Patent Application by Matthew Scott Tan, 18 October 2021

PATENT DESCRIPTION WITH CLAIM

TITLE:

Audio QR for Financial Transactions (FAQRT): Data Transmission through Fourier Transform Modulation for Sound Waves Between Two Devices for Financial Transactions

TECHNICAL FIELD: Digital Signals Processing, FinTech,

The invention is related to Digital Signals Processing for FinTech purposes, where a modulation scheme and encoding scheme are suggested to enable data transmission for financial transactions.

Transmission of data through sound is a concept that has been explored before through various types of modulation schemes such as Frequency Shift Keying and Amplitude Shift Keying. This invention seeks to suggest a novel mechanism for data transmission through purely sound waves, using Discrete Fourier Transform or Fast Fourier Transform as the method of modulation.

In other file sharing mechanisms such as Bluetooth, AirDrop and Nearby Share, there is a requirement for certain types of hardware to be included in the device to enable the mechanism to occur wirelessly. Similarly, digital financial transactions require the presence of NFC chips to allow two devices to carry out financial transactions through mobile devices.

In developing countries, most mobile devices lack NFC chips and other hardware capabilities and components which are required for most mobile phone payment services and other data transmission services. This new proposed mechanism of Audio QR (AQR) allows users to circumvent this problem as only a speaker and microphone are required. As these are the standard hardware components that any basic phone possesses, the functionality is not limited to smart phones and can include any type of basic phone which may lack hardware components such as NFC chips and Bluetooth capabilities.

This new proposed mechanism of Audio QR (AQR) aims to help carry out data transmission, in particular financial transactions with banking applications and digital wallets, as well as other types of file sharing processes. In summary, the new AQR will allow for financial transactions (FAQRT) using just basic hardware and its application can be far reaching in developing economies.

METHOD

The AQR function allows data in the form of text or string to be shared from one device to another through the use of sound waves. The mechanism follows the following procedure:

1) Data is encoded into the form of a string or text, where it is represented as alphanumeric characters.
2) Data is then converted into binary form.
3) Data may be encrypted at this stage or between stages 1 and 2, using various encryption methods.

4) Following this, the binary data is represented in the frequency domain and Inverse Discrete Fourier Transform or Inverse Fast Fourier Transform is applied.
5) The result is a sound wave that is converted from digital to analog and played from the sending device to the receiving device
6) The receiving device captures the sound wave and converts the analog signals to digital signals to produce the discrete version of the sound wave.
7) Discrete Fourier Transform or Fast Fourier Transform is applied to the discrete sound wave, recovering the data in the frequency domain.
8) Data is then decoded and decrypted to obtain the original information.

UNIQUE FEATURES of the mechanism include:

a) Attenuation features that indicate the start and stop of data, as well as allow the calibration of the sound wave for both devices.
b) Ability to incorporate Mathematical based encryption methods of Symmetric Key, Asymmetric Key and Hash Function cryptography such as RSA cryptography, Diffie Hellman Exchange and Elliptic Curve Cryptography which allow for secure transmissions of data that would be necessary for financial transactions.
c) Encoding methods that enable variety of information to be represented in the frequency domain for transmission.
d) Data for financial transactions comes from EMV code for financial transactions, allowing it to be used worldwide

INNOVATIVE POINTS

a) Original Modulation Strategy for Sound Based Data Transmission.
b) Original Mechanism for Data Transmission Permitting Encryption and Attenuating Features for Safe and Lossless Transmissions.
c) Omission for the requirement of sophisticated hardware

PATENT CLAIM

The Invention Claim is:

1) A data transmission mechanism between two devices, both with microphone and speaker features, which is characterized by the following features:
    a) Modulation scheme including:
        a. Inverse Discrete Fourier Transform and Discrete Fourier Transform or
        b. Inverse Fast Fourier Transform and Fast Fourier Transform
    b) An encoding system that allows for alphanumeric characters or text into binary representation, such as:
        a. ACSII character encoding scheme
        b. Base 64 character encoding scheme

    c. Unicode Character encoding scheme
    d. UTF-8 encoding scheme
c) Data transmission characterized by the use of purely sound waves as the transmission mechanism, allowing any device with a speaker and microphone to act as sender and receiver.
d) Usage of features to ensure accurate and lossless transmission of data including:
    a. Attenuation features added onto data
    b. Specific conversion mechanism from text to binary to ensure lossless information
    c. Encryption methods pre-modulation used to ensure secure transmission of data

2) A data transmission mechanism as recited in Invention Claim 1, wherein data transmission can be used for digital financial transaction between digital wallets.
3) A data transmission mechanism as recited in Invention Claim 1, wherein data transmission can be used for secure data transmissions and file sharing.

A data transmission mechanism as recited in Invention Claim 1, wherein data transmission can be used with transmission duration of variable length