Web Browser for Smartphone with New Optimized Power Consumption Technique

Sivanantham.R¹, Rajavignesh.R²

¹II PG of Computer Science Dept., Arasu Engineering College, Kumbakonam, Tamil Nadu.
²Associate Professor of Computer Science Dept., Arasu Engineering College, Kumbakonam, Tamil Nadu.
Sivananthamar17@gmail.com
rrajavignesh@gmail.com

Abstract— A smart phone is a mobile phone with an advanced mobile operating system which combines features of a personal computer operating system with other features useful for mobile or handheld use. Smartphone wastes its battery power for display and wireless interface. Smartphone web browser takes much more power for downloading the web pages, so it will drain the battery power completely for web browser. Here propose three techniques to solve the power consumption problem during web browsing that are, 1.Changing of browser computation sequence, 2.Advanced Regression tree algorithm, 3.Less Energy Consumption Approach. Here proposed first algorithm is “changing of browser computation sequence”, it will rearrange the computation sequence of web browser, and first download the all object from server in DCH state, and DCH state consumes more battery power of the Smartphone. Now the radio interface is put into FACH state, the FACH state uses the half of the power of DCH state, here downlink or uplink takes place to perform remaining computation. Because remaining computation requires some upload and download process. Here propose second algorithm is “Advanced Regression Tree”, after downloading of all objects, average computation time was calculated by the ART, based on that time value only the smart phone still run in FACH state, if the computation takes more time, than Smartphone will be switched to idle state. Using these three algorithms we can reduce the power consumption of Smartphone by more than 30 percent during the web browsing.

Keywords— smartphone browser, Advanced Regression Tree, DCH state, FACH state, IDLE state.

I. INTRODUCTION

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio. Wireless technology play major role in Smartphone devices. The most common wireless technologies use radio. With radio waves distances can be short, such as a few meters for television or as far as thousands or even millions of kilometers for deep-space radio communications. It encompasses various types of fixed, mobile, and portable applications, including two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of applications of radio wireless technology include GPS units, garage door openers, wireless computer mice, keyboards and headsets, headphones, radio receivers, satellite television, broadcast television, and cordless telephones.

A smart phone is a mobile phone with an advanced mobile operating system which combines features of a personal computer operating system with other features useful for mobile or handheld use. They typically combine the features of a cell phone with those of other popular mobile devices, such as personal digital assistant (PDA), media player and GPS navigation unit. Most smart phones can access the Internet, have a touch screen user interface, can run third-party apps, music players and are camera phones. Most Smart phones produced from 2012 onwards also have high-speed mobile broadband 4G LTE internet, motion sensors, and mobile payment mechanisms.

Smartphone wastes its battery power for display and wireless interface. Smartphone web browser takes much more power for downloading the web pages, so it will drain the battery power completely for web browser. Today Smartphone web browsers uses timeout value to release and re-establishing the wireless interface (or) internet connection, the web browser takes long time for downloading and processing all objects. Here focusing the power consumption of web browser in Smartphone. Our idea is to reduce the power consumption in Smartphone web browsing. Fig 1.0 describes the power consumption in Smartphone during the browsing time.

Here propose three techniques to solve the power consumption problem during web browsing that are,

2. Advanced Regression Tree algorithm to calculate the average computation time.
3. Less Energy Consumption approach to switch the Smartphone from FACH state to IDLE state.

There are various computations when loading a webpage such as HTML parsing, Java Script code execution, image decoding, and style formatting and page layout. The web browser processes are categorized as two that are

1. downloading the objects from server.
2. performing computation on objects and display content to the user.

Here proposed first algorithm is “changing of browser computation sequence”, it will rearrange the computation sequence of web browser, and first download the all object from server in DCH state, and DCH state consumes more battery power of the Smartphone.

Now the radio interface is put into FACH state, the FACH state uses the half of the power of DCH state; here downlink or uplink takes place to perform remaining computation. Because remaining computation requires some upload and download process.

Our second algorithm is “Advanced Regression tree”, after downloading of all objects, average computation time was calculated by the Advanced Regression tree, based on that time value only the smart phone still run in FACH state, if the computation takes more time, than Smartphone will be switched to idle state. Using these three algorithms we can reduce the power consumption of Smartphone by more than 30 percent during the web browsing, our solution reduces the web page loading time and increase the network capacity.

II. RELATED WORKS

[1] In this paper, the author discovered that the key reason of the long delay and high power consumption in web browsing is not due to the bandwidth limitation most of time in 3G networks. The local computation limitation at the Smartphone is the real bottleneck for opening most WebPages. [2] In this paper, modern Web applications, style formatting and layout calculation often account for a substantial amount of local Web page processing time. In this paper, two novel caches, smart style caching and layout caching for Web browsers. They cache stable style data and layout data for DOM elements are recorded when a page is browsed, and then reused when the page is revisited later. [3] In this paper, last benchmark measured the power consumption for a web-browsing workload using both GPRS and Wi-Fi connections. The benchmark was trace-based, ran for a total of 490 seconds, and consisted of loading the browser application, selecting a bookmarked web site and browsing several pages. We used the BBC News website, which we mirrored locally to improve the reliability of the benchmark. After each run, the browser cache was cleared. The results averaged over 10 iterations, including backlight power at 4 brightness levels. GPRS consumes more power than Wi-Fi. [4] In this paper author present ZOOMM, A Parallel Web Browser Engine for Multicore Mobile Devices, a highly concurrent web browser engine prototype and show how concurrency is effectively exploited at different levels: speed up computation performance, preload network resources, and preprocess resources outside the critical path of page loading. On a dual core Android mobile device author demonstrate that ZOOMM is two times faster than the native WebKit based browser when loading the set of pages. [5] In this paper , Monitor and track usage of internet access over smartphones. Established behavioral patterns associated with browsing, NIA use and physical locations. (NIA-NATIVE INTERNET APPLICATIONS) Found these differences were stable across virtual and physical location visiting with Smartphone.

III. SYSTEM IMPLEMENTATION

A. System Architecture
**B. Module Description**

1. **Changing Of Browser Computation Sequence**
   The current Smartphone web browser, there are two types of computations associated with each incoming object. The first type is the computation that generates new data transmissions such as HTML and CSS file parsing and JavaScript code execution, which is referred to as the data transmission computation. The second type is the computation that does not cause data transmission. This type of computation is used to layout the webpage such as image decoding, style formatting, page layout calculation and page rendering, which is referred to as the layout computation.

   **ALGORITHM**
   1. Switching the Smartphone from IDLE state to DCH state.
   2. Giving URL address to browser.
   3. Requesting the web server for HTML, CSS, IMAGES and JS Pages.
   4. Download all data from server.

2. **Advanced Regression Tree algorithm to calculate the Average Computation Time**
   A machine learning based approach to predict the user reading time, based on which we can decide if the Smartphone should switch to IDLE. Since different users have different reading patterns, we build the prediction engine for each user individually. A machine learning based approach to predict the user reading time, based on which we can decide if the Smartphone should switch to IDLE. Since different users have different reading patterns, we build the prediction engine for each user individually.

3. **Less energy consumption approach to switch the smartphone from FACH state to idle state.**
   Here present our energy-aware approach algorithm has two different modes: the delay driven mode which optimizes delay, and the power driven mode which optimizes power. Recall that improperly moving to the IDLE state may increase the power consumption and the data transmission delay. In delay driven mode, if the predicted reading time \( T_r \) is shorter than \( T_d \), new data transmission may come during the FACH state, and hence the Smartphone will not go to IDLE to avoid increasing the data transmission delay.

**IV. CONTROL FLOW DIAGRAM**

A. **Normal Web Browser Control Flow**

![Control Flow Diagram]

**International Journal of Advanced and Innovative Research (2278-7844) / # 220 / Volume 4 issue 10**
B. Energy Aware Browser Control Flow

![Diagram of Energy Aware Browser Control Flow]

V. SIMULATION

In computer programming, Eclipse is an integrated development environment (IDE). It contains a base workspace and an extensible plug-in system for customizing the environment. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages through the use of plugins, including: Ada, ABAP, C, C++, COBOL, Fortran, Haskell, JavaScript, Lasso, Lua, Natural, Perl, PHP, Prolog, Python, R, Ruby (including Ruby on Rails framework), Scala, Clojure, Groovy, Scheme, and Erlang. It can also be used to develop packages for the software Mathematica. Development environments include the Eclipse Java development tools (JDT) for Java and Scala, Eclipse CDT for C/C++ and Eclipse PDT for PHP, among others. The initial codebase originated from IBM VisualAge.\(^2\) The Eclipse software development kit (SDK), which includes the Java development tools, is meant for Java developers. Users can extend its abilities by installing plug-ins written for the Eclipse Platform, such as development toolkits for other programming languages, and can write and contribute their own plug-in modules. Released under the terms of the Eclipse Public License, Eclipse SDK is free and open source software (although it is incompatible with the GNU General Public License). It was one of the first IDEs to run under GNU Class path and it runs without problems under Iced Tea.

VI. CONCLUSION AND FUTURE WORK

CONCLUSION

In this paper, we proposed an energy-aware approach for web browsing in 3G based Smartphone. First, we reorganize the computation sequence for loading
page so that the web browser can first run the computations that will generate new data transmissions and retrieve these data. Then, the web browser can put the 3G radio interface into IDLE, release the radio resource, and then run the remaining layout computation. This not only saves power, but also reduces the webpage loading time by removing the computation intensive redraws and reflows. Second, we predict the user reading time on the webpage after it is downloaded. If this time is longer than a threshold, the radio interface can be put into IDLE to save power. Since Smartphone have limited computation capability, we propose a low overhead prediction algorithm based on Advanced Regression Trees (ART). Additionally, our approach can also increase the network capacity, since the radio resource can be released earlier. Experimental results show that our approach can reduce the power consumption of Smartphone by more than 30% during web browsing. Moreover, our solution can reduce the webpage loading time by 17%, and increase the network capacity by 19.6%.

**FUTURE ENHANCEMENT**

As future work, we will apply other techniques such as caching and prefetching to save energy. By prefetching and caching we can capture data at the right time, wireless data transmissions can be aggregated to save energy. We will also extend our techniques to 4G/LTE network after it is widely deployed in our area.

**REFERENCES**


[8] Feng Qian,Kee Shen Quah,Junxian Huang,Jeffrey Erman and Alexandre Gerber, WEB CACHING ON SMARTPHONES: IDEAL VS. REALITY, Published in MobiSys ’12 Proceedings of the 10th international conference on Mobile systems, applications, and services on jun25,2012.

[9] Xing Xie, Gengxin Miao1*, Ruihua Song, Ji-Rong Wen, Wei-Ying Ma , EFFICIENT BROWSING OF WEB SEARCH RESULTS ON MOBILE DEVICES BASED ON BLOCK IMPORTANCE MODEL, Published in PERCOM '05 Proceedings of the Third IEEE International Conference on Pervasive Computing and Communications on mar8,2005.