Mark Reynolds and Arif Mahmood

Title: Automatic Scene Measurements using a Video Camera with Partial Calibration

Automatic scene measurements have wide range of applications including computation of 3D scene structure, autonomous robot navigation, and human activity recognition. Some recent work have proposed techniques for estimating heights and lengths from video without any camera calibration information. We think that estimates can be improved greatly by using, in addition, some quick and easy (pre or post) calibration techniques such as measuring a few lengths in the background scene. This project is to develop and test some basic approaches using different combinations.
Experience with Matlab and/or C++ beneficial. The project will use Linear Algebra, Analysis of Vector Geometry and standard image processing functions.

Mark Reynolds and Arif Mahmood

Title: Mobile Phone Based Hand Held Scanner

Most of the high end mobiles have a built in camera. In this project student will develop an application to use the mobile phone camera as a document scanner. Commonly used document scanners are a separate hardware customized for normally used page sizes. For larger pages, larger scanners are required which are much more costly. Also many documents of historic importance cannot be handled or even touched. This project will enable scanning page of any size without physically touching the documents. This is a research and development based project. Experience with Matlab and/or C++ beneficial. The project will use Linear Algebra, Analysis of Vector Geometry and standard image processing functions.

Prof Mark Reynolds and A/Prof Tim French

Title: Simulation and exploration of hybrid systems via automata.

Hybrid systems are dynamical systems that have both discrete and continuous components. A simple example might be a thermostat which has discrete aspects (whether the heater is on or off) and continuous aspects (the current temperature). Hybrid systems can be used to formally model the way a discrete controller interacts with a continuous environment, and formally verify certain safety properties of that system.
This project will look at modelling hybrid systems from various domains, using automata, and formulating and checking basic safety properties. Suitable domains could include mechatronic systems (such as cruise control, or anti-lock brakes), fluid systems (such as batch plant control), or discrete event systems (such as train gate controllers).
A successful project will build one or more such models, and assess the feasibility of verifying several important safety properties of the system.

Robot to go and have a look

Prof Mark Reynolds, Assoc/Prof Du Huynh, Asst/Prof Wei Liu

In many security, remote and industrial monitoring situations, successful automation will depend on a smooth combination of sensing, artificial intelligence and robotic investigative action. In order to make progress in integration of these technologies for such applications, this project will consider a fairly simple but typical scenario in which a system will decide when and how to dispatch a robot to investigate problematical sensor data. In this case, a camera vision system will be used to identify problems in terms of the arrangements of objects in a room. The system will use wireless communication with a mobile robot with its own cameras and other sensors to investigate the situation and clearly identify whether there is a serious problem. The student will primarily be involved in designing and implementing a way for the vision, AI, communication and robot movement modules to work together reliably. Skills in Java and/or C++ programming are recommended.