

Laser Harp

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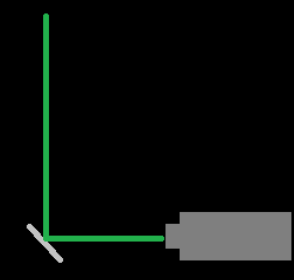
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Introduction

The stepper motor with a mirror divides the laser into nine beams. When one or more of the beams are cut, the light sensor (Light Detecting Resistor, LDR) detects it. According to the corresponding motor positions, it sends signals to the Arduino, which in turn produces the respective signal through a computer. At the same time, Arduino board will send signals to control speaker which creates different tones. Hence, we can play this instrument as a laser harp.

Principle

Turn on the laser for the 1st beam

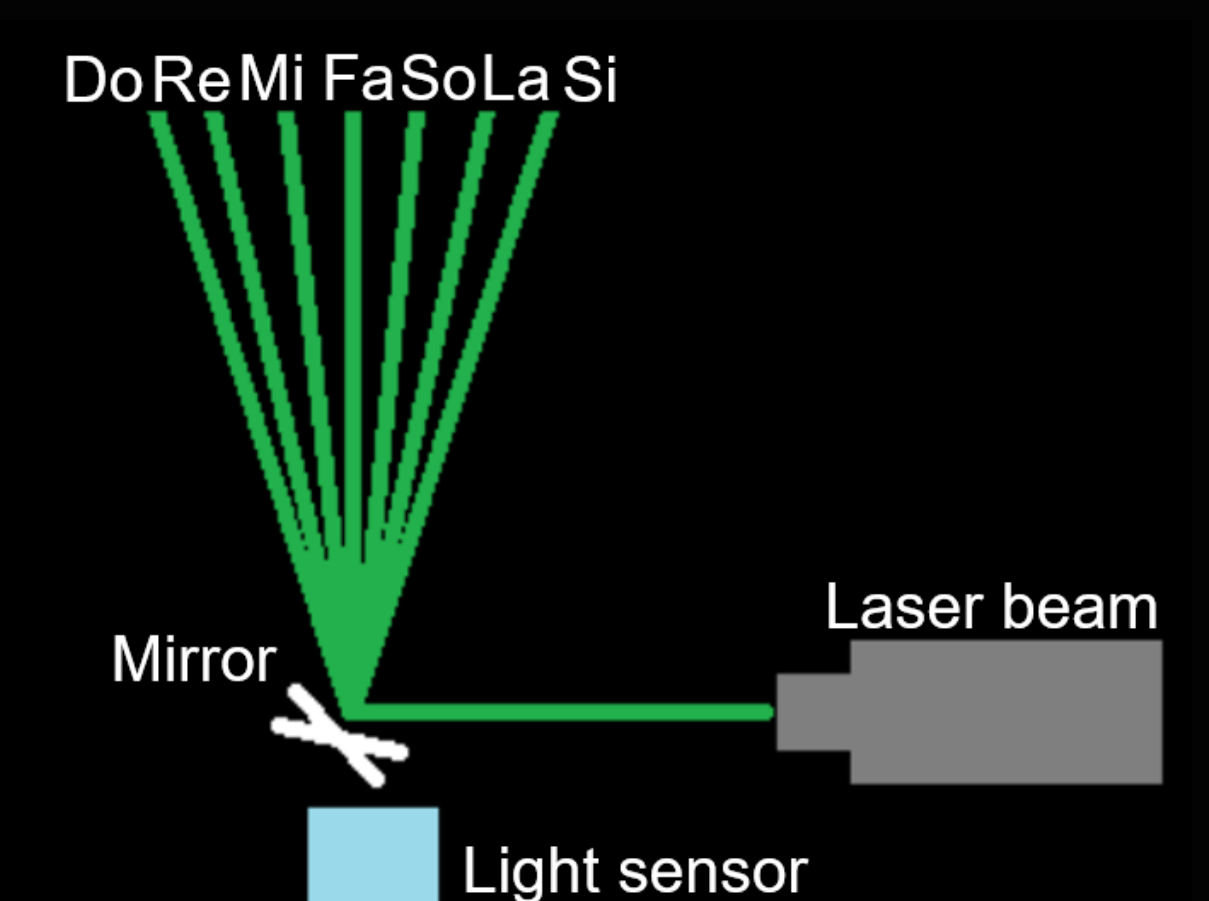


Turn off the laser for the 1st beam

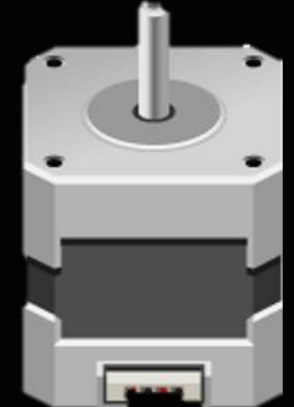


Laser disappears

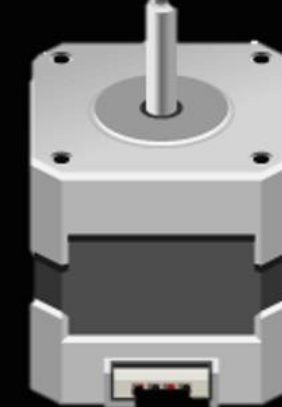
Since persistence of vision, we will see seven beams simultaneously while there's only one beam in fact.



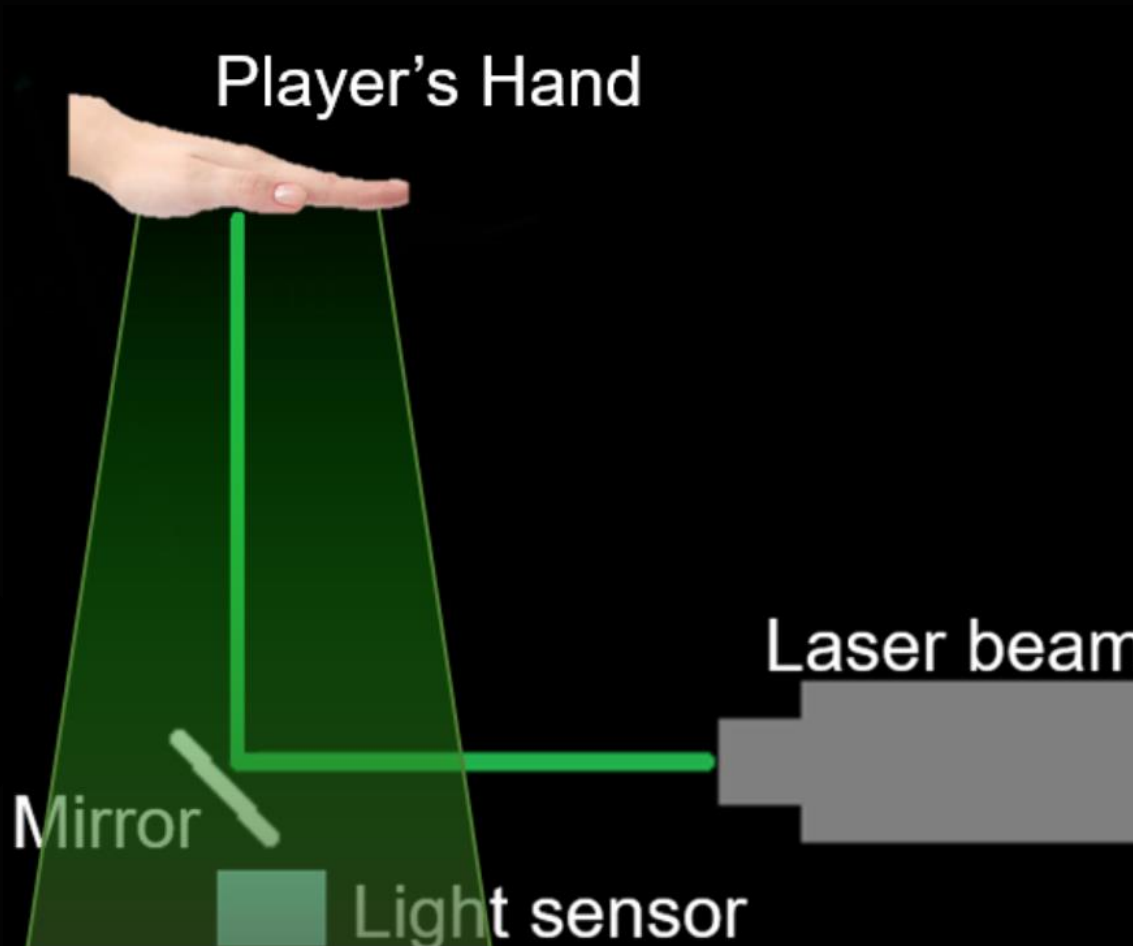
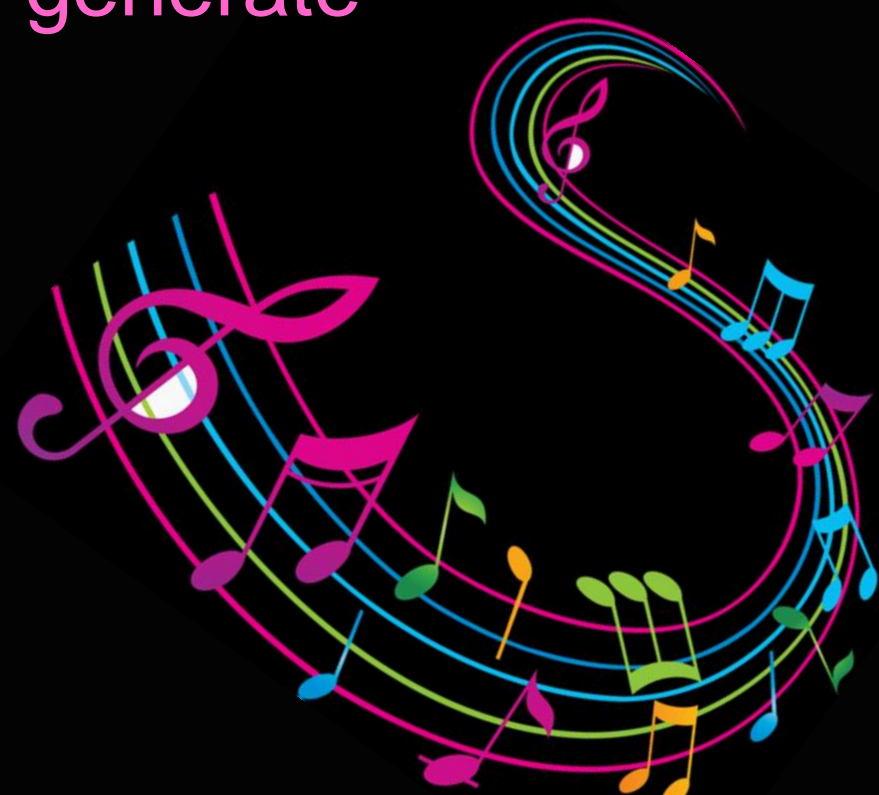
The stepper motor stays still



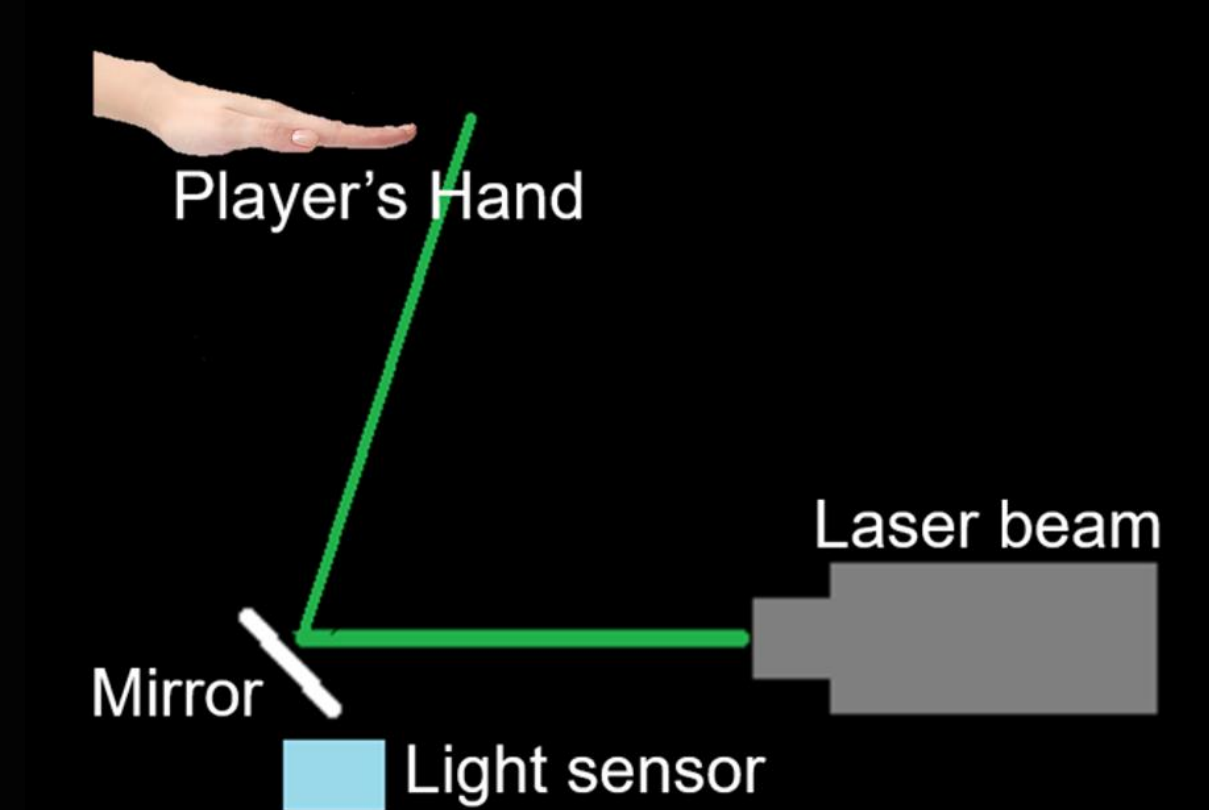
The stepper motor rotates



Arduino let the speaker generate a sound



If the laser beam isn't cut, the lux that the light sensor will no be changed. Thus, the Arduino won't let the speaker generate a sound



Stepper motor

Stepper Motor is a motor controlled by a series of electromagnetic coils. The center shaft has a series of magnets mounted on it, and the coils surrounding the shaft are alternately given current or not, creating magnetic fields which repulse or attract the magnets on the shaft, causing the motor to rotate.

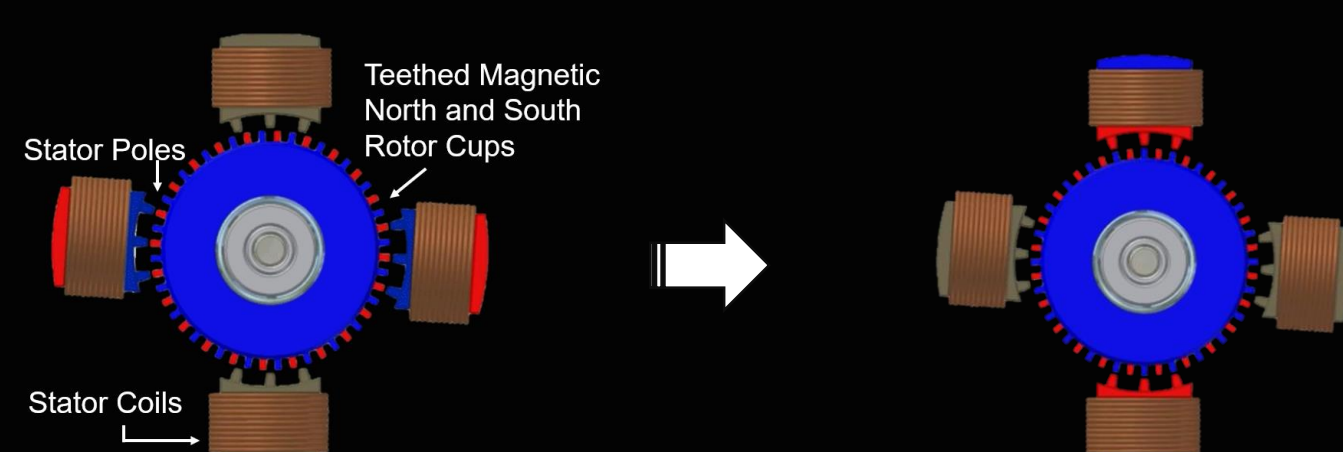
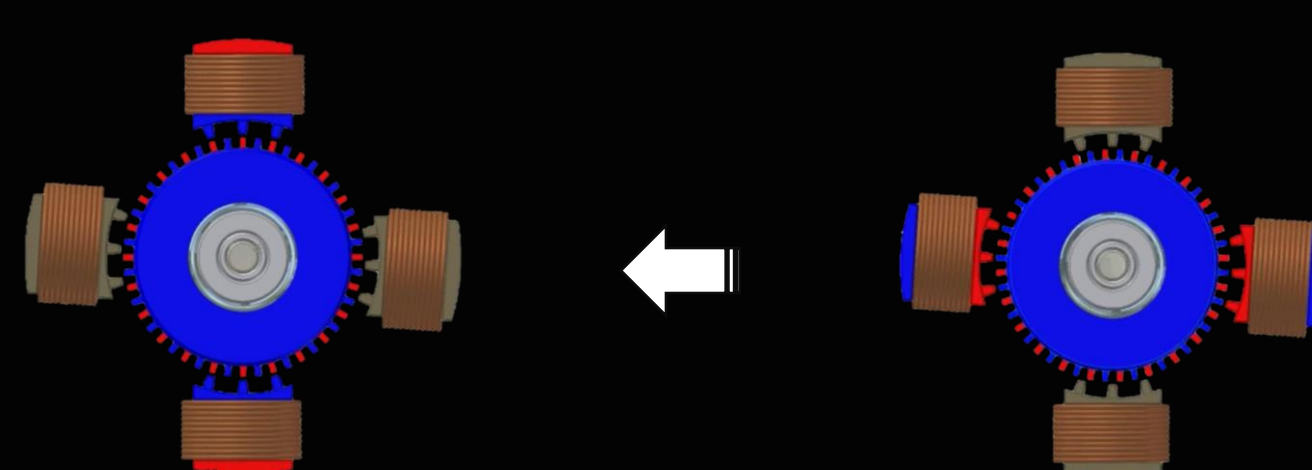


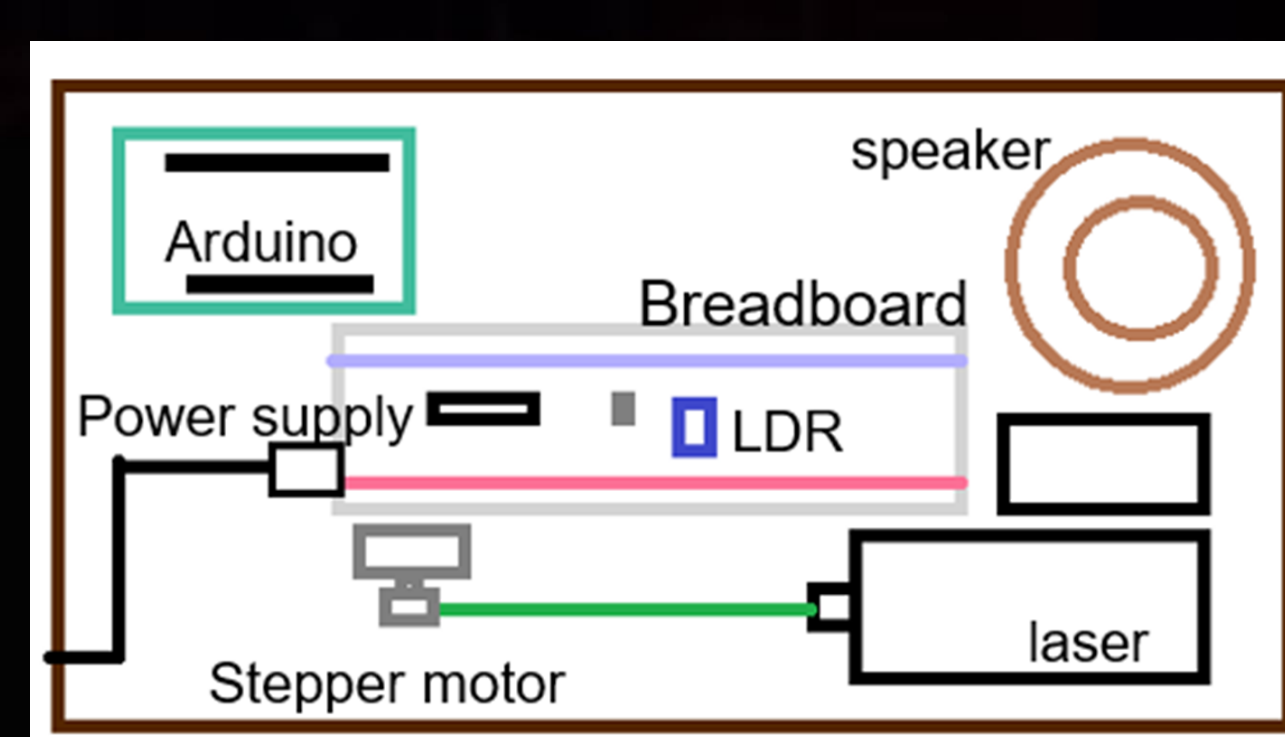
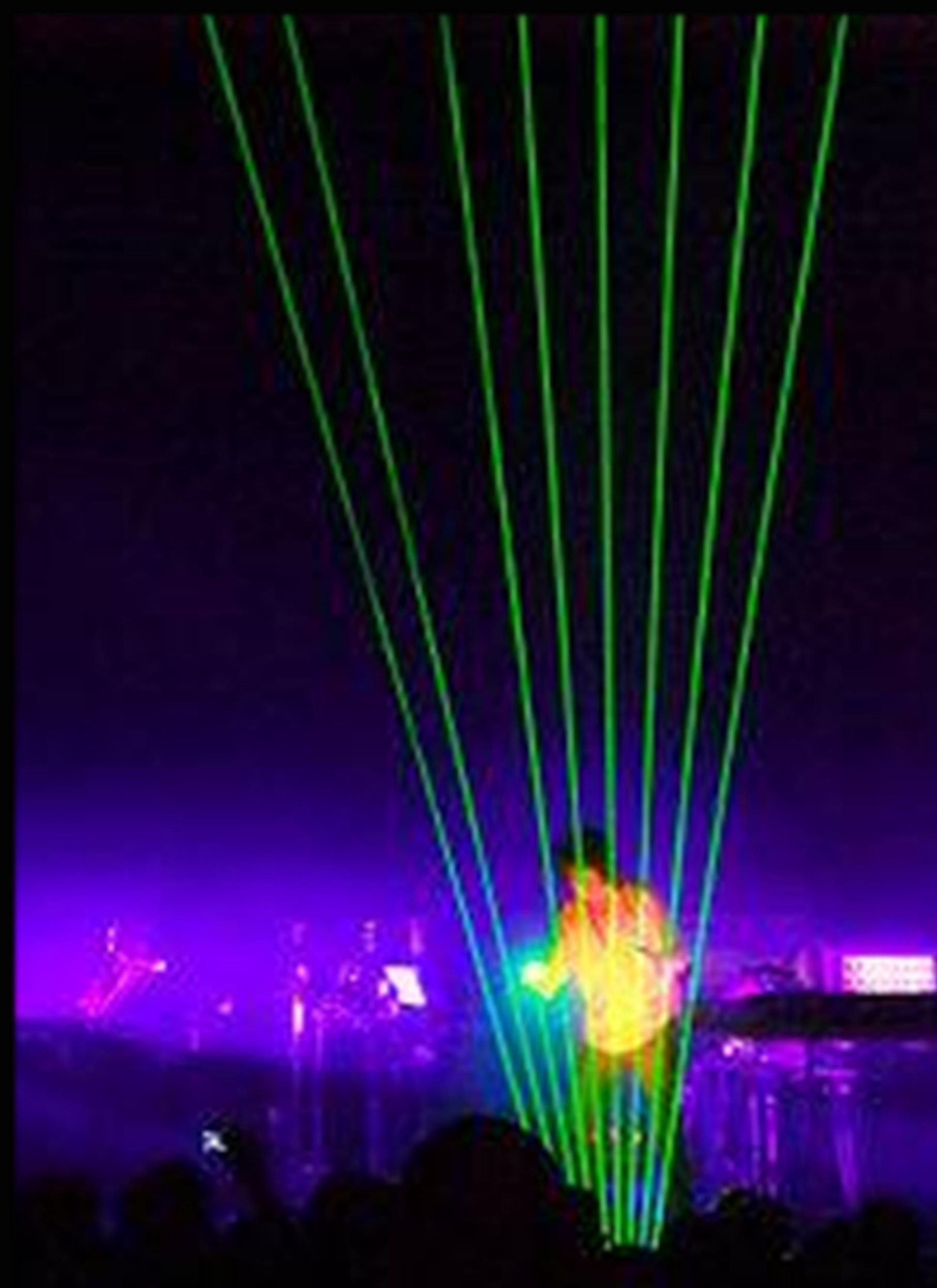
Illustration of Lenz's law



Reference :

[1] <http://www.instructables.com/id/Frameless-Laser-Harp>

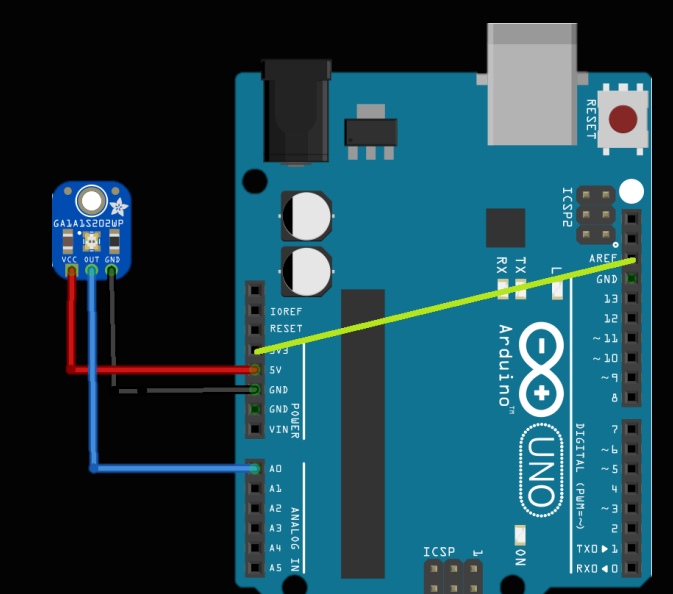
[2] <https://cdn-learn.adafruit.com/downloads/pdf/adafruit-ga1a12s202-log-scale-analog-light-sensor>



Light sensor

A photo-resistor is a light-controlled variable resistor. The resistance of a photo-resistor decreases with increasing incident light intensity; In other words, it exhibits photoconductivity. The principle of it is that light exposure to the semiconductor, the original stable electrons are excited and become free electrons.

$V_{cc} = 5V$
 $V_{out} = A_0$
 $GND = GND$
 $AREF = 3.3V$



Conclusion

By the project of the experiment, we have learned how to control the light sensor and stepper motor by Arduino coding. Overall, the major point of the laser harp is the controlling of stepper motor because there are many kinds of stepper motor in this world. With some components(Arduino card, stepper motor, light sensor, laser, speaker), we can finish a laser harp.