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MOBILE USER BEHAVIOUR DETERMINATION IN WCDMA USING HIDDEN MARKOV MODELS

A dissertation submitted to the
Department of Electronic and Telecommunication Engineering,
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Master of Engineering in Telecommunication

By

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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.

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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 inaccurate, 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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Table of Contents

| | |
|---|------------|
| Declaration | i |
| Abstract | ii |
| Acknowledgement | iii |
| Table of Contents | iv |
| List of Figures | vii |
| | |
| 1 Introduction | 1 |
| 1.1 Background and Context | 1 |
| 1.2 Scope and Objectives | 1 |
| 1.3 Overview of Dissertation | 2 |
| 1.4 An Overview of Mobile Location | 3 |
| 1.4.1 Classifications..... | 3 |
| 1.4.2 Problem of position estimation..... | 4 |
| 1.4.3 Types of Measurements | 4 |
| 1.4.4 Measures of Accuracy | 5 |
| 1.4.5 Limits on location covariance..... | 6 |
| 1.4.6 Positioning methods and statistical modelling | 6 |
| 1.5 An Overview of Location Based Services | 8 |
| 1.5.1 Classifications..... | 8 |
| 1.5.2 Location based Services..... | 9 |
| 1.5.3 Location Based Services Communication Model..... | 10 |
| 1.5.4 Key Implementation requirements..... | 11 |
| 1.5.5 Major Challenges..... | 12 |
| 1.6 Basics of WCDMA | 12 |
| 1.6.1 Introduction | 12 |
| 1.6.2 Basic concepts | 13 |
| 1.6.3 Channel Structure | 14 |
| 1.6.4 Channel Estimation..... | 16 |
| 1.6.5 Location techniques for UMTS | 16 |

| | |
|--|-----------|
| 2 Statement of Problem..... | 18 |
| 2.1 The Vision..... | 18 |
| 2.2 Problem Identification..... | 18 |
| 3 Survey of Previous Work..... | 20 |
| 4 Theoretical development..... | 23 |
| 4.1 Statistical Modelling..... | 23 |
| 4.2 Implementation..... | 23 |
| 4.3 Markov Property..... | 24 |
| 4.4 N-State Markov Model..... | 25 |
| 5 Proposed Methodology..... | 26 |
| 5.1 Process Summery..... | 26 |
| 5.2 Training of the hidden markov model..... | 26 |
| 5.3 Identification of state..... | 30 |
| 6 Simulation..... | 32 |
| 6.1 Assumptions..... | 32 |
| 6.2 Simulation of Physical Layer of 3G wireless system..... | 32 |
| 6.2.1 Basic Operation of Simulator..... | 33 |
| 6.2.2 The Uplink Simulator..... | 33 |
| 6.2.3 Simulation Parameters..... | 34 |
| 6.2.4 Simulator Output..... | 36 |
| 6.3 Simulation of Propagation Conditions..... | 36 |
| 6.4 Software Implementation..... | 37 |
| 7 Results and Analysis..... | 38 |
| 7.1 Results obtained for Specific cases defined in 3GPP and WINNER Propagation Conditions given in Paragraph 6.3..... | 39 |
| 7.1.1 Results obtained for Case-1, at a speed of 3 kmh with an Average Power of -10dB Error Sequence..... | 39 |

| | |
|--|-----------|
| 7.1.2 Results obtained for a Case-C1 Metropol at a speed of 70 kmh with an Average Power of -10dB Error Sequence | 41 |
| 7.1.3 Results obtained for Case-3 at a speed of 120 kmh with an Average Power of -3 dB Error Sequence | 43 |
| 7.2 Results obtained at intermediate speeds to check the reliability of proposed method..... | 46 |
| 7.2.1 Results obtained at a speed of 60 kmh with an Average Power of -10 dB Error Sequence..... | 47 |
| 7.2.2 Results obtained at a speed of 65 kmh with an Average Power of 0 dB Error Sequence..... | 48 |
| 7.2.3 Results obtained at a speed of 75 kmh with an Average Power of -10 dB Error Sequence..... | 49 |
| 7.2.4 Results obtained at a speed of 100 kmh with an Average Power of 0 dB Error Sequence..... | 50 |
| 7.2.5 Results obtained at a speed of 110 kmh with an Average Power of 0 dB Error Sequence..... | 51 |
| 7.2.6 Results obtained at a speed of 125 kmh with an Average Power of -3 dB Error Sequence..... | 52 |
| 7.2.7 Results obtained at a speed of 130 kmh with an Average Power of 0 dB Error Sequence..... | 53 |
| 7.3 Analysis..... | 53 |
| 7.4 Evaluation..... | 54 |
| 7.5 Applications..... | 56 |
| 8 Conclusion..... | 58 |
| 8.1 Summary | 58 |
| 8.2 Future Work..... | 58 |
| References | 60 |

List of Figures

| | | |
|----|---|----|
| 1 | LBS Communication Model..... | 10 |
| 2 | Signal Spreading and Correlation in WCDMA | 14 |
| 3 | WCDMA Channel Structure..... | 15 |
| 4 | A Hidden Markov Model..... | 24 |
| 5 | Computation of forward variables..... | 27 |
| 6 | Computation of backward variables | 28 |
| 7 | Variation of Normalized Error with Number of Bits..... | 40 |
| 8 | Variation of Resolution with Number of Bits..... | 40 |
| 9 | Variation of Resolution with Number of Bits..... | 42 |
| 10 | Variation of Resolution with Number of Bits | 44 |
| 11 | Variation of Magnitude of Error with Speed of Mobile Station..... | 45 |

performance. Commercial systems are being built from the existing networks. There is a need for identification of high accuracy methods combining various techniques. This book will be used as a reference for mobile positioning technology in the context of the development of wireless emergency services.

1.1 Background and Context

1.1.1 Objective and Scope

The objective of this research is to provide a simple, practical, and computationally efficient method for the determination of user location. The focus is on mobile, roaded speed limits for vehicles up to 200 km/h. The method is designed to be implemented on a mobile phone. The method is designed to be implemented on a mobile phone. The method is designed to be implemented on a mobile phone.

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