ITSP

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Abstract

The project is about making an automatic drum tuner that can tune a standard drum kit without the need of much human intervention. This device could save a lot of the time and effort required to tune a drum set.

Method of Tuning a Drum Set and Limitations

The aim of tuning a drum set is simple-getting the frequency near each tuning knob on a common level. But the process itself isn't as easy as said and done. It involves hitting the membrane of the particular piece you're tuning near each of the knobs, and comparing their frequencies, and then turning the knobs individually to bring them to a common level. Again, there are many different ways to do this, like comparing opposite pairs of adjacent knobs, making each such pair of knobs at one common frequency each and then equating all of them. Another way would be to do a similar process but with opposite knobs. One major difficulty in all of this could be hearing and comparing frequencies. It is very difficult to compare the frequencies of the strikes, making the process very inaccurate at times due to the inefficiency of the human ear.

Method of Implementation

Fundamentally, we need to measure the frequency of the vibrating drum membrane. There are two ways by which it could be achieved:

- A microphone or a membrane (which would be in direct contact with the drum's membrane) could detect the frequency and compare it to a standard frequency.
- A nib (attached to a spring from the other end) could be pressed onto the drum's membrane. By measuring the spring's compression, tension of the membrane could be measured and then compared to standard tension value.

The device itself would consist of a key that attaches to the tuning knobs of the drum, which would be connected to a motor and would rotate the knobs, varying the tension. Multiple such keys could be made to attach to multiple knobs on the drum simultaneously. This apparatus could be 3D printed. There would be a processor, a display and maybe even a mechanical ‘drum arm’ that would hit the drum for us. This would reduce human intervention further.

Design options

1) A single unit attached to one knob which hits the piece with a mechanical arm, and adjusts the knob till a particular frequency is reached. Will have to remove and place on each knob, and reiterate the process once or twice for all knobs.

Components required:

a. 1 servo motor
b. 1 stepper motor
c. 1 microphone
d. Unit case made by solid printing
e. Arduino

2) Six to eight units which can measure the frequency of vibrations on membrane near the knobs they are attached on independently and simultaneously.

Components required:

a. 6-8 stepper motors
b. 6-8 piezoelectric sensors
c. Multiple unit cases
d. Arduino

Amongst these, the first option is much cheaper, but at the same time much slower than the other. If the second option is possible and economically feasible, it would be the favourble option.
As the final aim is to bring the piece to a specific frequency, a knob will be provided to choose the note to which the drum is to be tuned.

Timeline

First week

Decide on which of the two design options is to be implemented. Once decided, decide on the exact models of the motors being used and thus make a solid works design with the dimensions of motors in mind.

Second week

Learn to process signal from device being used for audio input.
Design circuit to be implemented.

Third week

Write code in Arduino for controlling motors, and for processing audio input.
Get circuit made on a PCB.

Fourth week

Get unit printed and attach motors. Get all parts of the project together and attempt tests

Remaining time

Fix bugs if any