Semantic-Enhanced Hybrid Recommender Systems for Personalised E-Government Services

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CERTIFICATE

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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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To My Family,

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ABSTRACT

E-Government is becoming ever more active in terms of improving the provision of services to citizens from a citizen-centred perspective, in which online services and information are delivered to citizens on a personalised basis. Some developed governments have started to offer personalised services through their official portals. However, the personalised services that are offered are mostly limited to static customisation and are therefore far from achieving effective citizen-centred e-Government services. Furthermore, delivering personalised online services that match the different needs and interests of government users is a challenge for e-Government, specifically in connection with the increasing information and services that are offered through the medium of government portals. Therefore, more advanced and intelligent e-Government systems are desirable.

Personalisation techniques, particularly in the form of recommender systems, are promising to provide better solutions to support the development of personalisation in e-Government services. Furthermore, semantic enhanced recommender systems can better support citizen-centred e-Government services and enhance recommendation accuracy. The success of semantic enhanced hybrid recommendation approaches and the citizen-centric initiative of e-Government have fostered the idea of developing personalised e-Government recommendation service systems using semantic enhanced hybrid recommender systems. Accordingly, the effectiveness of utilising the semantic knowledge of e-Government services to enhance the recommendation quality of offered services is addressed in this thesis.

This thesis makes five significant contributions to the area of e-Government personalised recommendation services. These contributions are summarised as follows: (i) the thesis first proposes a general framework for offering personalised e-Government services from a citizen-centred perspective based on the available user profiles information and semantic knowledge of a specific e-Government domain of interest; (ii) based on this general framework, a personalised e-Government tourism service recommendation framework is also proposed and considered as a target domain in this research study; (iii) new semantic enhanced hybrid recommendation approaches are

developed to support the implementation of the recommendation generator engines of the proposed e-Government frameworks. The recommendation generator engines represent the core components of the proposed frameworks; (iv) new semantic similarity measures based on semantic knowledge of a target domain ontology are proposed to effectively evaluate the similarity between e-Government service items. The new semantic similarity measures are incorporated within the proposed hybrid approaches to improve the quality and accuracy of recommendations and to overcome the limitations of existing hybrid recommendation approaches; and (v) a switching semantic enhanced hybrid recommendation system is further proposed to enhance the overall quality of recommendation, address the sparsity, the cold-start user and item problems.

Experimental evaluations of the proposed semantic enhanced hybrid recommendation approaches and switching system, on a real world tourism dataset, show promising results against state-of-the-art recommendation approaches in terms of the quality of recommendations, capacity to alleviate the sparsity, cold-start item and user problems.