**Human Centered Interface Development**

*Presentation given by Anil Raj, M.D.*

October 25, 2013

Doctor Anil Raj who graduated from the University of Michigan School of Medicine in 1990 is a scientist studying automated systems that utilizes tactile interfaces for humans. He studies techniques to interface these tactile systems with humans to help with them live their daily life. Most of the time people use visual aids as their primary sensory system. Dr. Raj is attempting to train people to use more than simply their vision by using their other sensory system with the use of technology. His studies mainly focus on using the touch sensory system but also include the audio sensory system.

One area of study that Dr. Raj focuses his research is anthro-centric multisensory interface which he is attempting to improve the communication gap between human and technology. This technique involves developing technology to interact with a person based upon the action of the person. An example of where this technology would be useful is with the automated telephone support system that many companies use for their customers. It is often helpful in these situations if an automated system can interact better with the person.

One technique of developing this interaction with humans and technology is through substitution that focuses on providing specific sensory systems over other sensory systems at specific times. An example is installing a microphone on the outside of an automobile and speakers on the inside of an automobile and the system would alert the driver of the vehicle in an emergency vehicle is approaching. Also the use of transposition of using the same sensory systems but using receptors to amplify the sensory system is another technique that is being researched. Finally there is replacement in which a damaged sensory system can be artificially replaced to be able to use the sensory system again. An example of this technique is the replacement of a damaged eye or implants to help recover the visual sensory system. There is also research in adaptive multi-agent integration in which one sensory system will be converted into another sensory system but only when it is required.

Dr. Raj focuses on using these techniques to improve both normal and diminished conditions of humans. One physical device that can be used is an abdominal vest that people wear to improve their sensory system. It is helpful to blind people in order for them to be able to navigate on a computer system. The vest however does have its limits because there are not enough sensory receptors on the stomach to provide enough feedback, especially with moving motions. Another device that helps to improve on this limitation of the vest is a tongue tactile feedback device. The tongue has more sensory receptors on it than some other parts of the human body.

This research being done by Dr. Raj helps to improve pilot errors in simulators and in flying airplanes. The use of the tactile system is also being used to improve the other sensory system of blind people and the walking balance of people with hearing problems. His research helps with automating airplane drones so fewer people have to fly the aircraft. Dr. Raj also works with surgical doctors to help them perform human surgeries with more accuracy and precision. Automotive racing also use tactile systems to improve driver safety in racing. These tactile devices to improve the communication gap between humans and technology are extremely helpful in the everyday life of people.

Daniel Davis & Cole Amick