PhD Lecture

In partial fulfillment of the terms for obtaining the PhD degree, Tanvir Ahmed will give a lecture on the following subject:

Analytics on Indoor Moving Objects with Applications in Airport Baggage Tracking

on Tuesday 24th of May 2016, 13:00, in room 0.2.90 at Selma Lagerlöfs Vej 300

Abstract:

A large part of people's lives are spent in indoor spaces such as office and university buildings, shopping malls, subway stations, airports, museums, community centers, etc. Such kind of spaces can be very large and paths inside the locations can be constrained and complex. Deployment of indoor tracking technologies like RFID, Bluetooth, and Wi-Fi can track people and object movements from one symbolic location to another within the indoor spaces. The resulting tracking data can be massive in volume. Analyzing these large volumes of tracking data can reveal interesting patterns that can provide opportunities for different types of location-based services, security, indoor navigation, identifying problems in the system, and finally service improvements. In addition to the huge volume, the structure of the unprocessed raw tracking data is complex in nature and not directly suitable for further efficient analysis. It is essential to develop efficient data management techniques and perform different kinds of analysis to make the data beneficial to the end user.

The Ph.D. study is sponsored by the BagTrack Project (http://daisy.aau.dk/bagtrack). The main technological objective of this project is to build a global IT solution to significantly improve the worldwide aviation baggage handling quality. The Ph.D. study focuses on developing data management techniques for efficient and effective analysis of RFID-based symbolic indoor tracking data, especially for the baggage tracking scenario. First, the thesis describes a carefully designed a data warehouse solution with a relational schema sitting underneath a multidimensional data cube, that can handle the many complexities in the massive non-traditional RFID baggage tracking data. The thesis presents the ETL flow that loads the data warehouse with the appropriate tracking data from the data sources. Second, the thesis presents a methodology for mining risk factors in RFID baggage tracking data. The aim is to find the factors and interesting patterns that are responsible for baggage mishandling. Third, the thesis presents an online risk prediction technique for indoor moving objects. The target is to develop a risk prediction system that can predict the risk of an object in real-time during its operation so that the object can be saved from being mishandled. Fourth, the thesis presents two graph-based models for constrained and semi-constrained indoor movements, respectively. These models are used for mapping the tracking records into mapping records that represent the entry and exit times of an object at a symbolic location. The mapping records are then used for finding dense locations. Fifth, the thesis presents an efficient indexing technique, called the *DLT-Index*, for efficiently processing dense location queries as well as point and interval queries. The outcome of the thesis can contribute to the aviation industry for efficiently processing different analytical queries, finding problems in baggage management systems, and improving baggage handling quality. The developed data management techniques also contribute to the spatio-temporal data management and data mining field.

Members of the assessment committee are Associate Professor Alberto Abello, Polytechnic University of Catalonia (UPC), Spain, Associate Professor Peer Christian Kröger, Ludwig Maximilian University of Munich (LMU), Germany, and Associate Professor Kristian Torp, Aalborg University. Professor Torben Bach Pedersen, Aalborg University, Associate Professor Hua Lu, Aalborg University, and Associate Professor Toon Calders, Université Libre De Bruxelles are Tanvir Ahmed's supervisors. Moderator is Associate Professor Christian Thomsen.

All interested parties are welcome. After the defense the department will be hosting a small reception in cluster 3.