MOBILE USER BEHAVIOUR DETERMINATION IN WCDMA USING HIDDEN MARKOV MODELS

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By

UDAYA DAMPAGE

Supervised by: Professor Dileeka Dias

Department of Electronic and Telecommunication Engineering,
University of Moratuwa, Sri Lanka.

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DECLARATION

The work submitted in this dissertation is the result of my own investigations, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

UOM Verified Signature

Name of Candidate: S U Dampage

Date: 01st February 2007

I endorse the declaration by the candidate.

UOM Verified Signature

Name of each Supervisor: Professor Dileeka Dias

Abstract

The vision of this research paper is that the mobile phone is aware of its user's motion state and surroundings and modifies its behaviour especially the characteristics of Location-Based-Services based on this information. In the research it is evaluated and implemented, a methodology which can identify individual user states. This learning is expected to occur online and does not require any external supervision. The proposed system relies on Hidden Markov Modelling and Log Likelihood Method. The underlying assumption of the statistical model is that the signal can be well characterized as a parametric random process, and that the parameters of the stochastic process can be determined (estimated) in a precise, well defined manner. The basic philosophy of Hidden Markov model is that an observation sequence can be well modelled if parameters of a Hidden Markov Model are carefully and correctly chosen. The problem with this philosophy is that it is sometimes in accurate, either because the signal does not obey the constraints of the Hidden Markov Model, or because it is too difficult to get reliable estimates of all Hidden Markov Model parameters.The implementation of the methodology is performed by first training the Hidden Markov Model for the required number of speed states by the intended network trace. The log likelihood value of the data for each hidden markov model in the set is computed and identifies the motion state-speed, by choosing the Hidden Markov Model that produced the highest value. The method of maximum likelihood provided estimators that have both a reasonable intuitive basis and many desirable statistical properties. The main reason for the selection of maximum likelihood method is that it is very broadly applicable and simple to apply. The results of simulations indicate that the proposed method is able to assist to create a meaningful user context model at various propagation conditions defined by both 3rd Generation Partnership Project (3GPP) and Wireless World Initiative New Radio (WINNER) propagation scenarios while only requiring a network trace-i.e. a received bit length, without having an integrated sensor onboard cellular phone or any other wearable sensor device.

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