Master thesis projects on “Traffic Management System” within the RaMSiS group

Three master thesis projects:

1) Mobile phone based user application
2) Algorithm and Software for Route Guidance
3) Traffic Database Management Software

are open for our research project “Real-Time Traffic Management System using SDR Technologies”. This project is a continuation of Traffic Management System Demonstrator that has been developed for the Smart Radio Challenge organized by SDR Forum (for details please visit: http://www.kth.se/ict/om/2.2130/1.13207). The students will have the opportunity to do a thesis project working closely with the PhD students and seniors from our research group.

If you are interested in one of this thesis projects please send your application to the Project Leader, Dr. Ana Rusu (http://web.it.kth.se/~arusu/) at: arusu@kth.se, no later than February 28, 2009. Please use the reference: Traffic.

The application should contain: a cover letter; Curriculum Vitae; transcripts (from KTH and/or previous universities). Candidates should have good programming skills (Java or/and C++) and very good communication skills including a firm command of the English language.

MS Theses description

Background:

The final goal is the development of a novel real-time traffic management system exploiting state-of-the-art wireless technology. Our vision is based on the notion that existing wireless infrastructures can and should be "upgraded" to enable seamless integration of such real time traffic management system. The proposed research is an attempt to develop and validate the tools necessary for such an upgrade to become a reality.

The main objectives of the proposed Real-Time Traffic Management System are: 1) to integrate the traffic management network with available commercial communication networks and maximize use of existing infrastructure, and 2) to make the subscriber unit available as a software application that runs on the user’s mobile phone. The main goal is providing vehicles with user specific, on demand route guidance based on real-time traffic information.

The main tasks performed by the proposed Real-Time Traffic Management System are: the traffic information gathering and processing, best route calculation and route guidance. These operations are supported by an efficient communication system and a database management system.

The on-board system will be integrated with a mobile phone allowing to access both commercial and unlicensed bands for optimal performance adapted to user needs. Moreover, the integration with GPS units allows the replacement of the sensor network with autonomous sensors reporting to traffic management software integrated into base stations of commercial mobile service providers.

The final solution should take into account the trade-offs between users’ privacy, data accuracy and cost of data collection, where the user’s mobile phones should have the possibility to control the service. The developed components will be validated in a small size demonstrator.
1) Mobile phone based user application

Goal:
Tracking vehicles position and velocity in real-time, maintaining user privacy.

Problem statement:
This thesis work includes the following tasks:
- Investigation of the existing solutions based on GPS-enabled mobile phones
- Development of the algorithm and software (Java or C++) for controlling the GPS
- Establishing a wireless connection to send the traffic data depending on the availability of a network WLAN/GSM/UMTS
- Establishing a TCP IP communication (for opening the communication to the internet)
- Developing a MMI (Man Machine Interface) that includes plotting information on Google maps such as current position, desired destination, and suggested route.

Students for this project are expected to have good programming skills (Java and C++).

2.) Algorithm and Software for Route Guidance

Goal:
The best route to take between the present position and the destination in the present traffic conditions.

Problem statement:
This thesis work includes the following tasks:
- Investigation of current solutions for efficiently representing the roads as programming objects.
- Investigation of the existing vehicle traffic management solutions and propose a solution taking into consideration the problems, challenges, limitations
- The processing algorithm uses data that are sent from GPS-enabled mobile phones and other traffic sources.
- Development and implementation of a best route calculation and route guidance algorithm, including traffic conditions information (using C++ or Java)

Students for this project are expected to have good programming skills (C++, Java)

3) Traffic Database Management Software

Goal:
A Central Management Unit (CMU) located on the traffic database server performs the best route calculations and answers the queries of the vehicles subscribed to the system.

Problem statement:
This thesis work includes the following tasks for the traffic database management system:
- Investigation of the existing solutions and propose a solution to manage large database (around 10,000 cars)
- Implement and test the software and interface; validate the software together with the other components in a small size demonstrator
- The CMU should include the TCP-IP connectivity (for moving data from mobile phone to CMU) and also should show the vehicle positions on the Google map.

Students for this project are expected to have good programming skills (C++, Java, Visual Basic).