Project Title: Programming Java for Longer Battery Life

Student Name: Anna Frances Rasburn

Student Number: 2411187

Supervisor: Dr Alexander Brownlee

# Project Objectives

It is a common experience that batteries in mobile phones frequently run out of charge. This is both an environmental concern and inconvenient for mobile phone users. A significant drain on the battery are the applications which, in order to run sufficiently fast, must place high demands on the phone’s CPU.

The objective of this project is to find a way to change the way we programme Java (particularly in Android mobile applications) to reduce CPU power of the device so the application uses less battery life.

End users are Android mobile users who would gain more mobile battery life since the application would require less power from the device’s CPU.

This research project builds on research done previously by Dr Alexander Brownlee et al in the paper labelled ‘Object-oriented genetic improvement for Improved Energy Consumption in Google Guava’.

# Proposed Approach

Using techniques derived from genetic improvement and search-based software engineering, I will be changing the way in which I program Java in order to reduce the power needed for at least one Android mobile application. This project also may require GIN tool (<https://github.com/gintool/gin>), Google’s guava library, JALEN which is a java agent for measuring energy consumption at code level, and the opacitor which is a tool that measure how many joules an application requires when it runs.

Technical issues regarding this project are that applications may have performance issues and may not run as quickly and could take slightly longer to respond to actions.

The issue of security is not expected to be a concern in this project.

# Hardware and Software Requirements

I will need basic PC access with a Java IDE

# Preliminary Plan

It is envisaged that the project will progress through four stages, outlined as follows:

Step 1: Analysis

* Find an Android phone application(potentially using github) or make my own. This will be the test subject.
* Run the test subject through opacitor to measure how many joules the application uses.
* Research and learn about genetic Improvement through my own research, the CSCU9YE: Artificial Intelligence module and summer work.
* Analyse the application to find where it can be improved or changed.

Due: September/October 2018

Step 2: Initial Implementation

* Start reprogramming a copy of the test subject using genetic improvement and search based techniques.
* Proving the concept using simple methods such as tuning numerical constants and local search.

Due: December 2018

Step 3: Refinement

* Continue programming the new mobile application using genetic improvement and search based techniques.
* Further refinement options using more advanced methods such as mutating source code and evolutionary algorithms.

Due: January 2019

Step 4: Evaluation

* Finishing programming the new mobile application
* Make sure the application works.
* Run the newly created mobile application through the opacitor to get results on how many joules it needs
* Compare these results to results gained from the test subject.
* If the new application uses fewer joules than the test subject then we know the project was successful.

Due: March 2019