Smart Temperature Control System & Rain Noise Generator for Insominiac Conditions

Group 11

Group Members

- Abhiram B (003)
- Drupad Dev P (028)
- Arun R (018)
- JIshnu B Thilak (034)
- M S Arkaj Kesavu (045)

Project Plot

This project proposes a new treatment for insomnia that is based on the use of sound and temperature control. The project team has developed a circuit that generates a soothing rain sound effect and a temperature-controlled fan The total project is divided to 2 Phases, consisting 2 different circuits. With the Same Aim.

Phase 1

Rain Sound Creator using LM741 Op-Amp

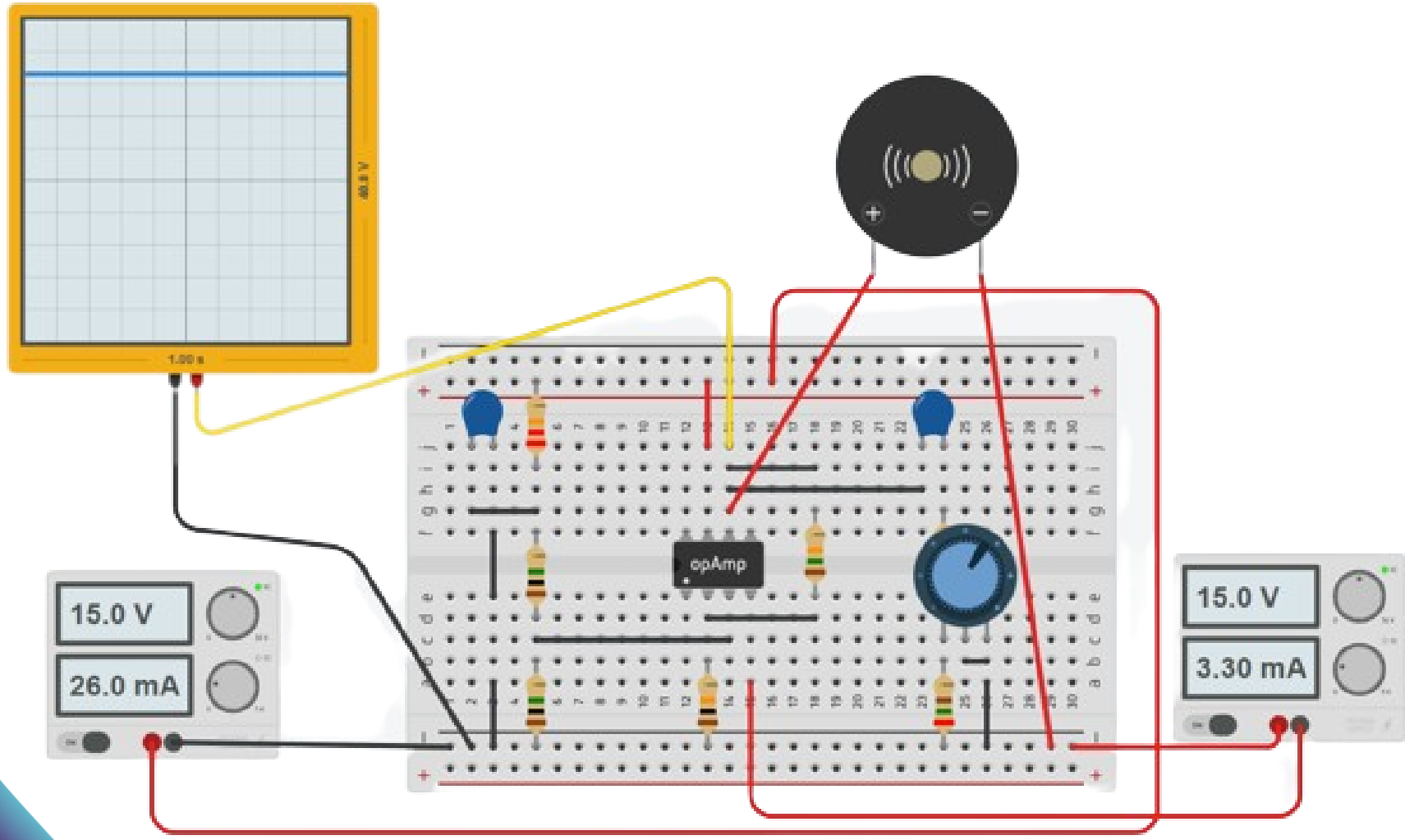
Components Used

- 741 Operational Amplifier
- 1 MΩ Resistor
- 10 kΩ Resistor
- 15 kΩ Resistor
- 300 Ω Resistor
- 22 kΩ Resistor
- 250 Ω Resistor
- 47 kΩ Potentiometer
- 10 uF Capacitor
- Piezo
- 1000 uF Capacitor

Circuit Diagram and Simulations

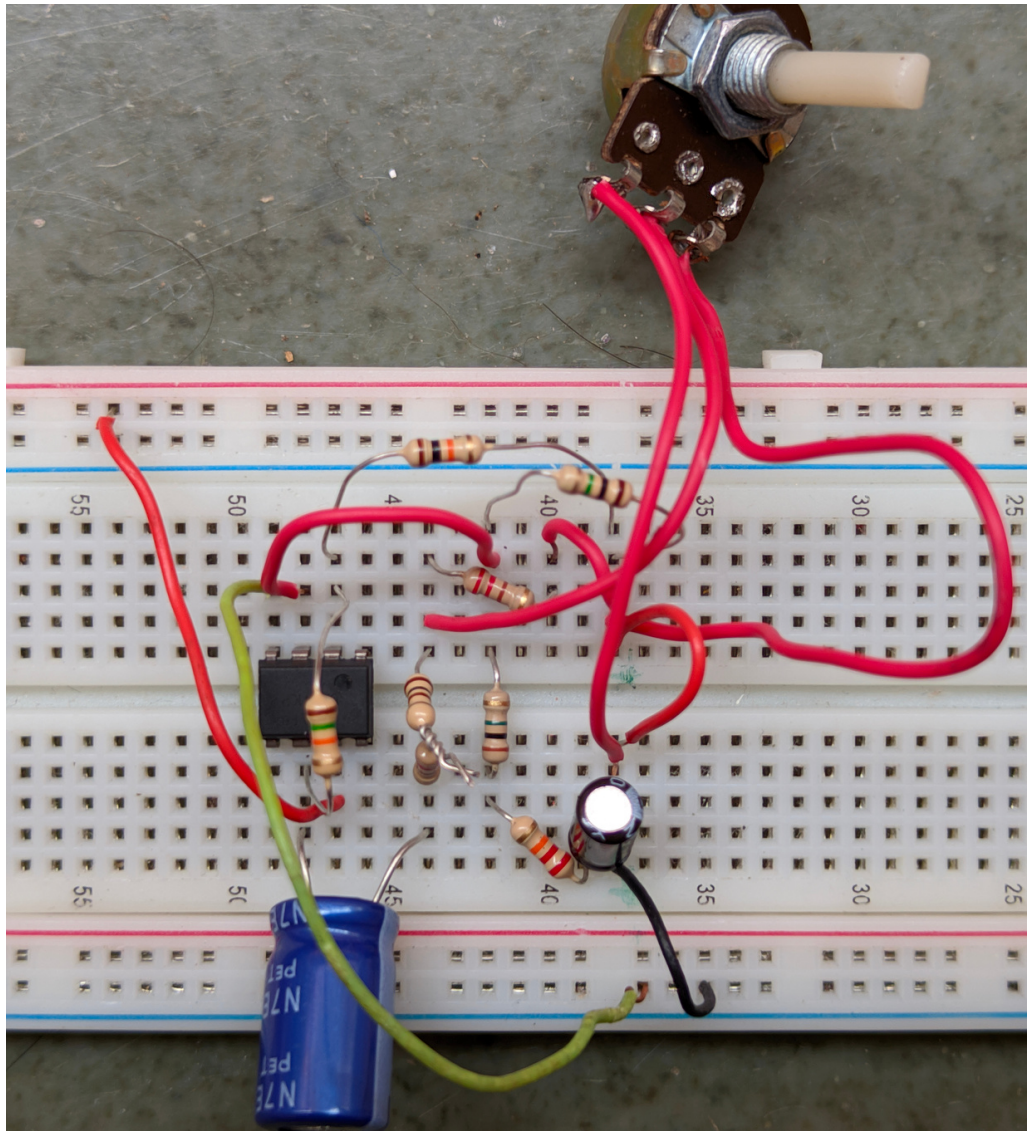
Phase 1

Simulation



Phase 1

Hardware Circuit



Working of Circuit

1. Noise Source: The first step is to introduce a noise source to the circuit. This can be achieved by connecting a resistor to the non-inverting terminal of the op-amp. The resistor is usually connected to a power supply, providing a steady current.

2. Amplification: The noise signal from the resistor is then fed into the inverting terminal of the op-amp through a resistor. This resistor is typically connected to the op-amp's inverting input and acts as the feedback resistor.

3. Capacitor Integration: Now comes the interesting part. A capacitor is connected between the output and the inverting input of the op-amp. This capacitor serves as an integrating element, smoothing out the amplified noise signal and producing a continuous white noise output.

4. Feedback Loop: To stabilize the circuit and control the gain, a resistor is connected between the output and the inverting input of the op-amp. This resistor, in conjunction with the capacitor, sets the gain and frequency response of the circuit.

Phase 2

Temperature Controlled DC Fan

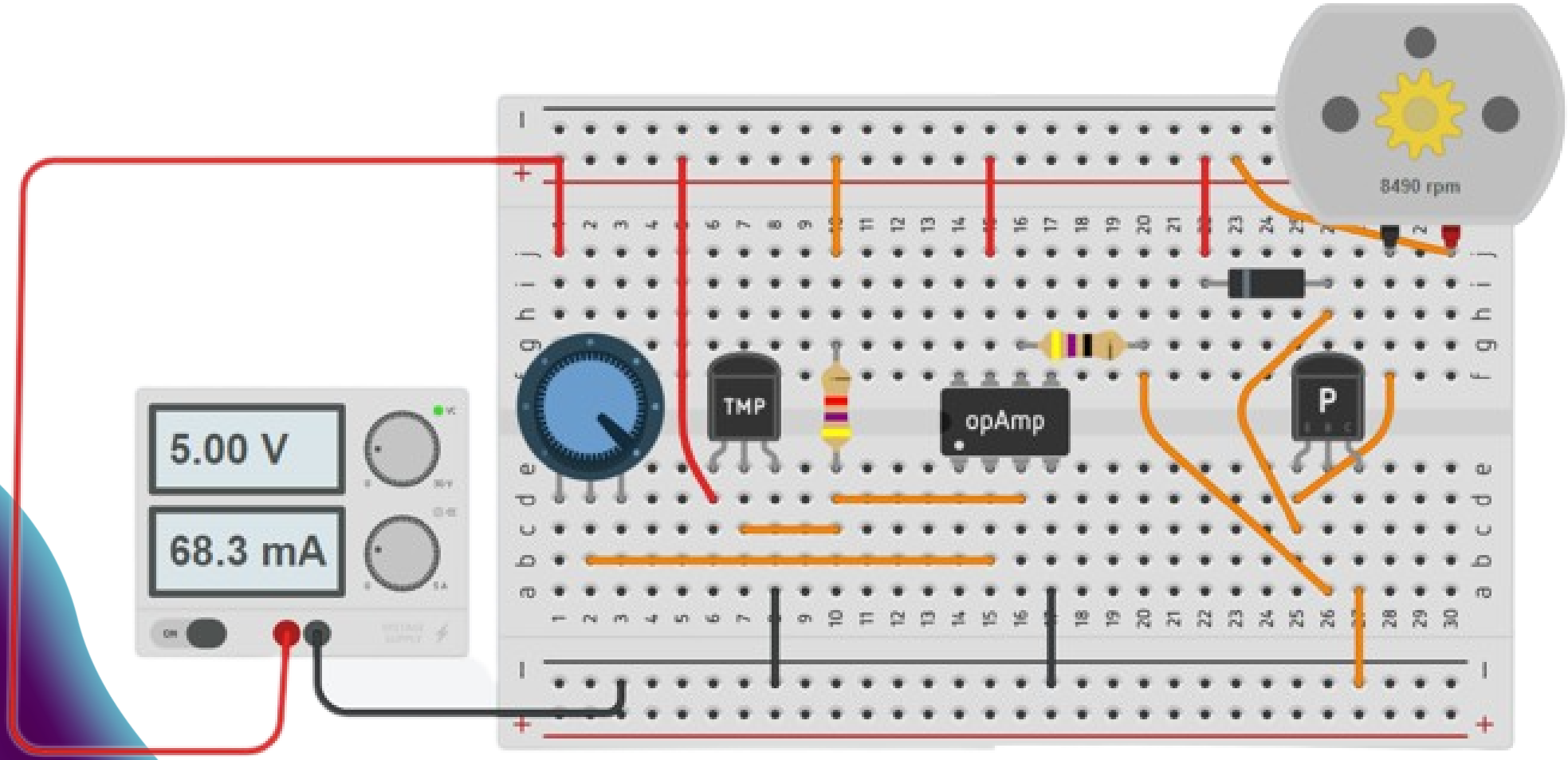
Components

- LM741 Op-Amp IC
- 4.7KΩ Thermistor
- Resistor (1KΩ, 47Ω)
- 10KΩ Potentiometer
- BD140 Transistor
- 1N4007 P-N Diode
- DC Fan

Circuit Diagram and Simulations

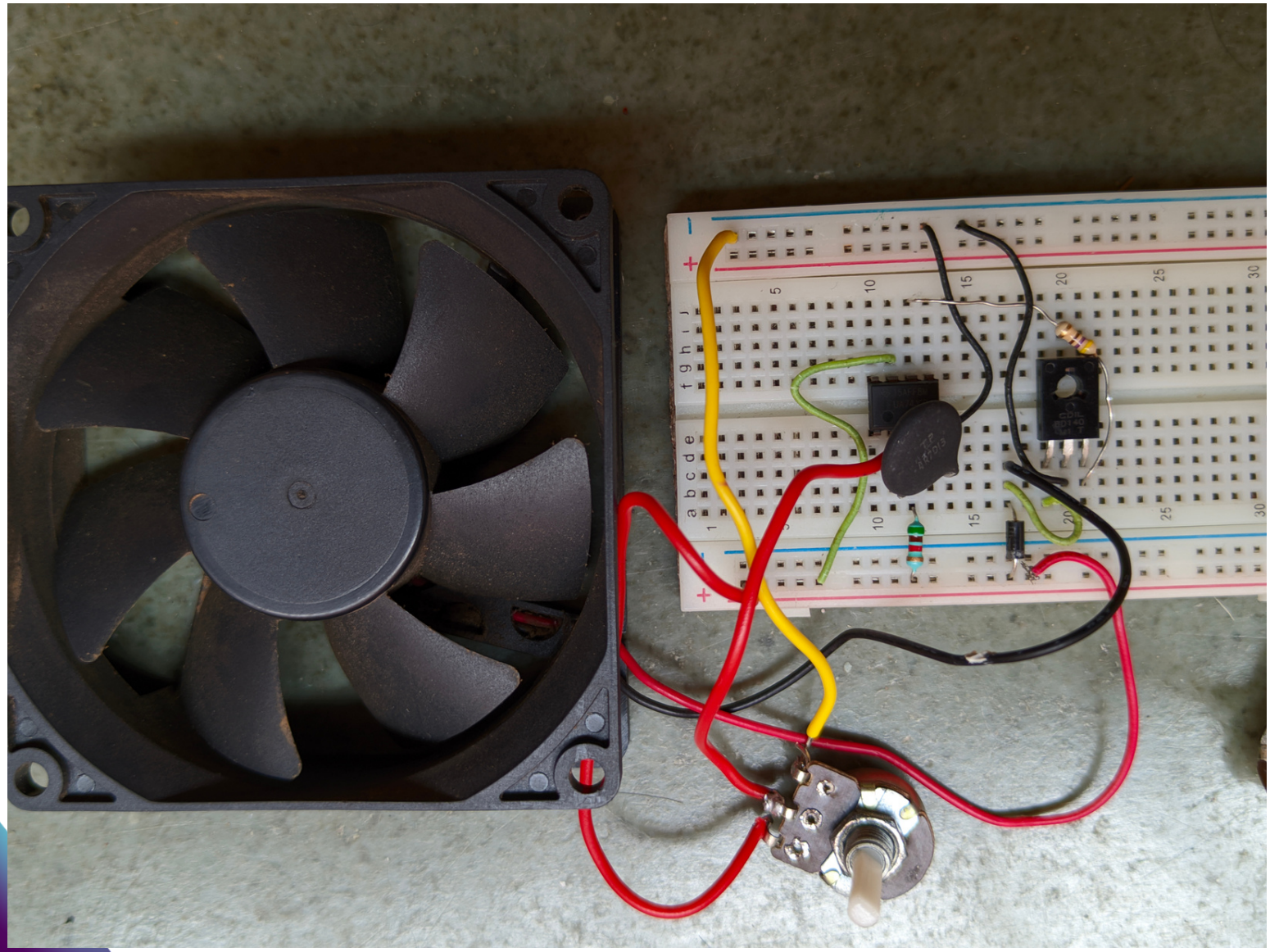
Phase 2

Simulation



Phase 1

Hardware Circuit



Working of Circuit

Here in this temperature controlled dc fan project, a 10K NTC thermistor is used. To turn on the DC fan, we use an IC 741 op-amp as a voltage comparator. Its inverting input (pin 2) gets an adjustable voltage through potentiometer while its non-inverting (pin 3) input gets voltage through a potential divider involving 1KΩ resistor and the thermistor. In this manner, the voltage at pin 3 relies upon the conductivity of the thermister.

At the point when the temperature is normal, pin 3 gets higher voltage than pin 2 and makes the output voltage of IC high. This high output voltage keeps T1 off since its base is positive. In this condition, the DC fan stays off. At the point when the temperature increases over the required values set by the potentiometer, the resistance of the thermistor decreases, and the voltage at pin 3 also decreases. Accordingly, the output voltage of the IC turns out to be low to turn on T1.

Conclusion

Addressing Insomnia: An Innovative Approach

- Objective: Develop a non-pharmaceutical solution for insomnia using IoT technology.
- Focus: Customized auditory experience with a soothing rain/white sound effect.
- Importance of Optimal Sleep Environment.

Phase 2: Enhancing the Sleep Environment

- Objective: Further improve sleep quality through environmental control.
- Proposed Solution: Temperature-controlled fan with integrated microcontroller.
- Benefits: Automatic airflow adjustment for ideal sleep temperature.

Comprehensive Sleep Aid Solution

- Combined Solution: Auditory and Environmental Factors.
- Improved Sleep Quality and Insomnia Treatment.
- Alternative to Traditional Treatments

Future Scope

- Improved Sound Quality:
  - Upgrade the sound chip or use a higher quality one to enhance the rain noise effect.
  - Explore options to add different types of rain sounds for a more diverse experience.
  - Incorporate adjustable volume and pitch controls to customize the sound according to individual preferences.
- Additional Features:
  - Expand the device to include other sleep-promoting features like white noise, nature sounds, or guided meditation.
  - Provide a wider range of options to cater to different user preferences and enhance sleep-inducing effects.
- Enhanced User-Friendliness:
  - Simplify the device by using pre-assembled components, reducing the need for soldering.
  - Utilize a pre-programmed microcontroller for ease of use, eliminating the requirement for user programming.
  - Enhance the user interface to ensure a more intuitive and user-friendly experience.

References

1. [1] American Academy of Sleep Medicine (AASM), "Insomnia Statistics." [Online]. Available: http://www.sleepeducation.org/news/2014/03/10/insomnia-awareness-day-facts-and-stats.
2. https://www.electroschematics.com/temperature-controlled-fan/


Thank You