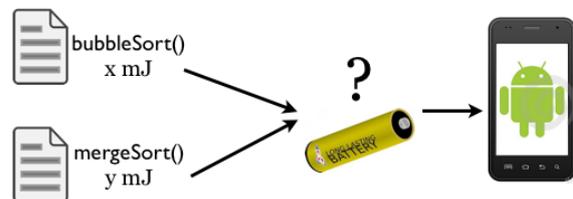


Semester / Master Thesis:

Powerful Software

Background: For long, software benchmarks had been synonymous with timing tests. New architectures were subjected to a benchmark set of applications to identify the fastest architecture. With the advent of portable computing, this has changed. The power consumed by a software is equally, if not more, important. If you write a new algorithm or design a new architecture, it is pertinent to rate it by the amount of energy it consumes.

Our specific interest is the Android operating system, which is a popular choice in today's smartphones. Particularly, we aim to study the development of Android applications with a view of making them *power-aware*. Imagine you are developing a data mining application on an Android smartphone. This application has to sort across very large vectors multiple times. Different algorithm choices exist to implement the sorting, such as bubble sort and merge sort. Which of these algorithms would one choose, so as to consume lesser energy? Is there a trade-off between power consumption and fast performance?



The Thesis:

The thesis comprises of two main tasks. The first task is to develop a *virtual power sensor* that can measure or estimate the power consumed by an Android application running on representative hardware. There are solutions, including published apps, which solve a similar problem. However, our intent is to take a scientific approach and identify the strengths and limitations of such sensing. The second task of the thesis would use the sensor of the first task to demonstrate how an application may be made “power”-ful. As examples, we may compare different algorithm choices for applications such as sorting vectors, decoding movies, encrypting messages or compressing an image. The aim is to illustrate a workflow to systematically expose power consumption as a metric and algorithm choice as a design variable.

What you can learn: The thesis will give you an opportunity to learn or improve your ability to program Android devices. It also provides an opportunity to explore, on real hardware, the algorithms from introductory computer science courses.

Requirements: You should be familiar with programming in one of the major languages such as C or Java.

Interested? Please have a look at <http://www.tec.ethz.ch/research.html> and contact us for more information!

- Pratyush Kumar: pratyush.kumar@tik.ee.ethz.ch, ETZ G76
- Lars Schor: lars.schor@tik.ee.ethz.ch, ETZ G78.1
- Lothar Thiele: thiele@ethz.ch, ETZ G87