Iot Gaming platform utilizing ultrasonic data transmission

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Abstract

There are various gaming platforms such as the Nintendo Wii, Microsoft Kinect/Xbox, Sony Playstation, which create environments that aim to improve health through virtual exercise. iXercise, in contrast, modulates a popular game and incorporates a fitness program. The motivation behind iXercise is to fully engage its users into an immersive gaming environment in addition to assessing one's progress in a fitness program. Ultrasonic data transmission utilizes wireless communication protocols for to enhance device-to-device interaction in order to establish a wireless connection for iXercise using ultrasonic data transmission for a better gaming experience for its users.

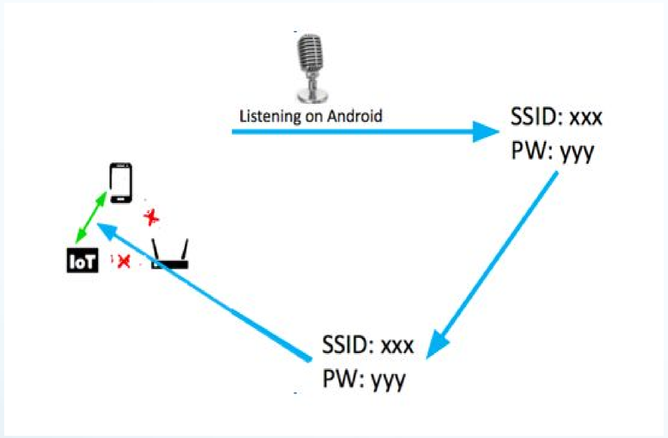


Figure 1: Diagram depicting the transfer network password of the hotspot by sound

Introduction

Sound can enrich interaction within computers. This can be done through the use of ultrasonic frequencies, which lie outside of the audible spectrum for human ears but are still able to carry encoded data. Many electronic devices in and around the human-made environment are designed to speak and listen as they contain devices such as a speaker to relay status to a human, but these same speakers can also be used for device-to-device communication via ultrasonic frequencies. To make this happen, acousticcomputer communication requires special protocols to be developed, such as impulse coding and frequency-shift keying.

Figure 2: Captures Yunho Huh testing out the iXercise platform

Research & Methods

The code originally implemented into the project used mainly java script and worked with the pied piper coding library. This library comprises of an array tone generator, a bit stream iterator, tone thread file, a bit stream tone generator and decoder file, and also test string file. A new library had to be found in order to implement the frequency-shift keying protocol for this research. I worked with the frequency-shift keying option and using a 16-bit encoder. The audio sample is a 16 bit signed integer typically stored as a Java short in a short array.

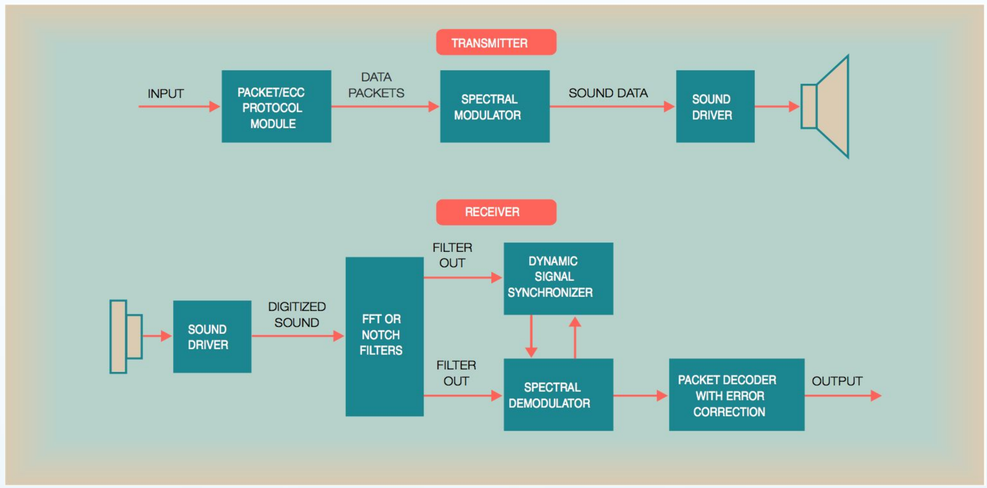


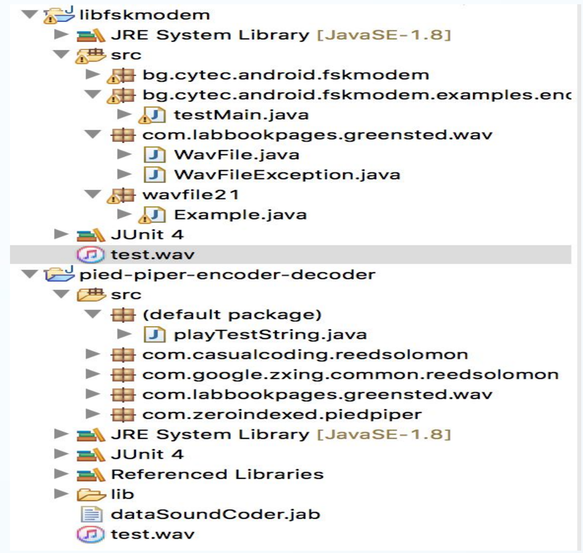
Figure 3: Sonicom block diagram that gives a visual representation of how the FSK protocol is implemented

Implementation

Once the modifications to the communication protocol were applied, a simple message could be transmitted. For this research a simple message of "Hello World" was able to be sent. The next step was to encode this scripted message into a wave file and have the same message transmitted as an audible signal rather than a scripted one.

Discussion

The scripted wav file generates a pitch that is not in the ultrasonic range however the tone is encoded with data. This is win-lose case, as even though the data signal is still in the audible frequency range it is however able to transmit data. A plausible solution that can be met is to mask the tone that is being generated with a song of the users choice.



Conclusion

Although the uses for this technology are not explored to its full potential in this particular research, the applications of ultrasonic data transmission are essentially endless. In an environment where data can be transmitted by sound, Wi-Fi will become the obsolete option as information can be transferred between mobile devices via ultrasound all at the click of a button.

References

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