



MOBILE DEVICE POWER MANAGEMENT MODEL FOR LOCATION BASED SERVICE APPLICATIONS

by
Hettiarachchige Don Sajitha Priyankara (168256H)

A thesis submitted to University of Moratuwa in partial fulfilment of the requirements for
the
Master of Computer Science, *Specialized in Mobile Computing*

Department of Computer Science & Engineering
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Dr. Indika Perera
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Abstract

Location based solutions for smartphones and other smart hand-held devices have been significantly increased. Geo location is one of the key contexts which can be easily captured with the current localization or geo positioning technologies. Most recent geo-localized Points of Interest (POI) aware systems perform much intelligent decisions and proactive actions by identifying nearby places and the nature of the surrounding. For achieving that proactiveness, Location Based Service (LBS) approaches utilize continuous feed of Global Positioning System (GPS) which consumes more energy, makes a significant battery drain and generates heat resulting in a severe reduction of operation time.

Objective of this research is to introduce enhanced power utilization mechanisms for POI aware systems by implementing intelligent location extraction methods along with Application Programming Interface (API) level optimizations as well.

In the relevant research literature mobile device power optimization has been discussed and many solutions have been introduced and those have been discussed and referred during the research work.

Applicable use cases which can be integrated with power management mechanisms have been identified to address the above mentioned problem as the first step. GPS and WiFi based hybrid positioning system has been identified as the main supportive GPS adaptation. Then intelligent GPS sampling mechanisms and intelligent communication with the location based service provider have been studied and classified based on the state differentiation of the applications.

In the implementation phase a prototype called “DealTella” has been created. Activity recognition has been implemented for intelligent decision making in location sampling. GPS adaptation using Wi-Fi trace based reversed location extraction is the most important power utilization adaptation introduced during the research work.

A considerable percentage of energy saving could be achieved by enabling

all the mechanisms explained under the implementation section along with enabling intelligent sampling. Proposed implementation has been tested under three main scenarios while enabling better battery consumption strategies. Accuracy has been measured against the battery consumption and recommendations have been provided based on results.

Further as part of the research work, a prototype has been developed just to prove the concept and it will be enhanced and released as a marketable and production quality application.

Modern leading operating systems invest more on optimizing battery consumption natively. Since modern smart applications are heavy process oriented for providing the best and most context related user experience. Those applications consume more and more energy for achieving that proactiveness and to feed the intelligence into applications. Still there exist a lot of research opportunities in the context and some of the extensions have been proposed to be carried out in a future phase.

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Abbreviations

A-GPS – Assisted Global Positioning System
AI – Artificial Intelligence
API – Application Programming Interface
CDF – Cumulative Distribution Function
CLA – Centroid location algorithm
CNP – Cellular Network Provider
EEPS – Energy-Efficient Positioning Scheme
GPS – Global Positioning System
GSM – Global System for Mobile Communications
HMM – Hidden Markov Models
IDC – International Data Corporation
iOS – iPhone Operating System
ISP – Internet Service Provider
KNN – K-nearest neighbor
LBS – Location Based Services
MAC – Media Access Control Address
NoSQL – Not Structured Query Language
POI – Points of Interest
RSS – Received Signal Strength
TTFF – Time to First Fix
Wi-Fi – Wireless Fidelity

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