A Facial Gesture Recognition System

The goal of this project is to design, build and evaluate a low-cost computer- and/or Web-based facial gesture recognition system. As in the project above, the system, while stand-alone, should be designed so that it could be incorporated into Freddie. Specific deliverables include a comparison of various low-cost input devices such as Webcam, Kinect, etc., and using the selected device to design and implement a simple system that can recognize some simple facial expressions such as smiling, frowning, and gazing at the input device. This facial gesture recognition module is envisioned to be part of a larger-scale system for many useful applications, for instances, an interactive robot for improving the communication skills of people with autism, an assistive tool for controlling the home interior environment for the elderly, or a validation device for allowing security access to sensitive areas. Primary Contact Person: If you are interested, please contact Dr. Kin Fun Li via email (kinli@uvic.ca)

An Assistive Monitoring System for Seniors

Many senior people live by themselves. In case of emergency such as falling or slipping, they may not be able to contact their relatives or friends. This project deals with the design and implementation of an assistive monitoring system for the seniors. Technical aspects of the project include video and audio hardware, and event detection with software, using cameras, microphones, and the Internet. Non-technical aspects to consider include privacy and user acceptability. An ideal deliverable would be a mobile app that one can monitor and view a subject’s home in real time, as well as notification based on image analysis for certain critical events. Primary Contact Person: If you are interested, please contact Dr. Kin Fun Li via email (kinli@uvic.ca)

Robotic Butler Program

These projects will be a component of our Robotic Butler Program. The goal of this program is the development of a robotic butler, “James”, that is designed to: (i) increase the independence and quality of life of disabled users (both in the home and in institutional setting) and (ii) provide assistance/support to caregivers and healthcare professionals. We have built a highly sophisticated and robust prototype of a mobile platform (designed to operate indoors or outside) that can either move autonomously or be controlled (even remotely) by a user. The platform is designed to accommodate a suite of interchangeable “plug and play modules” mounted on a motorized lift. These will perform specific tasks. For example, opening doors and pushing buttons, positioning trays, establishing video calls, operating a camera, carrying groceries. The idea being that “James” could, for example, be used to deliver pills and or water to user at different times of the day. Alternatively, a user can “call” James at any time to, for example, establish a video connection so that he or she can chat with a friend or family member. Primary Contact Person: If you are interested, please contact Dr. Nigel Livingston via email (njl@uvic.ca)

On board water delivery system

This will be designed to be used by individuals with very limited mobility. A cooled water reservoir (approximately 8 liters) will be mounted on the dolly. This water will be delivered to a cup sized vessel containing a plastic straw or tube. The user will either suck water through the straw from the container or will use a pump to draw water from the container to his or her mouth.
An onboard manipulator will position the straw close to the user’s mouth. Students will be responsible for the design of the cooling system and the controls for the vessel/straw positioner and manipulator. Primary Contact Person: If you are interested, please contact Dr. Kin Fun Li via email (kinli@uvic.ca)

**Button pusher/door opener**

Student will be responsible for the design of the electronics/controls of the motors/manipulators/sensors used in a module to open doors and or press buttons (for example to open automated doors or to operate an elevator. Primary Contact Person: If you are interested, please contact Dr. Kin Fun Li via email (kinli@uvic.ca)

**Smart Campus Design and Development**

With the advances of communication and information technologies, many cities and campuses have initiated projects to develop smart environment that can assist citizens to perform various tasks and to maintain their personal wellbeing. The primary objective of this project is to provide a smart environment for the University of Victoria campus. Using the latest technologies such as GPS, RFID, smart Grid, etc., a Smart UVic system (aka SUVs) is to be designed and developed in a cost-effective fashion. Services offered as apps on smart phones may include building directory, route planning, emergency planning, people lookup, university announcement, etc. Primary Contact Person: If you are interested, please contact Dr. Kin Fun Li via email (kinli@uvic.ca)

**MedWatch**

Description: Objective of the project is to develop an interactive watch face for Android Wear or Watch OS (and backend services) that aids the wearer with medication adherence. Primary Contact Person: If you are interested, please contact Dr. Jens Weber via email (jens@uvic.ca)

**Smart Home**

In a smart home, one can control and monitor various devices such as lights, thermostats, appliances, security systems, etc., through mobile phone apps or web apps. Students can choose to design a smart hub that controls a few gadgets, or individual smart devices such as smart power plug, smart lock, smart thermostat, smart LED, etc. This project will involve hardware design, firmware design and app development. Primary Contact Person: If you are interested, please contact Dr. Xiaodai Dong via email (xdong@ece.uvic.ca)

**Real Time Wireless ECG**

The objective of the project is to design a wireless personal ECG monitoring system that is capable of recording and transmitting a patient’s ECG sensor signal wirelessly in real time to his/her smartphone and further to a monitoring center. The system consists of two parts: a Band-Aid like disposable ECG sensor with Bluetooth low energy transmitter wearable by a patient, and a smartphone application that enables the receiving of the ECG signal through its Bluetooth device, performs ECG analysis and retransmits the ECG data through cellular network to doctors, family members, monitoring centers, etc. The ECG sensor/transmitter development involves hardware and circuit board design, while the smartphone application development involves mainly software and digital signal processing. Primary Contact Person: If you are interested, please contact Dr. Xiaodai Dong via email (xdong@ece.uvic.ca)
Virtual Power Lab

The objective of the project is to design a virtual power lab that allows users to perform experiments on different types of motors and drives. MATLAB SimScape will be used to build the virtual power lab. Primary Contact Person: If you are interested, please contact Dr. Ilamparithi via email (ilampari@uvic.ca)

Automating the collection of bird data from video footage Background

In Canada, the Chimney Swift is listed as a threatened species following extensive population declines since the 1960’s. As their name suggests, chimney swifts use chimneys for both nesting and roosting. Chimney Swifts winter in South America and migrate to the United States and Canada to breed. During migration, large numbers of chimney swifts may roost communally at a single chimney. Sault Ste Marie, Ontario, hosts one of the largest roosting populations of the threatened Chimney Swift in Canada. In Sault Ste Marie, swifts use two large chimneys for roosting, and up to 2700 swifts per night have been observed using these chimneys during spring migration. In 2014, Algoma SwiftWatch was established to research and raise awareness of Chimney Swifts in Sault Ste Marie. Hikvision video cameras were installed at two chimneys to monitor roosting behaviour and to aid daily population counts. At each chimney, both the outside and the inside of the chimney are video-monitored. One camera is mounted inside the chimney (at the top and looking down into the chimney), and a second camera is mounted outside the chimney (on the roof and looking at the chimney). The cameras continuously record from 1st May - 31st August each year in color during daylight hours and in infrared during low light conditions. Video is typically 1920 x 1080 and either 30fps or 15 fps. Project requirements Currently, video is interpreted manually to (a) count birds entering and exiting the chimney and (b) to describe roosting behaviour. However, manual interpretation is extremely labour intensive and can be monotonous for interpreters, as there are often extended time periods when there is no bird activity. Instead we require an automated procedure that will complete these tasks, or will identify a subset of video footage for manual interpretation. As a first step we require a computer vision approach that will:

1. Identify points in time (hour:minute:second) when swifts are (a) entering or (b) exiting the chimney for each day of the year (year:month:day); and
2. Count the number of swifts (a) entering or (b) exiting the chimney at a given time point (Hour:Min:Sec).

The computer vision approach will preferably:

1. Use opensource software such as OpenCV or SciKit and python language; and
2. Run on a home computer.

Primary Contact Person: If you are interested, please contact Dr. Alexandra Branzen Albu via email (aalbu@uvic.ca)