Proposal for a Master Thesis at the Chair of Robotic and Embedded System

A wifi communication in a heterogeneous platform

**Advisors:** Biao Hu  
Dr. Kai Huang

**Professor:** Prof. Dr. Alios Knoll
**Project Description**

In the context of TU9 project, research at the Institute of Robotics and Embedded Systems is dealing with the challenge of providing high-performance ECUs as an enabling technology applicable in the automotive field, which will be a heterogeneous system with multi-core CPU, FPGA, and GPU.

A typical application of ECUs in car is to avoid driving accidents. Lane detection is a technology that can detect the lane markings on the road using mainly, image processing techniques on the images captured from a camera on board automobiles. This can help in developing warning systems to alert a driver of an impending accident. This is particularly a challenging problem due to varying light conditions, traffic on the road that obstructs the lane markings, the shadows cast by buildings or trees. A possible solution is that we use FPGA to accelerate the computing of lane detection, thus reducing the computing burden on main processor [1].

![Figure 1: The platform of lane detection system](image.jpg)

Now we have built a embedded FPGA and CPU platform, which can run the lane detection. The next step is that we want to implement the lane detection in a smart phone. As shown in Fig. 1, the smart phone is used to capture the road image with the camera in the phone, then the images are transferred to an CPU and FPGA board via wifi. After the image processing in the board, the processed images are sent out to the smart phone. Then, on the screen of this smart phone, the road image whose lanes are marked is shown.

The project will include the following phases:
• Be familiar with the current programming environment.

• Investigate how to build the wifi communication system between smart phone and this board.

• Debug the lane detection to conveniently run this application.

This work will be carried out in TU9 project to which the Institute of Robotics and Embedded Systems is contributing in terms of hardware and software design and performance analysis.

Kind of Work

• 10% theory

• 40% implementation

• 30% evaluation

• 20% documentation

Tasks

• Implement the online lane detection on smart phone by the support of the Altera board.

• Build the wifi communication system, and make it can run conveniently on every smart phone.

Contact

Biao Hu          Dr. Kai Huang
MI 03.07.059     MI 03.07.042
hub@in.tum.de    huangk@in.tum.de
Phone: +49.89.289.18128 Phone: +49.89.289.18111

References