Interdisciplinary Project: Phase-aware Frame Rate based Power Management for Internet Browsers on Android

The number of mobile users has increased rapidly over the past few years and is reported to surpass desktop web browsing traffic. Google reports that already more searches take place on mobile devices than on desktops in major ten countries including US and Japan [1]. Not only is the mobile web traffic, but also computation demand of the mobile web pages significantly increasing [2].

Mobile web browsing is enabled by mobile browsers such as Chrome, Safari, etc. A browser consists of multiple components such as the user interface, browser engine, layout engine, display components, and networking. The most time and power consuming component while rendering a web page depends on the type of the web page. In order to meet the growing computational demand of mobile web pages, there has been a race by browser developers to enhance the processing speed. However, mobile web browsers are still designed assuming desktop conditions, that is, for performance, and little attention has been paid to power consumption for mobile scenarios. Hence, existing power management techniques for web browsing workload on state-of-the-art Android systems leave much room for power optimization.

During the browsing process, there exist different phases such as loading, scrolling, typing, reading, etc. All of these phases have different performance requirements which we define by frames per second (FPS). The higher the frame rate, the more frames have to be computed and consequently, the more energy is consumed. In this work, we want to identify the different performance requirements and modify the internet browser accordingly. Further, we want to compare the user perception and measure the power consumption for the different approaches.

The hardware platform we use is an Odroid-XU3 board with a big.LITTLE processor architecture that is also used in state-of-the-art smartphones. The operating system is Android.

The work packages can be defined as follows:

- Identify loading phases within the browser
- Research existing power management approaches and implement them for the web browser
- Compare the strategies regarding to user perception and power consumption

Required Skills:

- Knowledge of Java or C++
- Knowledge of the Linux/Android system structure
- Knowledge of git
- Helpful: Bash scripting
- Helpful: Matlab
- Diligent, independent and well-organized work performance

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