WERCware Collaboratory

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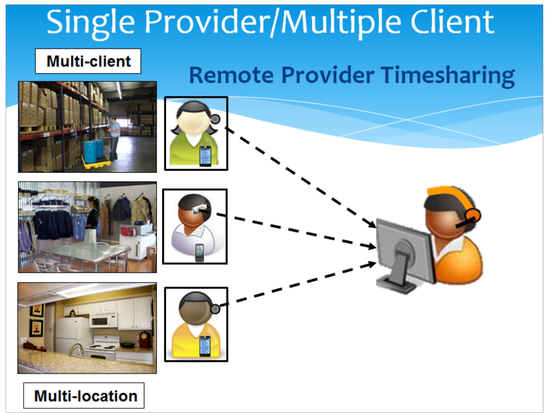
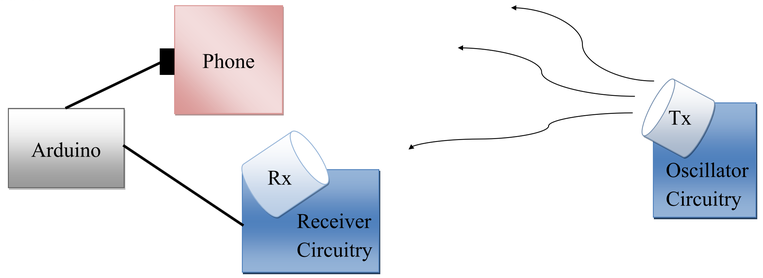
Introduction

The **W**ireless **R**emote **E**nabled **C**o-presence project (**WERC**ware) is for people who need the aid of life-coaches. The goal is to enable the coaches to help their clients from afar. WERCware will help keep from fostering dependency, and may also offer fading tutorials to help teach the clients. This year we have worked on: (1) developing a shut-off solution, a back-up method to automatically turn off video and audio in areas requiring privacy, in case the client forgets; (2) investigating ways to help the coach anticipate a client's level of stress.



Results: Shut-off Solution

To find the best option for automatically shutting-off the smart phone in private areas, I researched various technologies to find the best one for our project. During the research phase, we considered Tōd, Infra-red, Sonic Pulse, and RFID technologies. Tōd would have had to be reprogrammed to fit our needs, and it was not contained by walls, so it would have been difficult to implement it. The Tōd app was also not compatible with the phone which we have for prototyping. The RFID readers are really expensive. There would also have been some difficulty in having multiple readers or tags in the vicinity, as multiple signals, or tags, could create inaccuracies. Infra-red needs direct line-of-sight and is susceptible to interference (from other electromagnetic waves) and light noise (from sun and certain light bulbs). Ultrasound is bound by walls, and is not as susceptible to interference. From this research, I determined that ultrasound was the best approach and have built various ultrasonic circuits.

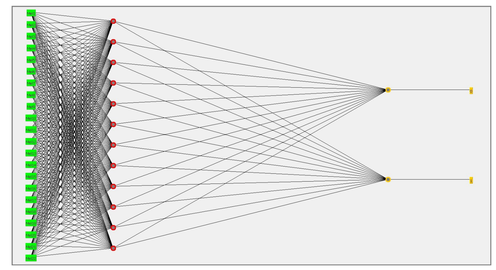


We aim to have an ultrasonic transmitter (Tx) in a location requiring the shut-off solution. The signal from the transmitter will be picked up by the receiver (Rx). The Arduino will interpret the output from the receiver circuit and communicate with the phone to either shut it off or turn it on again.

Results

The project also had the goal of developing a fully operational StressAlyrter system. This system will be continually monitoring the individual, with the hope that it will initiate a call to the life coach when a stressful situation arises. We purchased a Q-sensor from Affectiva and an e-Health sensor from Libelium, both of which monitor the galvanic skin response of an individual. The Q-sensor is worn on the wrist and it is really easy to use while the e-Health sensor requires connection directly to a computer and wires with electrodes to the fingertips. After performing some testing using both sensors, two things became apparent. First, the Q-sensor provides the most convenience and comfort while retaining the same functionality as the e-Health sensor. Second, electrodermal activity provides adequate detection of stressful situations, with a major drawback. It did not have the ability to differentiate between negative and positive stressors.

In order to differentiate between positive and negative events, Chad and Stephen did some research to determine possible solutions. They settled on using the person's voice and an artificial neural network as the possible discriminator. An artificial neural network is a piece of software that can learn differences between different sets of data. There are a series of weights associated with the different inputs and outputs that are adjusted through backpropagation, which allow the network to make accurate predictions as to the type of data being inputted. As a start, Chad developed an artificial neural network that had the ability to differentiate between male and female voices. 120 samples of people speaking were sampled at 32 kHz. Each sample was five seconds in length and the gender split was 50%. After all of the signals were collected, they were transformed from the time domain into the frequency domain using a Fast Fourier Transform. The energy was summed and normalized in twenty -two logarithmically increasing regions based on a mel scale. These normalized energies were the inputs into the neural network, seen below. All of this data was then inputted into an artificial neural network that was created using WEKA, which is a free source for data classification use. The artificial neural network successfully predicted the gender of individual 95% of the time.



Clients

The SymBionyx Corporation envisions providing the world solutions that harness emerging information and mobile communication technologies, so that every person with a cognitive disability may be served by a well-equipped provider in a way that helps them reach their full potential and the highest possible quality of life.

SymBionyx

Conclusions

WERCware is an exciting new technology underway which has the potential to aid many people with cognitive disabilities by expanding the reach of and enhancing the work done by life-coaches.

Further Information

You can find more information on the collaborator website at: http://www.thecollaboratoryonline.org/wiki/Wireless_Enabled_Remote_Co-presence_(WERC)

You can also find more information on the SymBionyx website at: http://symbionyx.com

Acknowledgements

I'd like to thank Chad Clemens and Stephen Powers for their efforts in WERCware. We would like to thank Dr. Harold Underwood for his advice. We would also like to thank Dr. Gene Chase, Dr. Randy Fish, Dr. David Owen, Dr. Nancy Patrick, Curt Byers, Symbionyx, Andrew Cameron, and Kelly Schwikerfor their support.

In the past, we have received funding from the Innovation Transfer Network in the form of a Seed Assistance Grant. We also received funding from the PA Department of Education through SymBionyx.

Messiah College — Department of Engineering — the Collaboratory for strategic partnerships and applied research