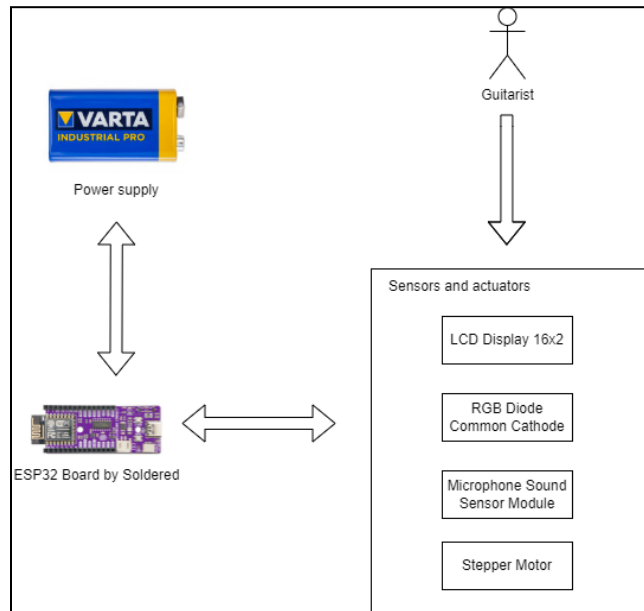
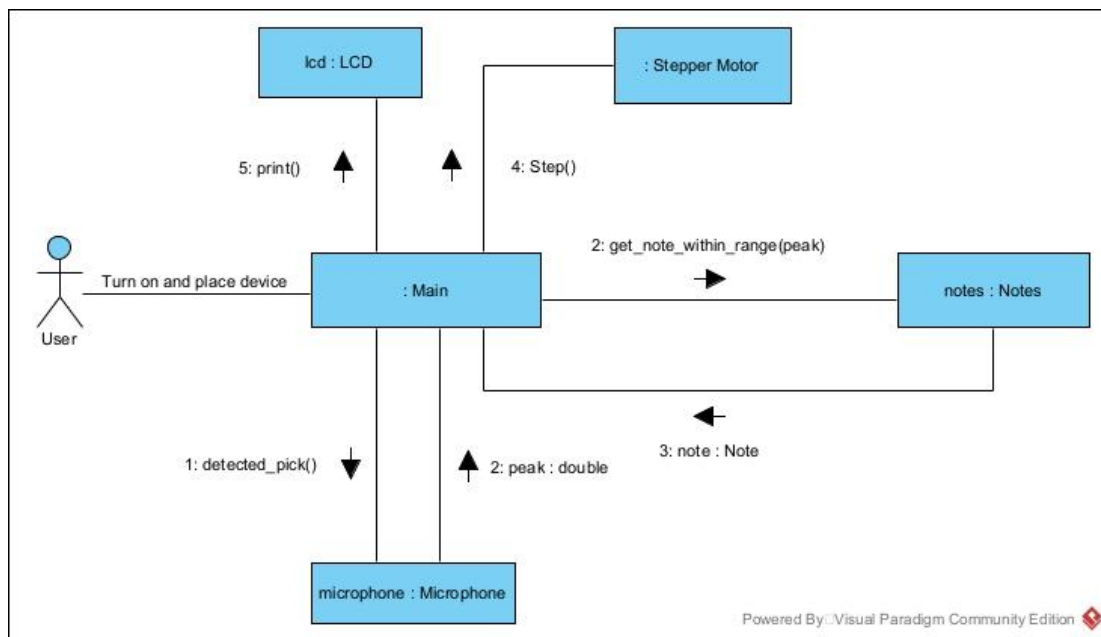


Guitar Tuner - Overview

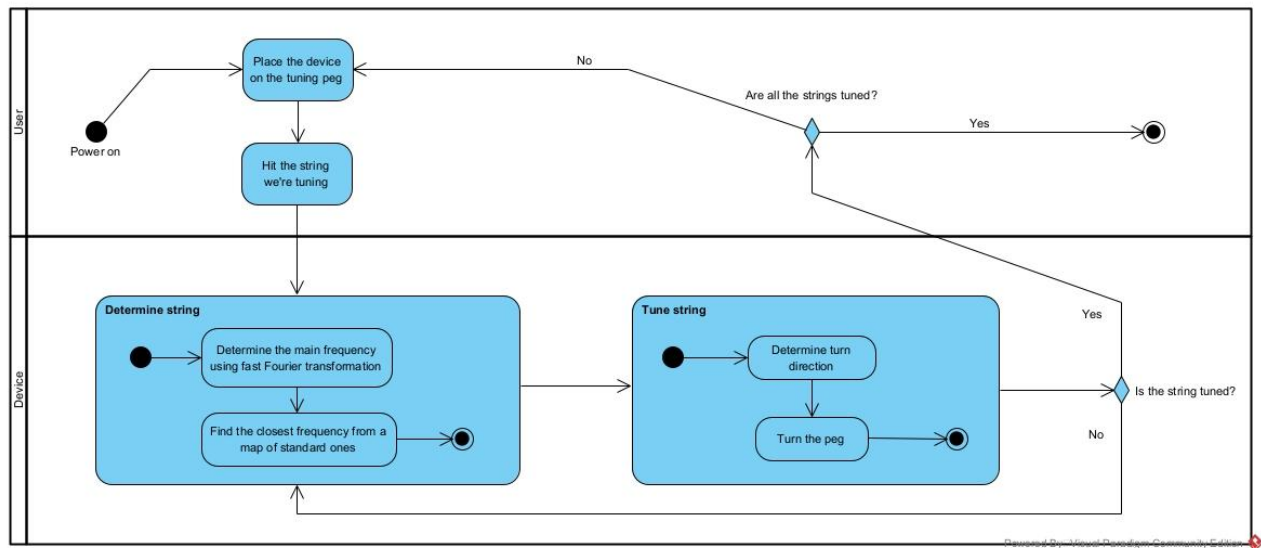
General Architecture



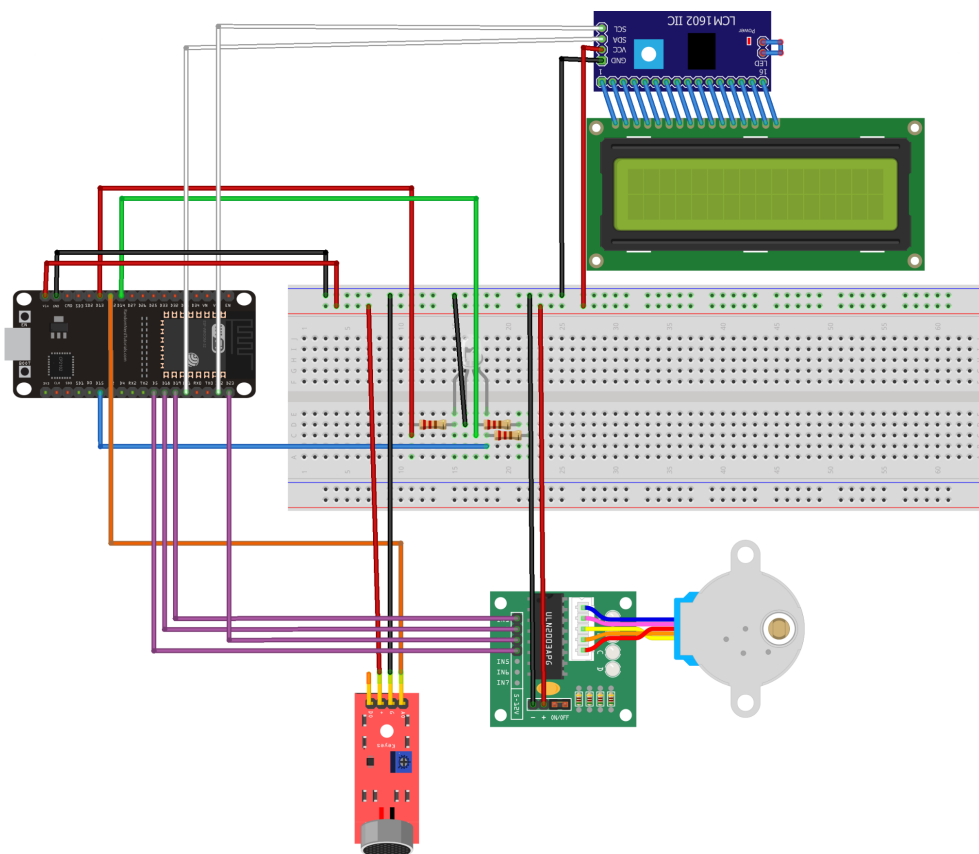
Communication diagram






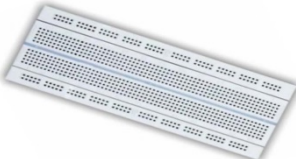
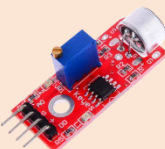



Activity diagram

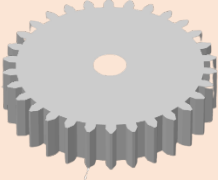

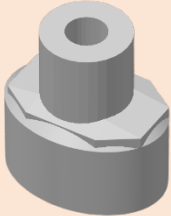
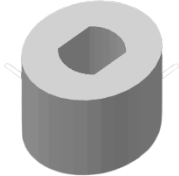
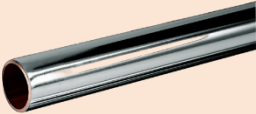


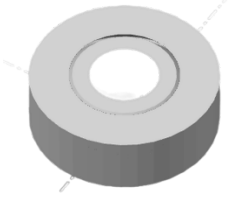

Connection diagram



Cost sheet

	Review	Description	Part count	Cost per unit	Overall cost
1		ESP32 board by Soldered	1	11.94 €	11.94 €
2		Resistor (320 Ω)	3	≈ 0.01 €	0.01 €
3		Wires	≈ 20	≈ 0.13 €	≈ 2.65 \$
4		Breadboard	1	5.3 €	5.3 €
5		Microphone sound sensor module	1	8.13 €	8.13 €
6		Stepper motor with drivers	1	4.6 €	4.6 €
7		RGB LED diode	1	0.09 €	0.09 €
8		LCD display	1	5.18 €	5.18 €

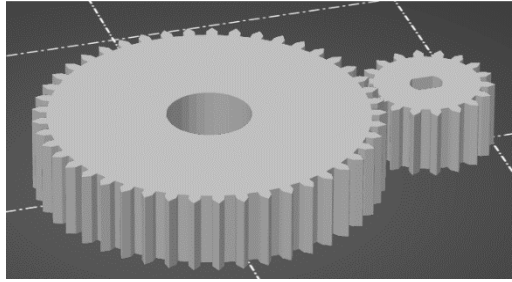
9		Big gear (50x50 mm)	1	0.01 €	0.01 €
9		Small gear (10x10mm)	1	0.01 €	0.01 €
10		Guitar tuner	1	0.01 €	0.01 €
11		Stepper motor holder	1	0.04 €	0.04 €
12		Pipe	2	1.59 €	3.18 €
13		M8 screw	2	0.07 €	0.13 €
20		M8 Washer	2	0.03 €	0.06 €

21		M8 bearing	2	0.13 €	0.26 €
22		Battery 5V	1	1 €	1 €
				Total price: 42.6 €	

Financial analysis

Description	Result
Total cost of parts	42.6 €
Amount of hourly wage per employee	10.62 €
Total number of hours spent per employee	40 h
Number of employees	4
Gross expenditure per employee	424.8 €
Net expenditure per employee	339,84 €
Total cost of the project	1741.8 €

Technical documentation - gear calculations



Large gear represents *driven* while smaller one represents *drive* gear because it is attached to the stepper motor. Gear ratio between two gears is represented as:

$$i = Z_e / Z_s$$

Where the Z_e represents number of turns by the *drive* gear while Z_s represents number of turns of *driven* gear, in other words, if we have ratio of 3:1, *drive* gear will make three turns while *driven* gear will rotate for only one full turn. For this project, gear ratio of 3:1 will be sufficient. With following information, we can calculate needed number of teeth per gear. Hence, number of teeth of *drive* gear will be 20, on the other hand, number of teeth of *driven* gear will be 60.

User Documentation

Introduction

The Automatic Guitar Tuner is designed to help guitar players tune their instruments with ease and precision. The tuner utilizes an LCD display for displaying the string that is being recognized, a microphone sensor module for detecting the string frequency, and an RGB LED for providing visual feedback. The device is simple to use and can help improve the overall quality of your guitar playing.

Getting Started

Before using the Automatic Guitar Tuner, please ensure that the device is correctly connected to a power source. Once powered on, the device will automatically enter calibration mode. During calibration, the device will adjust to the surrounding noise levels and set a reference point for tuning. Once calibration is complete, the device will display the message "Pluck a string" on the LCD screen.

Using the Automatic Guitar Tuner

1. Place the device near your guitar.
2. Place the microphone module inside the guitar.
3. Place the Tuner tool on the string you wish to pluck and pluck it.
4. The device will automatically recognize the string and display the corresponding string name on the LCD screen.
5. The RGB LED on the device will turn **blue** when no string is being plucked, **red** when the string is not in tune, and **green** when the string is in tune.
6. The tuner tool will automatically tune the pegs (string) it was previously placed onto.
7. Repeat steps 3-5 for each string on your guitar until the RGB turns green and the LCD displays "*In tune*".

Note: The motor that should be responsible for tuning the peg is somewhat weak. Therefore, the device is, in some cases, only able to recognize the string, display the corresponding string name on the LCD screen, and provide visual feedback through the RGB LED. It's up to the user to manually adjust the tuning pegs.

Troubleshooting

If the device is not properly recognizing the string or displaying the correct string name, please check the following:

1. Ensure that the device is correctly connected to a power source.
2. Make sure that the microphone module is placed close to the guitar sound source so that it can accurately detect the string frequency.
3. Ensure that the tuner tool is properly placed on the tuning peg.

Please contact customer support for assistance if the device continues to have difficulty recognizing the string.

Support

If you experience any issues with the Automatic Guitar Tuner or have any questions about the device, please contact customer support for assistance.

Conclusion

The Automatic Guitar Tuner is a useful tool for guitar players of all skill levels. It helps improve the tuning process and can enhance the overall quality of your guitar playing through the RGB LED providing visual feedback. However, it should be noted that the device is sometimes only able to recognize the string, display the corresponding string name on the LCD screen, and provide visual feedback. It's up to the user to manually adjust the tuning pegs. If you experience any issues with the device or have any questions, please contact customer support for assistance.