Hand Tracking in Uncontrolled Environments

The process of communication is to transfer information from one entity to another. Hand gestures are powerful human-to-human communication channels, which form a major part of information transfer in our daily life. The user experience of using digital devices would be largely enhanced if all digital devices are able to interpret human hand gestures. Hand Gesture Recognition (HGR) is a research area dedicated to recognising human hand gestures from still images and video sequences using computers. As any other research areas of Pattern Recognition, the main process of hand gesture recognition also consists of two parts, namely feature extraction and classification. This mini project is focusing on the first part, the extraction of hand trajectory features.

Although HGR is one of the most promising Human Computer Interaction (HCI) methods, the challenges from uncontrolled environments are the main obstacles that prevent the widespread deployment of HGR systems. The challenges include: changing of lighting condition, complex background, gesture performers wearing short sleeve tops, hand/face overlapping, hand out of scene, pause during gesture, moving objects in the background and large skin-coloured region in the background, etc. The main objective of this mini project is to develop a hand tracking scheme to overcome one or a few challenges listed above using ordinary cameras. The developed method should be able to extract the trajectory of target hand performing in uncontrolled environments with the presence of single or multiple challenges. The student will be working on Warwick Hand Gesture Database (created by Digital Forensics Lab in our department) or Palm Graffiti Database from Boston University.

Fig.1: Samples of Palm Graffiti Database (left) and Warwick Hand Gesture Database(right)

There are many existing methods for hand tracking and hand segmentation. However, the majority of these methods are only applicable in controlled environment. If combined with suitable classifier, this mini-project can lead to a PhD topic in Hand Gesture Recognition.