NOTICE OF
UNIVERSITY ORAL

GEODESY AND GEOMATICS ENGINEERING

Master of Science in Engineering

Rajesh Tamilmani

Tuesday, December 19, 2017 @ 10:00 am

Head Hall – Room E-11

Board of Examiners:	**Supervisor:**	**Dr. Emmanuel Stefanakis, Geodesy & Geomatics Eng.**
	Examining Board:	**Dr. Ian Church, Geodesy & Geomatics Eng.**
		Dr. Suprio Ray, Faculty of Computer Science
	Chair:	**Dr. Robbie Kingdon, Geodesy & Geomatics Eng.**

SEMANTICALLY ENRICHED MODELLING, ANALYSIS, AND VISUALIZATION OF SIMPLIFIED LINEAR FEATURES AND TRAJECTORIES

ABSTRACT

Multi-Scale maps provide a method of abstracting geographic features at different granularities. Polyline geometries are used to represent linear features, such as roads, rivers, and pipelines on maps. Map generalization processes are in use to represent these features either at different scales. Specifically, original geometries representing linear features at a large scale can be abstracted using a line simplification process. However, the simplification process may result in losing semantic attributes associated with the original geometries. This occurs as line simplification eliminates a series of points from the original geometries that contain attributes or characteristics relevant to the application domain. For example, points on the road network can contain information about accumulated length of the road, positional velocity, speed limit or accumulated gas consumption. This study adopts the SELF (Semantically Enriched Line simpliFication) data structure to preserve the length and other semantic attributes associated with individual points on linear geographic features at different granularities. SELF data structure has been implemented in PostgreSQL 9.4 with PostGIS extension and tested for both synthetic and real linear features such as rivers and pipelines. Further, Synchronized Euclidean Distance (SED) based simplification has been implemented to consider the temporal dimension of trajectories. The SELF data structure is built to preserve semantic attributes associated to individual points on original trajectories. Subsequently, a graph data model has been proposed to combine the simplified geometry of trajectory and the semantics lost during the simplification process. Original trajectories are simplified based on Synchronized Euclidean Distance (SED) and the Semantically Enriched Line simpliFication (SELF) data structure is built to preserve the semantics along with the simplified trajectories. These are modelled in terms of nodes and edges into Neo4j graph database for performing trajectory data analysis. Finally, a visualization tool has been developed on top of Neo4j graph database to support the semantic retrieval of trajectories at different granularities. Historical vessel trajectories were used to test the SELF structure at various levels of simplification. The simplified versions of these trajectories along with their semantics were modelled, analyzed and visualized in Neo4j using Cypher query language and Neo4j spatial procedures.

Faculty Members and Graduate Students are invited to attend this presentation.