From 19th to 25th July 2012, three second year EE students (Ngyuen Anh Tuan, Wang Siqi & Xu Yang) under the supervision of Assistant Professor Akash Kumar and Dr Rajesh C Panicker participated in Intel Cup Undergraduate Electronic Design Contest Embedded System Design Invitational Contest in Shanghai Jiaotong University, Shanghai. The motivations behind the competition are to promote the awareness and interest from undergraduate student on embedded system design and look for possible technical solutions to various practical problems. In the competition, students have the freedom to demonstrate any design based on the Intel atom board provided by the organizing committee. This year was the 6th batch of the competition, where over 150 teams participated in the competition. While most teams were from renowned universities in mainland China, there were also 15 overseas teams from 9 different countries such as Singapore, Mexico, Russia, and India. Our team received the first prize in the competition.

Our students built an indoor navigation system called InSINQ (intelligent system of inertial navigation using QR-Codes) based on the given atom board. This system was designed to provide indoor navigation function in buildings where the GPS signal is blocked. The main navigation algorithm was built up by two sections – inertial navigation algorithm and QR-code error correction. For the inertial navigation algorithm, accelerometer and gyroscope were used to detect the number of steps and the orientation of the user. Kalman filter and Madgwick's orientation filter were implemented to eliminate noise from the sensors. In addition, information of absolute positions in the building is encoded in the QR-Codes pasted inside the building. As the user walks around, a camera keeps tracking QR-codes, and updates the new location when it finds one. By integrating both the inertial navigation algorithm and QR-code error correction methods, a precise indoor navigation system is developed.

A voice assistance system by using voice recognizer and synthesizer is also developed, so that the visually impaired can also use our system. The whole system is developed in Matlab code, and two inertial sensors and a camera are all mounted on a cap. A short video of the system is available at http://youtu.be/VPMrcuANeFU.