

UNIVERSITY OF LINCOLN SCHOOL OF COMPUTER SCIENCE

PURE FLOW [mobile edition]

UROS Project 2011

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1 Abstract

PURE FLOW [mobile edition] is a digital art project that extrapolates location and accelerometer data from iOS devices to generate a moving piece of artwork.

The intention of the art piece is to illustrate the inaccuracy of GPS data, the use of which is becoming a lot more common in recent times, especially with the widespread adoption of smartphone handsets.

The application was originally a combination of scripts that ran on a Mac with a GPS dongle plugged into it; the goal of this project was to port it to native iOS code.



2 Introduction

This project is to create a mobile version of an art installation authored by Katy Connor and Duncan Rowland. The project utilised a GPS dongle to analyse the discrepancies in the returned GPS data and used an algorithm to generate a visualisation based upon it.

The aim of this project is to port the algorithm to the iOS platform, running on both iPhone and iPad and have the finished article ready for dissemination (deployed on the Apple App Store) for the opening of an art installation containing the project.

3 Process

The research project took place over the summer of 2011 and all of the work took place on site at the University of Lincoln. Prior to starting the project proper, Duncan Rowland, Katy Connor and I met for a meeting in Newark to discuss the outline of the project. The project was to run on the Apple iPhone and iPad and was to use onboard GPS receiver to generate a visualisation based upon the statistical uncertainty in the data.

After this meeting, Duncan and I met again back at the University of Lincoln to discuss how to port the algorithm from the previous version of the project to the iOS platform. The previous algorithm was in a flowchart style format, not suitable for our requirements. Duncan agreed to work on that part of the project while I worked on the rest of the application.

The majority of the development process took place in the research office of the Lincoln Social Computing group, as there was room for another computer there and other people to keep myself company during the development process. Development took place mostly autonomously, however I consulted with Duncan frequently for feedback and with help integrating the visualisation algorithm he had developed for the project.

After a week, Katy visited Lincoln and checked in on the state of development, providing feedback and suggestions on the project. After she left, Duncan and I worked on

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implementing an external development framework to allow Katy to receive the latest progress and provide feedback remotely.

After a couple of weeks of development, the project was ready for its first submission to the Apple App Store. The purpose of this was to determine if there were any low-level problems which would cause it to be rejected from the App Store so they could be resolved. The submission was accepted and development continued.

After this point, most of the development was polishing the application ready for public dissemination, no new features were allowed in development as the deadline was approaching quickly. A couple of weeks prior to the deadline the application was submitted for the second and final time and was accepted. The project was complete and ready for display at Katy's exhibits around the country.

4 Results

4.1 *What went right?*

4.1.1 Rapid prototyping of the user interface

The user interface was designed so that it could be changed fairly easily; adding, removing, renaming or even changing the function of a button was as simple as changing a few lines of code. Coding the UI this way was more cumbersome than the traditional method of dragging buttons in interface builder; however, this made compliance with the artist's requests a lot easier, as new revisions of the app could be returned to the artist very quickly for feedback and critique.

4.1.2 No rejected App Store submissions

Much to the surprise of everyone in the office, all three of the submissions to the App Store were accepted without incident. In most cases, submissions to the App Store are rejected at some point, usually due to mistakes during submission, bugs and crashes in the app, or violation of some of Apple's App Store regulations. Consequently, during the design and implementation of the app, the various guidelines Apple supplies were read and adhered to where possible.

4.1.3 Use of professional development infrastructure

For the development of the application, an infrastructure to manage the code was required. This was achieved by the use of a free service called Unfuddle, which supplies a subversion repository, as well as a ticket tracker. By using this service, communicating with the client was made easier as she could create tickets (such as bug reports or feature requests). The subversion repository was natively integrated with Xcode (the development environment), which made keeping the code organized easier.

Using the subversion repository meant that all of the code and resources were automatically backed up whenever a new revision is committed; it also meant that if some changes to the code rendered the app nonfunctional, the code could be reverted to a previous, working condition.

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4.2 *What went wrong?*

4.2.1 Core Location API woes

Initially it was planned to solely use iOS' Core Location API to gather the required data for the algorithm; however, there was a problem encountered where the API would not retrieve a new location if the device had not moved.

There was no way to circumvent or otherwise fix this without violating the App Store submission guidelines, so a compromise was made with the artist: Noise from the accelerometer would act as a stand-in for the GPS data whenever GPS data is not being received. While this compromise made the application more enjoyable by the end-user, it undermined the sentiment behind the art piece.

4.2.2 Trouble with subversion

A problem that occurred early within the development phase was that a subversion repository hosted on the University network had an invalid certificate. This caused problems with committing to and checking out from the repository. The ICT Services department would have to acquire a new certificate, and this would take time; consequently, it was decided to use a separate service called Unfuddle.

4.2.3 Lack of testing devices

During the development of the application, the application needed to be run on physical devices rather than the iPhone Simulator application; this is because the iPhone simulator does not simulate Core Location or Accelerometer data. The only testing devices that were available were my personal iPhone, and the head of department's iPad 2.

While this meant we had one of each type of device, we lacked a wide range of devices for a decent amount of testing on various hardware specifications. In addition, the iPad lacked a GPS module in its hardware, meaning that it was not possible to fully test the application fully on the device.

5 Conclusions

The development of the application ran smoothly overall; there were no real problems during development and the App Store submission process was completed without incident.

A lot was learned from this project, and if I was in the same position again, I would not have done anything differently. I enjoyed working on the project, and it has taught me a great deal about working with a team, and about development for the iOS platform and in general.

I hope the skills I have learned doing this project will help me in the future, especially having the ability to develop universal iPhone/iPad applications.

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6 Acknowledgements

6.1 *Duncan Rowland*

Duncan was invaluable in the development and I could not have completed the project without his assistance. He assisted me when I was stuck on problems and provided constant support and feedback.

6.2 *Katy Connor*

Without Katy, the project would never have existed. She was the client of the project, and without her constructive feedback the finished article would not have turned out as well as it did.

6.3 *LiSC Research Group*

The members of the LiSC Research Group kept me company and provided some cursory feedback and suggestions during the development process. I owe them a lot for sharing their office with me and making me feel as welcome as I did during my time there.