Encoder and Decoder

'Project Report'

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I. INTRODUCTION

The project is considered as signal processing , and in this project we are going to encode some Strings Data to a Signals Data in "phase 1" and using some network to send them to a decoder to bring back the original value of the string in "phase 2" , and that is done by encoding each character to a sinusoidal signal consists of 3 frequencies (low, medium ,high) and concatenate all the characters to one signal , then send this signal to a decoder to analyze it and bring back the original string , and we build a graphical user interface to deal with the two phases and to see the results .

II. PROBLEM SPECIFICATION

Encoding strings to a signals and decoding them has many benefitions in communication field , two important use of this principle is :

• Let the machine recognize the words that we speak in microphone and convert them to signals and finally to strings on the screen .
• Read the string which is entered from user and convert it to signals and finally hearing there sounds or pronunciation

as an example of these uses : Google translate (when it reads the given words and recognize the word that we said in mic) , however , In this project , we are more concerned with the second use that let the user to enter a string then encode it , instead of hearing it's pronunciation , we will hear a ringing depending on the frequencies which given in the table for each character , and finally decode this signal to define the original string , so getting the same string after encoding and decoding and to hear it's specific ringing is our main goal .

III. DATA

In this project we don't have a real signals , in other word , we don't have a signal or a voice spoken from user in microphone , in fact , all signals and data are artificially made that means we entered a specific string and frequency values , so the data set that we have is : the entered string , the encoding characters(signals) .

IV. EVALUATION CRITERIA

Our project works successfully after doing our testing and evaluation criteria such as checking the output string from the decoder if it matches the entered string to the encoder , and how many characters are wrong or correct , and the order of each character and we heard the ringing for the encoding signals and compare the sound with other groups too check if it is correct , we also tested many sentences to see how successful it is , so in our opinion we have a 95-100% accuracy

V. APPROACH

In phase 1 , we convert the string to lower case , split it to characters and we manipulate character by character for constructing the encoded signal , and we got the 3 frequencies from a table that we made , in phase 2 ,we use Fourier transform to determine the amplitude and frequency so that we can recognize the character , beside a bandpass to filter the input signal and pass or reject depending on the wanted frequency , and that is done in 40ms for each character .

Also , we made a GUI to let the user decide what phase he want to use or what string he want to enter , hear it or save it .

VI. RESULTS AND ANALYSIS

Our results after testing was excellent for encoding a sentence, generate a signal and decode it, and as I mentioned above, we got a 95-100% success with our project results , some of the sentences that we used for testing is : "welcome to DSP project"

VII. DEVELOPMENT

If we wanted to develop it, the first thing is to add an icon to make sound recording from the device and then store it in the project file and also store a lot of sounds inside the project file to be able to analyze all the words with different frequency and to give the best criteria s

VIII. CONCLSUSION

In this project, we learnt the importance of signal processing and it is widely use in mobile applications or websites such as the translators or the games or educational programs, also , we are more familiar with manipulating signals and hearing them , encoding / decoding them .
Moreover, we improve our skills in working in a group and to divide the project into phases, beside that , we are now more familiar with python language and it's libraries .

REFERENCES

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[3]: geeksforgeeks