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AUDIO FREQUENCY ANALYZER USING EXPEYES AND RASPBERRY PI

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ABSTRACT

This project focuses on developing a low cost frequency analyzer for audio signal like classical songs as input. Small sized computer system, Raspberry Pi is employed for analysis purpose. Standard transforms like Fast Fourier transform is employed to display the frequency components present in the input in the form of Fourier coefficients. Python language is used for coding the output files. In the market, number of costly spectrum analyzers is available. Such spectrum analyzers are not portable. The proposed system is fast and portable and also reliable due to the use of microcontroller like expEYES.

Keywords: Raspberry Pi B+, Expeyes Junior Hardware.

I. INTRODUCTİON

Classical songs have always been challenging and difficult to comprehend by common people. Tremendous contributions have been done in the field of music by the Maestros. Beauty of music can only be truly appreciated by learning music. Wide range of society remains untouched by the aura of classical music pertaining to the complexity of musical notes and the typical standards of classical music. Todays generation is more inclined towards rock music and blends of classical notes with digital sound. However, neglecting the standards of music (Classical), effective understanding of music cannot be achieved. Also, due to widening of musical field and birth of numerous genres, the task of learning music as an amateur becomes more complex. In todays world of smart phones and smart devices, there comes a need for developing a device for analyzing music.

II. MARKET SURVEY

The Market research shows that efficiency and accuracy are the parameters of any analyzer system. Costly spectrum analyzers are available in the market. The proposed system is cost efficient and portable.

III. PROPOSED SYSTEM

The Block Diagram of Audio Frequency Analyzer is as shown below: The block diagram of analyzer is as shown in figure 1. Raspberry Pi is the main block. expEyes Junior Hardware, Monitor Display and Fourier Transform data output compose the subordinate blocks. Brief description of each block is as follows:

1. Raspberry Pi- It is the heart of the analyzer. All the computations are done in this block. It is connected to expEYES Hardware where audio data is received. Monitor is used for displaying GUI of Raspberry Pi.

2. Monitor- It is used for displaying GUI of Raspberry Pi and also for obtaining the output of Fourier transform.

3.fft.dat file contains Fourier transform data which can be accessed using Python Code.

4.Python code being the core language of Rasbian OS, suitable modifications can be achieved in the system, making the system more user friendly.

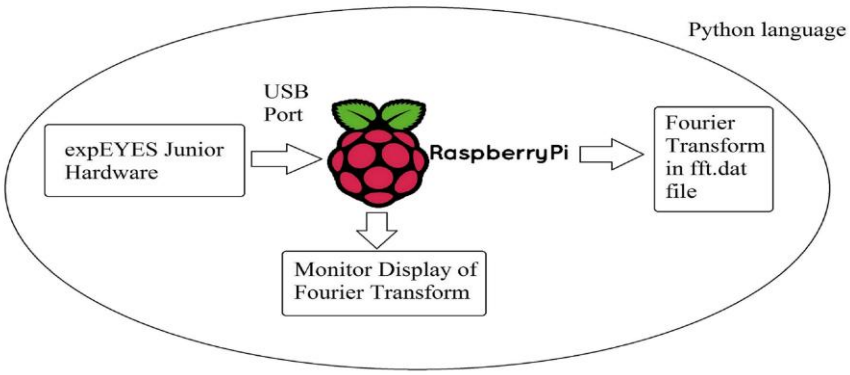

Fig. 1. Block diagram of proposed system

IV. HARDWARE DESIGN

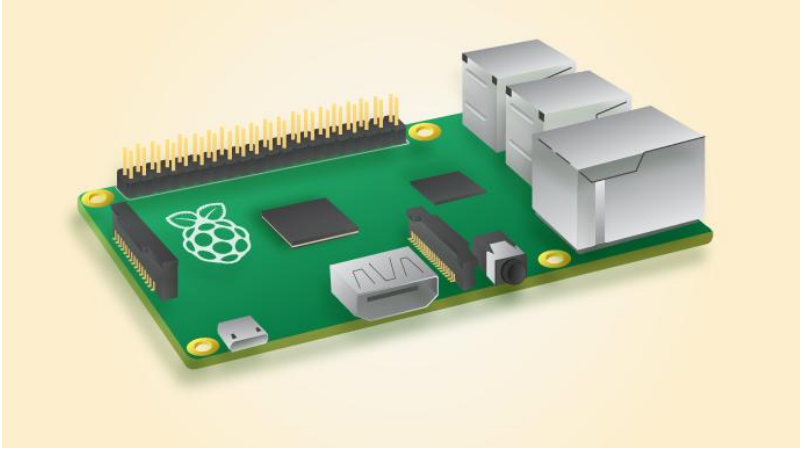

Fig. 2. Raspberry PI board

1) Raspberry Pi: The Raspberry Pi shown in figure 2 is a series of credit card sized single-board computers developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools and third world countries. The Model B+ is the final revision of the original Raspberry Pi.It has 40 General purpose input output pins. This Micro controller has 4 USB 2.0 ports. It has

power consumption by between 0.5W and 1W.The audio circuit incorporates a dedicated low-noise power supply.

2) Expeyes Junior Hardware: ExpEYES Junior shown in figure 3 is a modified version of ExpEYES. It is a tool for learning by exploration. It is a part of PHOENIX project(Physics with Home-made Equipment Innovative Experiments).The software is released under GNU General Public License. It is used as a laboratory tool for performing experiments from school level to graduate level.

Figure 3: Expeyes Junior designed under PHOENIX project

V. FUTURE SCOPE

This system can be used for analyzing data[2] and approximating audio signals for transmission purpose. Also using this system, input signal error detection and correction is possible for known input signal.

VI. OBSERVATIONS

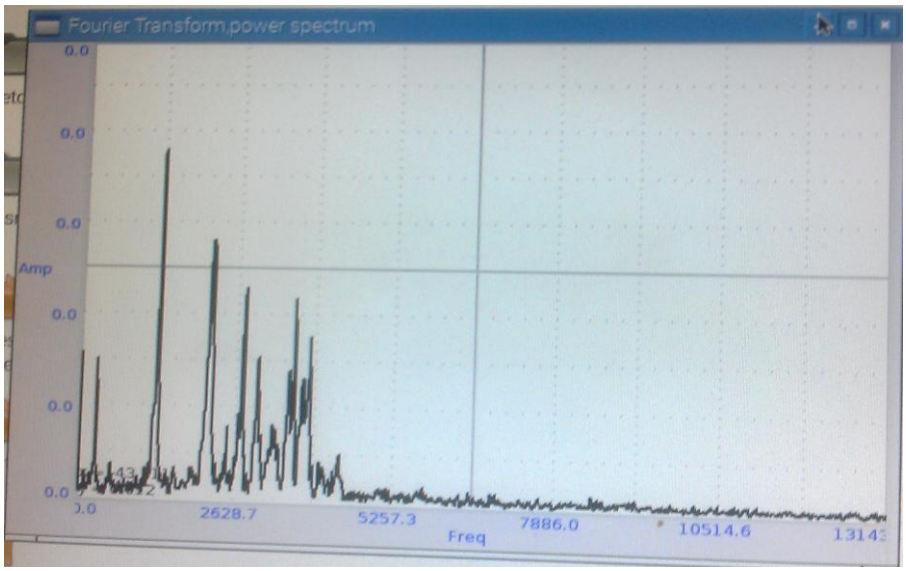

Fig. 3. Fourier analysis of Bhoop Rag

Frequency in Hz	Fourier Coefficient (Gain)
1.301 0.029	1.316 0.031
2.149 0.017	2.164 0.018
2.178 0.025	2.208 0.024
2.222 0.019	2.749 0.016
2.763 0.020	3.611 0.020
3.874 0.016	
1.301 0.029	1.316 0.031
2.149 0.017	2.164 0.018
2.178 0.025	2.208 0.024
2.222 0.019	2.749 0.016
2.763 0.020	3.611 0.020

Table 1 : Frequency analysis

VII. CONCLUSION

Thus we developed a system to produce a Fourier Transform of the applied input signal. The advantage of this system is that hardware is portable. Also, the transform obtained is instantaneous and can be accessed using Python code which is the core language of Raspberry Pi.

VIII. ACKNOWLEDGMENT

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