**Android Energy Manager [or better title]**

A user friendly energy tool for Android Phones

Vikram Shanker

Carnegie Mellon University

Pittsburgh, PA, USA

vshanker@andrew.cmu.edu

Shilpa Murthy

Carnegie Mellon University

Pittsburgh, PA

shilpam@andrew.cmu.edu

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# Introduction *(Heading 1)*

The use of mobile devices has now permeated our everyday lives. Cellular phones and other devices are merely an extension of the self. They are used and relied upon for everyday tasks such as phone calls, emails, text message, social media, web browsing and more. As the usage of smartphones increases, the battery life of phones has began to decrease. In the days of flip phones, devices could be used for multiple days without charging. However, now, most devices don’t last more than 6-8 hours.

The source of the loss in battery life is two-fold. First, the increased usage of the cell phone will naturally cause some loss in battery life. It is unrealistic to expect that we use a device much more and still have it maintain the same battery life. Second is the rise of power-hungry mobile applications. Mobile applications are consuming increasingly more of the phone’s energy.

There are two general classes of applications that consume disproportionally large amounts of energy. The nature of some applications is such that they must use large amounts of energy. Applications such as maps that rely heavily on real-time sensor data will naturally and inevitably use more battery. Other applications, such as Facebook, run continuously in the background polling for updates or user information, unbeknownst to the user, draining battery significantly. The second class is particular instances of applications that happen to consume more energy. This can sometimes be due to a faulty launch in the application and a simple restart is enough to cure the issue. Other times, the software itself has a bug.

Distinguishing between these two cases is difficult for a computer to do given that it has no information about the baseline of how much energy the app is expected to consume. However, this information is often intuitive to the user. It is simple for the user to determine whether the app is a naturally energy intensive application or it is consuming unexpected amounts of energy. Therefore, Android Energy Manager delegates the task of determining these thresholds to the user. The choice of this approach will be discussed in future work.

# Related Work

Many research projects have taken various approaches to monitoring application energy usage. Carat, by Oliner et al. takes a black-box approach at diagnosing energy-usage. Pathak et al. took a fine-grained approach to diagnosing energy usage, and Balasubramanium et al use native instrumenting tools to measure mobile device energy consumption.

In Energy Consumption in Mobile Phones, the native Nokia Energy Profiler was used to sample the energy consumed every 250 milliseconds. The application reported consumption at 95% confidence. Obvious drawbacks to the method are that this only works on Nokia phones. Furthermore, even though the data is fine-grained and accurate, users have reported that interpreting the data presented by the application is difficult to interpret and act upon. This is because the energy profiler only estimates energy consumption device level. It does not profile at the application level.

Pathak et al take the opposite approach in Fine Grained Energy Accounting on Smartphones with Eprof. They instrument the code in order to fully understand how energy is consumed at the sub-application level. However, this method is not portable for our application since it requires the source of applications. Furthermore, to measure the energy of a new app requires work for each additional app, which does not allow for universal use.

Discuss carat, other energy discussion papers, and limitations of those approaches that builds up to this approach.

# Design

Explain the choices of this paper

User defined thresholds

Simple selection

Hourly detection and user notification (android does not give access killing apps immediately + more user defined control so apps aren’t killed when they are undergoing some desired behavior)

# Measuring Energy

Cpu usage is highly proportional to energy usage.

V. Evaluation

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 

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A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).

Do not use the word “essentially” to mean “approximately” or “effectively”.

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There is no period after the “et” in the Latin abbreviation “et al.”.

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An excellent style manual for science writers is given by Young [7].

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For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*

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