NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

PH.D DEFENCE - PUBLIC SEMINAR

Title: **SMARTPHONE-BASED DECENTRALIZED PUBLIC-TRANSPORT APPLICATIONS**

Speaker: Mr Kartik Sankaran

Date/Time: 23 November 2015, Monday, 03:00 PM to 04:30 PM

Venue: Executive Classroom, COM2-04-02

Supervisor : Dr Chan Mun Choon, Associate Professor, School of Computing

Abstract:

Transportation is the lifeline of a country. Population growth has put a strain on road networks, causing delays due to congestion, particularly in cities of developing countries. Use of public transport such as buses and trains is critical to reduce road congestion and improve overall efficiency of the transport system. Smartphone-based applications that provide users with information about transit routes, transit stops, and estimates of travel time during public transport journeys are the key to make users choose public transport over the convenience of a car. Existing smartphone-based applications make strong assumptions about the availability of cellular data connectivity and route maps, and fail to work in developing countries where these are often unavailable. These applications also typically track user location, causing concerns about privacy and battery consumption, leading users even in developed countries to turn off these applications.

In this thesis, we propose new techniques for building public transport applications on smartphones that are decentralized, and do not require cellular data or information from route maps. We use a new sensor modality - the barometer - together with local collaboration between users in the same bus to tackle the key challenges of context detection, route and transit-stop detection, and deployment of applications. Our system makes only few assumptions about infrastructure, enabling it to work even in developing countries where other approaches fail. Since our system uses the barometer instead of location sensors, it reduces concerns about location privacy and has lower power consumption, encouraging even users in developed countries to use such applications. The use of the barometer also makes the system largely independent of user hand movement and phone placement, removing the need for training typically required by other systems.

This thesis work is the first in the literature to implement use of only the barometer sensor for public transport applications, and is the first to show that smartphone-based public transport applications can work even with limited infrastructure. It paves the way for future

research work in building infrastructure-'less' smartphone applications.