ADAPTIVE PROFILE DRIVEN DATA CACHING AND PREFETCHING IN MOBILE ENVIRONMENT

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ABSTRACT

This thesis describes a new method of calculating data priority by using adaptive mobile user and device profiles which change with user location, time of the day, available networks and data access history. The profiles are used for data prefetching, selection of most suitable wireless network and cache management on the mobile device in order to optimally utilize the device's storage capacity and available bandwidth.

Some of the inherent characteristics of mobile devices due to user movements are – non-persistent connection, limited bandwidth and storage capacity, changes in mobile device's geographical location and connection (eg. connection can be from GPRS to WLAN to Bluetooth). New research is being carried out in making mobile devices work more efficiently by reducing and/or eliminating their limitations. The focus of this research is to propose, evaluate and test a new user profiling technique which specifically caters to the needs of the mobile device users who are required to access large amounts of data, possibly more than the device storage capability during the course of the day or week. This work involves the development of an intelligent user profiling system along with mobile device caching system which will first allocate weight (priority) to the different sets and subsets of the total given data based on user's location, user's appointment information, user's preferences, device capabilities and available networks. Then the profile will automatically change the data weights with user movements, history of cached data access and characteristics of available networks.

The Adaptive User and Device Profiles were designed to handle broad range of the issues associated with:

- Changing network types and conditions
- Limited storage capacity and document type support of mobile devices
- Changes in user data needs due to their movements at different times of the day

Many research areas have been addressed through this research but the primary focus has remained on the following four core areas. The four core areas are : selecting the most suitable wireless network; allocating weights to different datasets & subsets by integrating user's movements; previously accessed data; time of the day with user appointment information and device capabilities.

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DEDICATION

I dedicate this thesis to my father, Dr.Safdar Mahmood, a distinguished scholar and writer, who has always been a source of advice, inspiration, encouragement and motivation. I thank him for helping me to develop independent, creative and critical thinking.

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EQUATIONS

LIST OF ABBREVIATIONS

AVP	Adaptive Value-Based Prefetch Scheme
MARS	Mobility-Aware Cache Replacement
GPRS	General Packet Radio Service
WWW	World Wide Web
WLAN	Wireless Local-Area Network
GPS	Global Positioning System
SS	Support Station
MH	Mobile Host
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol
PDA	Personal Digital Assistance
AVP	Adaptive Value-Based Prefetch Scheme
GSM	Global System for Mobile Communication
UMTS	Universal Mobile Telecommunications System
MULTICS	Multiplexed Information and Computing Service
OBL	One Block Look-Ahead
MSHR	Miss Information Status Handling Register
MIME	Multipurpose Internet Mail Extensions
UML	Unified Modeling Language
URL	Uniform Resource Locator
ERD	Entity Relationship Diagram
OO	Object Oriented
LRU	Least Recently Used
DOM	Document Object Model
UP	Uniprocessor
TIP	Transparent Informed Prefetching
PDF	Portable Document Format
PPT	Power Point Document
UML	Unified Modeling Language