FREQUENCY SPECTRUM DISPLAY ON OLED WITH THE USING OF ARDUINO UNO CONTROLLER

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Abstract: From the past years we are using Spectrum Analyser, Spectrum Analyser is an analog input reader display on OLED, it performing FFT analysis, and displaying frequency bin bars. Its converts a signal from its original domain to a representation in the frequency domain and vice versa to an audio signal. So in this way we are made freely handheld, small in size and low power consumption device. In this new research technique, we are using Arduino, OLED display and microphone. We are presenting the human voice and any other audio signal by using microphone and then analysing and display on OLED display in the form of spectrum.

Index Terms **- Arduino, OLED (Organic Light Emitting Diode), Microphone.**

I. INTRODUCTION

This device smaller in size and lower power consumption of such devices offers noticeable advantages over any conventional measuring device giving us opportunities to make use of them in the field of measuring instruments. In this new research technique, we are mainly using three parameters: 1. ARDUINO UNO Controller, 2. OLED (Organic Light Emitting Diode) for display and 3. Microphone. In this paper we are proposed a Spectrum Analyser for general purpose spectrum analysis of audio frequency by using microphone. Some spectrum analysers have integrated functions like modulation decoding and radio frequency signal generation. Modern spectrum analysers use digital techniques to combine and reduce the hardware.

II. BLOCK DIAGRAM

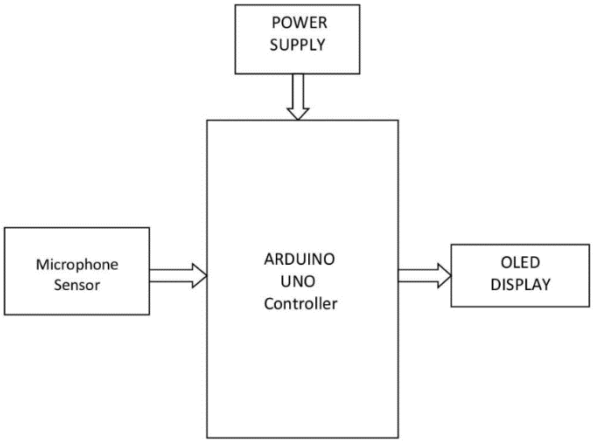

fig. 1 – block diagram of circuit

In this block diagram there are total four major blocks:

1) ARDUINO UNO Controller
2) Microphone Sensor
3) OLED Display
4) Power Supply

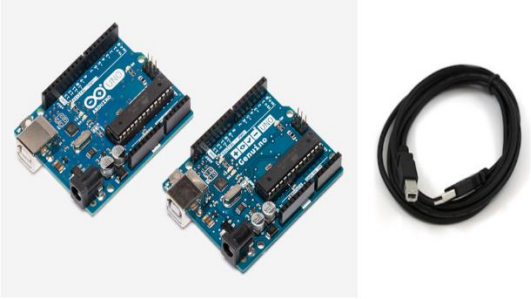

fig. 2 – arduino uno controller

ARDUINO UNO Controller - Arduino is a ATmega328 microcontroller device. It has 5V operating voltage, 7-12V input voltage, this is recommended. It has total 14 digital Input/Output pins and 6 analog input pins. Arduino has 32KB of which 0.5KB used by bootloader flash memory. It has 40mA DC current per I/O pins and 50mA DC current for 3.3V pin. It has 2KB SRAM, 1KB EEPROM and 16MHz clock speed. Arduino UNO powered by USB connection or an external power supply, power source is automatically selected. External power can come from AC to DC adapter or battery. The adapter connected plugging by 2.1mm center positive plug into the board's power jack. The Arduino UNO is used for communicating with computer [2].

fig. 3 – electret microphone amplifier (sensor)

Microphone Sensor - Microphone is used for recording and sensing the human voice and converts to the spectrum then displaying on OLED display. Characteristics of microphones such as frequency response, frequency range, dynamic range and directionality [3].

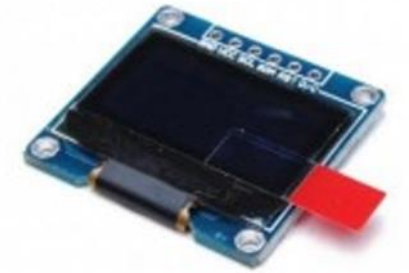

fig. 4 – oled (organic light emitting diode) display

OLED Display - OLED has emissive electro luminescent layer is a film of organic compound [4]. OLED is a monochrome graphic display module with a built-in 1.3 inch, 128X64 high-resolution display. In a dark environment, OLED display is higher than LCD display in contrasting. OLED are used to make digital displays in devices such as television screens, computer monitors, portable systems such as mobile phones [5].

Power Supply - The ARDUINO UNO Controller can be powered by the USB connection or with an external power supply. External power come either from an AC-to-DC adapter or battery [2]. The board can operate on an external power supply of 6 to 20 volts. If the power supplied with less than 7V, hence, the 5V pin may supply less than 5V and the board may be unstable. If you are using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The power pins are as follows:

- **VIN -** The input voltage to the Arduino board when it's use as an external power source. You can supply the voltage through VIN pin or, via the power jack.
- **5V -** This pin outputs a control 5V from the regulator on the board. The board can be power supplied either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V).
- **3V -** A 3V supply generated by the on-board regulator.
- **GND –** Ground Pins.

III. WORKING OF PROJECT

Firstly, we are interfacing the OLED display with Arduino UNO Controller. OLED is a monochrome graphic display module with a built-in 1.3 inch, 128X64 high-resolution display. In a dark environment, OLED display is higher than LCD display in contrasting. This device is compatible with I2C or SPI.

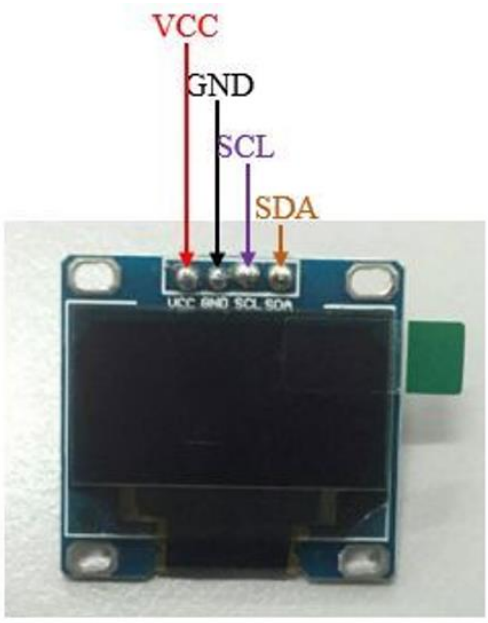

fig. 5 – specification of oled display

Connection of Arduino UNO Controller to OLED Display:

Firstly, we are connected VCC to 5V or 3.3V, secondly we are connected GND to GND, then we are connected SCL (Clock line) to A5 and finally we are connected SDA (Data line) to A4.

Second Step we are connecting the Electret Microphone Amplifier (Sensor) to the Arduino UNO Controller. Microphone Sensor is used for recording the human voice and converts to the spectrum then present on OLED display.

Then finally we are downloading the U8glib library and move the extracted file to the desired Arduino's libraries, then we are simply try those written coding and construct the circuit according to the coding. Later we are uploading those coding into Arduino and see how the circuit works. And finally we are getting the output.

IV. IMAGE OF OUTPUT

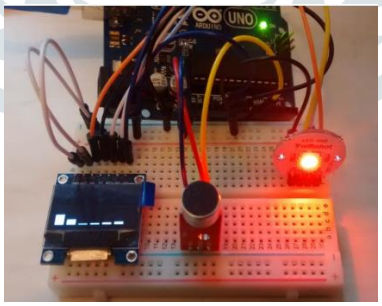

fig. 6 – with audio frequency 400 hz

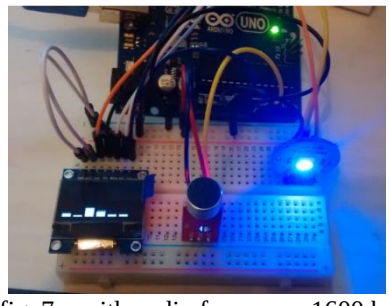

fig. 7 – with audio frequency 1600 hz

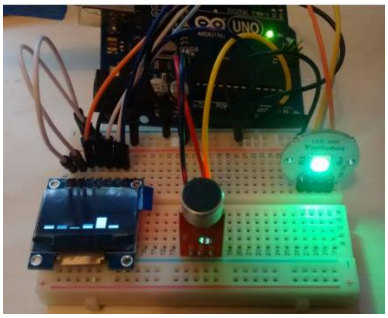

fig. 8 – with audio frequency 6000 hz

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