AUDIO SPECTRUM ANALYSER

SUBJ NAME : ELECTRONIC DESIGN WORKSHOP

SUBJECT CODE : ECECC09
BATCH : ECE 3

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SYNOPSIS

An audio spectrum analyzer is a device that can analyze the frequency components of an audio signal and display them as a visual representation, typically on a LED matrix display. This can be accomplished using the Fast Fourier Transform (FFT) algorithm, which takes a time-domain signal and converts it into its frequency-domain representation.

In the case of an audio spectrum analyzer using an ESP32 and WS2812 LED strips, the process typically involves sampling the audio signal using the ESP32's analog-to-digital converter (ADC), and then applying the FFT algorithm to the resulting digital signal. The

frequency-domain data is then used to control the brightness and color of the individual LEDs in the WS2812 strip, creating a visual representation of the audio signal.

MOTIVATION

The motivation behind creating an audio spectrum analyzer using FFT and WS2812 LEDs with an ESP32 is to provide an interactive and visually engaging way to analyze audio signals. Such a project can be used for a variety of purposes,

such as music visualization, audio monitoring, or educational purpose.

PROJECT DESCRIPTION

The audio spectrum analyzer using FFT and WS2812 LEDs with an ESP32 is a project that involves creating a device that can analyze audio signals and display the frequency components

of the signal as a visual representation using a LED strip.
The project can be broken down into several main components:

1.Hardware setup:
The first step involves setting up the hardware components. This includes connecting the WS2812 LED strip to the ESP32 and configuring the ESP32's ADC to sample the audio signal. A circuit can be designed to amplify the audio signal and ensure it is within the range of the ESP32 's ADC.

2.Software setup:
The second step involves setting up the software components. This includes installing the necessary libraries for the FFT and WS2812 control. The ESP32 can be programmed using a suitable programming language such as C or Python.

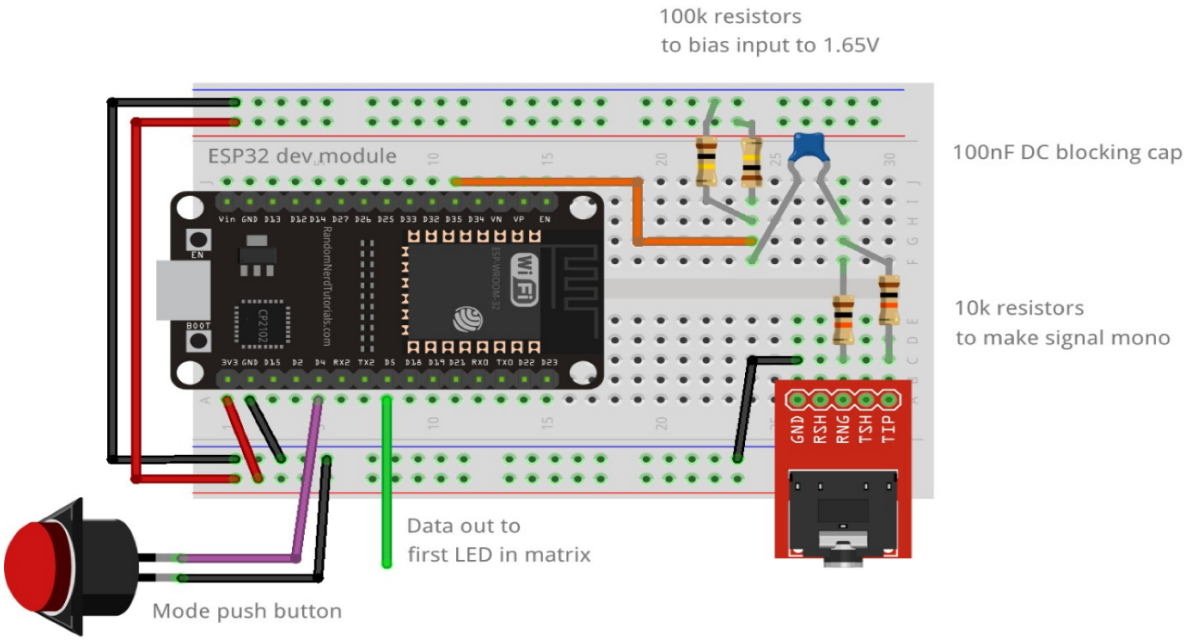
3. Sampling and processing the audio signal:
The ESP32's ADC can be used to sample the audio signal at a suitable frequency. The sampled

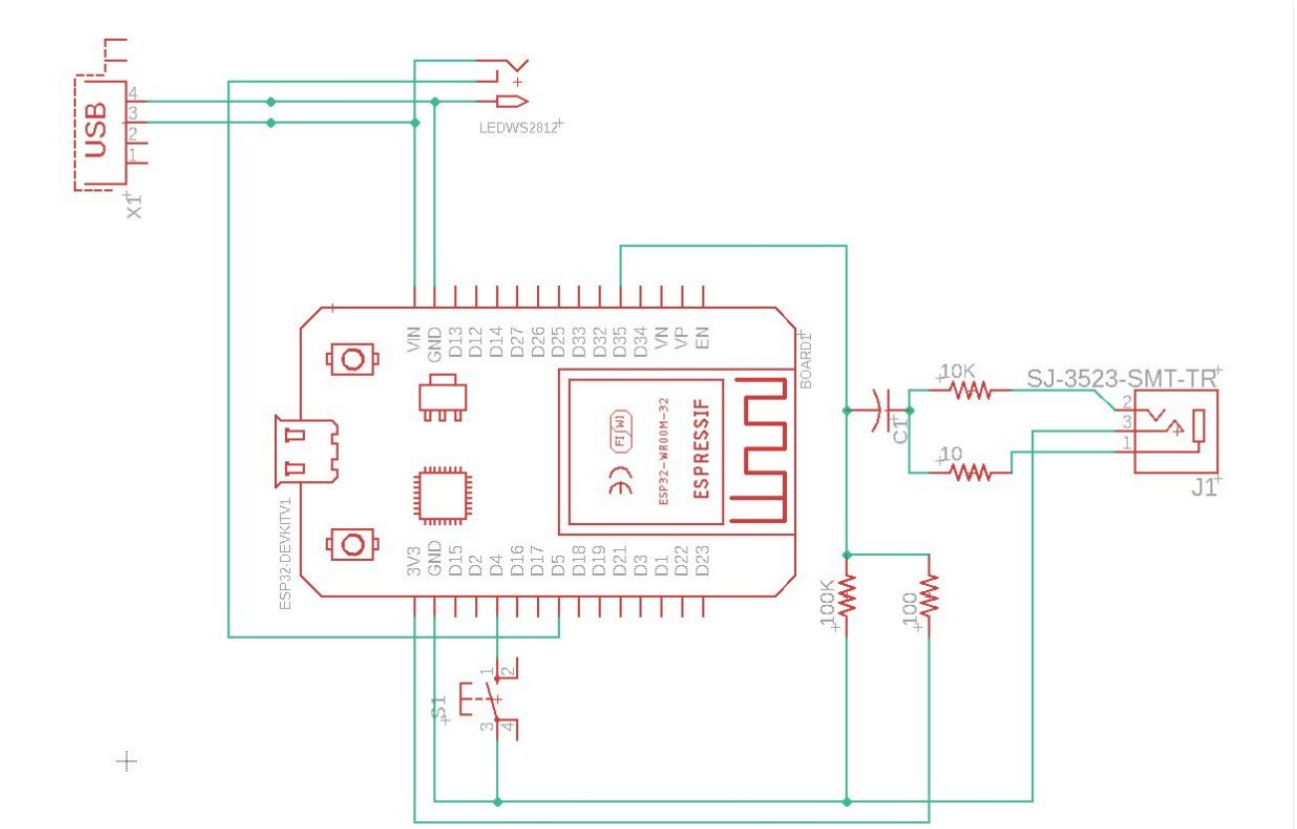
audio signal can then be processed using the FFT algorithm to obtain the frequency-domain data.

4.Displaying the visual representation:
The frequency-domain data can be used to control the brightness and color of the individual LEDs in the WS2812 strip, creating a visual representation of the audio spectrum. The colors and brightness of the LEDs can be customized to suit the user's preferences.

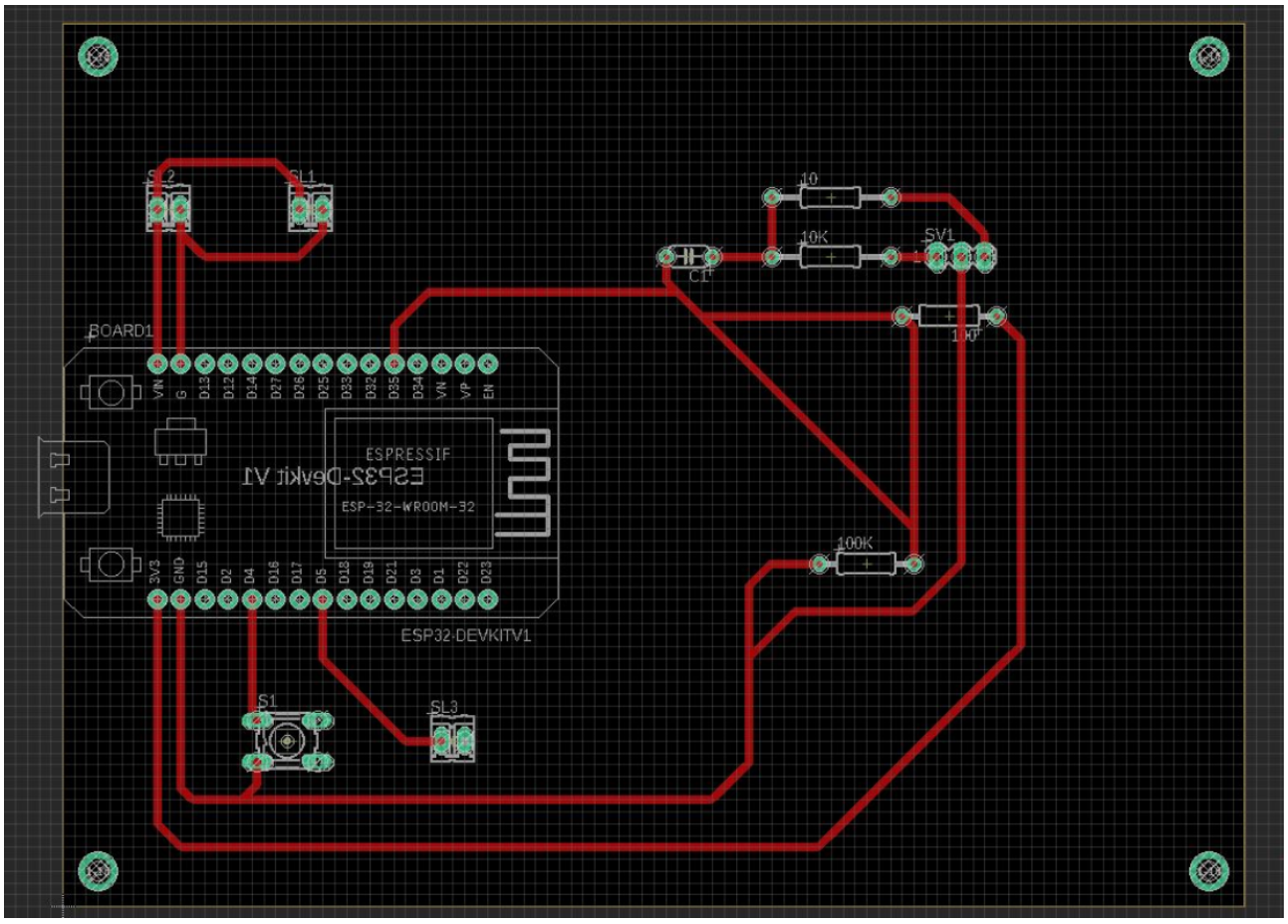
Additional features: Additional features can be added to the project, such as real-time adjustments to the FFT parameters or the ability to display other types of data in addition to the audio spectrum.

CIRCUIT AND SCHEMATIC DIAGRAM





PRINTED CIRCUIT BOARD (PCB)



BILL OF MATERIAL

LED WS 2812
ESP 32 DEV KIT V1
RESISTORS (2*10 OHM AND 2*100) CAPACITOR
PCB
AUDIO FEMALE JACK
JUMPER WIRES

GANTT CHART

REFERENCES:

https://github.com/G6EJD/ESP32-8266-Audio-Spectrum-Display/blob/ master/ESP32_Spectrum_Display_02.ino

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