

ENCRYPTED AUDIO COMMUNICATION SYSTEM

AIM:

To develop a secure audio communication system using DTMF frequencies.

WORKING PRINCIPLE:

The DTMF frequencies are a group of 2 sets of frequencies (high and low) such that if any high frequency is added to a low frequency, the two will have minimal interference with each other. There are 4 high and 4 low frequencies forming a 4*4 grid. I have used each element in the grid to represent a hexadecimal number. The mapping of hex symbols to frequencies is done in accordance with an encryption key which randomly does mapping by providing the key as the seed to the rng function.

There are two components to the system:

- **Transmitter:**

The transmitter takes the message to be sent as input and the encryption key. The message is converted to UTF-8 format. Then the UTF-8 encoded message is converted to hex numbers. 1 UTF-8 symbol translates to 2 hex values which need to be sent. Using DTMF frequencies, they are converted into audio data which is played by the speaker. At the start and end of the message 2 distinct beacon frequencies are appended to synchronize the receiver with the transmitter, so that it only processes the part which actually contains the message. This is recorded by another device (eg cellphone).

- **Receiver:**

The receiver first listens to the audio transmitted by the transmitter, then it first identifies the start and end times of the message by looking at the beacon frequencies. Then, the received signal between the start and stop times is windowed, with the same window length as the length of each DTMF frequency, with no overlaps. Then we input the decryption key (equal to the key given to the transmitter). Using this it maps the frequencies detected in the windows to hex values, which are mapped to numbers in UTF-8 format and these numbers are mapped to characters, which should be the same as the transmitted message.

DIRECTIONS FOR USE:

1. Input a message and an encryption key (any random number) in the transmitter part of the project.
2. Record the resulting audio on some device (ex mobile phone)

3. Play back the recorded audio to the receiver part of the project when start speaking is outputted.
4. Enter in the same encryption key used in the transmitter.
5. Wait for around 30 sec-1 min for the decoded message to appear.