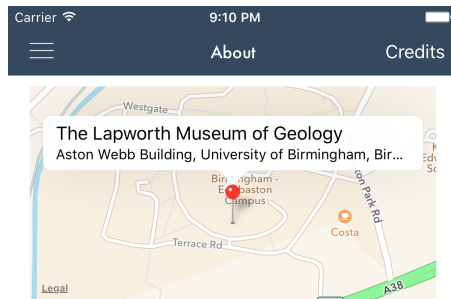
The redevelopment will include new galleries and innovative exhibitions to showcase exceptional objects that have not previously been displayed.

The new display will be based around four key themes:

- Evolution of Life
- Active Earth
- Mineral Wealth
- Learning and Discovery

About

The about page features a map pin-pointing the location of the museum as well as text containing general information about the museum. This page also links to the 'Credits' page where outsourced images are referenced.



The Lapworth Museum of Geology has the finest and most extensive collections of fossils, minerals and rocks in the Midlands. The Museum dates back to 1880, and is one of the oldest specialist geological museums in the UK.

The collections contain in excess of 250,000 specimens. In addition to rocks, fossils and minerals, there are large collections of early geological maps, equipment, models, photographic material, and also zoological specimens and stone axes. The Lapworth Archive contains one of the most complete records of the work of a scientist of the 19th century.

Language

The bulk of the application is written in Objective-C merely for the fact that this is was my preferred language at the time. However, as it was less verbose to do so, some features are written in Swift such as the Quiz. Hence, there are a mixture of Objective-C and Swift source files in the project.

It should be noted that the Swift source files are written in Swift 1.0 and there have been new releases of the language by Apple since then. Thus an IDE such as Xcode may prompt for the updating of syntax and care should be taken with this.

Code Design

Design Patterns

The entire code base follows an MVC design pattern. With the Storyboard (Main.storyboard) serving as a collection of all the views, the .h and .m source files extending *UIViewController* or *UITableViewController* serving as the controllers and the source files extending *NSObject* serving as the models. This means the code is

loosely coupled and it should be relatively simple to change one feature without affecting other parts of the software.

Localisation of Data

In the initial development of the application, data was hosted externally in a BaaS (namely Parse.com). However, the museum requested to have all data stored locally in the application for the inherent benefit that there would be no internet connection required to use the application. This now means all images are contained within the project's source files and all data is hard-coded in the source files.

This has two notable effects:

- To add/remove/update any of the information in the application, the hard-coded values will have to be changed in the source and this new version of the application will have to be released for users to get this version.
- The application size is considerably larger than it otherwise would be. The current size is 177MB. This exceeds Apple's recommended app size and means users are not able to download the application unless they are connected to wifi. A cellular connection is not enough.

Whether or not the user not requiring internet connection to use the application outweighs these disadvantages is down to the museum. Although, from a technical point of view, these effects are greatly unfavourable and data should be stored externally.

Conclusion

Going forward, it would be favourable to find a solution to the 3D visualisation as this was intended to serve as the main feature of the application. I would also advise data is transferred to an external source and downloaded on a request basis to reduce the size of the application.

Good additional features may include:

- Language localisation which would aid foreign students/visitors of the museum
- Extending the application to other mobile platforms, namely Android.