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INTELLIGENT M-GOVERNMENT SERVICES: A MOBILE-BASED EMERGENCY RESPONSE SYSTEM

A thesis submitted for the degree of Doctor of Philosophy

By

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Certificate of Authorship

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Abstract

Recent advances in Internet technologies and services have allowed governments to deal with their citizens in a new way, through mobile platforms. The use of mobile technologies assists people by providing access to information anytime and anywhere. The demand for better, more efficient and more effective government services will put serious pressure on the government with regard to m-Government. m-Government is the next inevitable direction of the evolution of e-Government.

In an emergency response system, mobile technology can be used to link citizens, businesses and non-profit organisations. For example, in an emergency situation such as the 9/11 terrorist attack, mobile technology can be used to enhance productivity, connectivity and response and facilitate rapid access to information anytime and anywhere. This was the impetus of this research into emergency response systems based on mobile technology.

A mobile-based emergency response system (MERS) is as one of the important new services of m-Government. It aims to support people (mobile users) in emergency situations through their mobile phones by giving them access to essential advice and information. It also provides information to the government to reduce risks. The main goal of this study is to make use of mobile technology to assist in information dissemination and decision making in response to disasters anytime and anywhere. Design research methodology is employed to address the primary research question: How can m-Government be used for dealing with emergency response systems?

This research presents an MERS framework that has five main components—register, monitoring, analysis, decision support and warning—aiming to provide a new function and service to m-Government. The proposed framework would also offer a new opportunity for interaction among government, citizens, responders and other non-government agencies in emergency situations.

According to this MERS framework, relevant information system techniques (algorithms and approaches) were developed to support the most important applications for the MERS. These applications are ontology-based information extraction (OBIE) and aggregation and an ontology-supported case-based reasoning (OS-CBR) approach for the MERS. OBIE has four main functions: to collect unstructured information from short message service (SMS) emergency text messages; to conduct information extraction (IE) and aggregation including lexical analysis, name entity recognition, merging structure, normalisation and duplication; to calculate the similarity of SMS text messages; and to generate query and results presentation. The OS-CBR approach consists of four main functions: data acquisition, knowledge base, case-based reasoning (CBR) component, and knowledge presentation.

More important, a MERS prototype system has been designed and developed in this study. Experiments conducted to evaluate the major algorithm, approach and prototype system show that MERS, as an implementation of the IE algorithm and OS-CBR approach, is an effective means of classification in terms of precision, recall, F-measure and overall accuracy.