NATURAL BUNNY

Soft Robotic Lamp | Inflatable Material | Product Design

"Natural Bunny: The Interactive Emotion Companion"? This concept combines the idea of emotional feedback and the soft, nature elements of the robot lamp, suggesting a friendly and comforting presence that's both interactive and capable of expressing a range of emotions through unique response.

TEAM MEMBERS

An Cao & Zhaorong Zeng

INSPIRATION & MARKET RESEARCH

In daily life, playful educational methods can enhance children's attention and emotional intelligence. This inspired me to utilize innovative technologies like touch sensors and LED lighting to simulate emotional responses, enriching the learning experience. I would like to design a lamp benefits both children and adults by providing emotional education and stress relief. Its unique design, incorporating elements like the mimosa plant's movements, serves as an attractive home decor item while seamlessly blending nature with technology.

Global Educational Toys Market Growth

This market is expected to have a compound Annual Growth Rate (CAGR)

8.5%

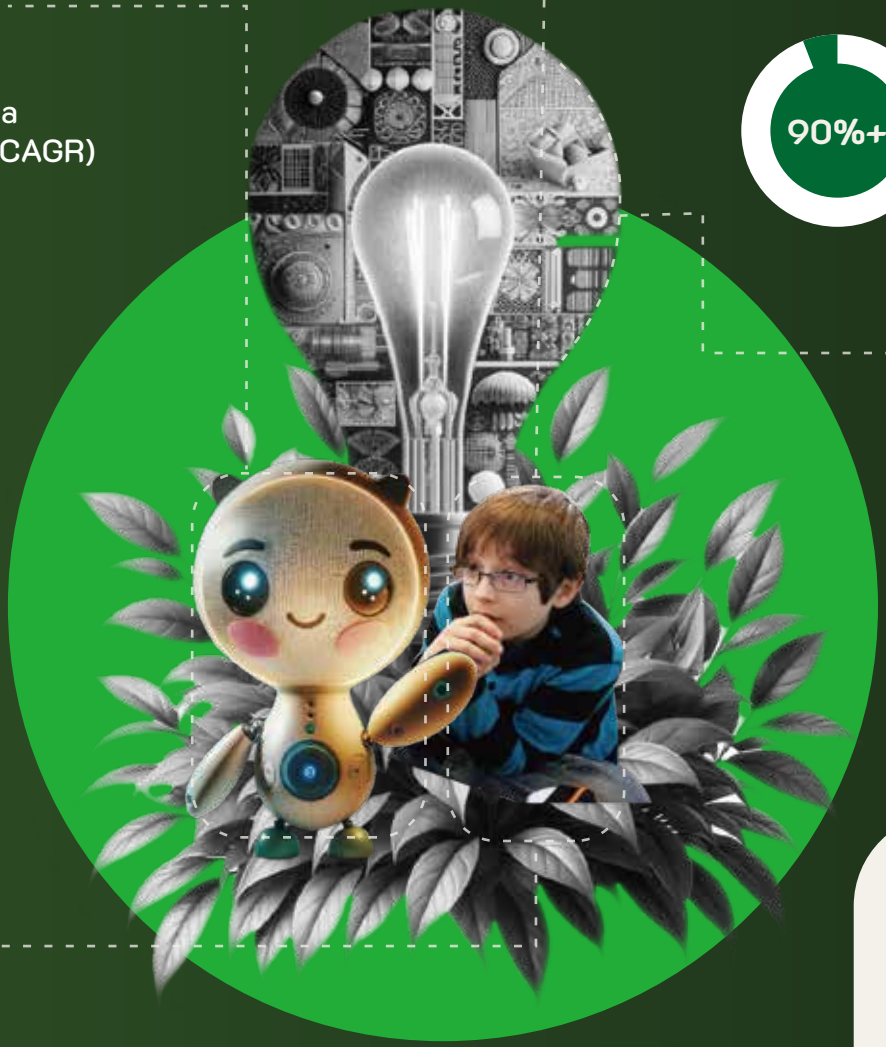
from 2021 to 2028

Focus on Children's Mental Health

A report by the American Psychological Association reveals that approximately

17%

of children under 18 suffer from mental health issues.



Demand for Emotional Intelligence Education

Statistics from CASEL (Collaborative for Academic, Social, and Emotional Learning) show that over *90% parents believe* schools should *promote* the development of students' *emotional and social skills.*

Smart Home Market Trends

This shows a *sustained interest among consumers* in home products that integrate *technology and design.*

11.6% UP

↑ $78.9 billion to $135.3 billion

CONCLUSION

Innovative lamp products have potential market demand and social ***value in emotional education,*** mental health, and smart home decor, demonstrating a sustained interest and need in society for educational ***products that integrate technology and design.***

PERSONA

SARA

| KID |

Age: 6 years old
Gender: Female
Education: Kidergarten
Pain point: Looking for toys that she can interact with and that stimulate her imagination.

“I like toys that are soft and can glow when they transform, as if they are really playing with me.”

JAMES

| COLLECTOR |

Age: 28 years old
Gender: Male
Education: Bachelor’s Degree
Pain point: He needed unique and creative decorations to decorate his studio.

“A creative light fixture is exactly what was missing from my collection, and its design is fun and functional.”

WILLIAM

| DESIGNER |

Age: 35 years old
Gender: Male
Education: Master’s Degree
Pain point: He is looking for interactive home decor that appeals to customers.

“My clients will be attracted to this interactive light fixture, which adds a fun touch to interior design.”

MOODBOARD

KEY WORDS

- Soft Robot
- Creative Lamp
- Cute
- Sensors
- Interactive
- Natural Shape
- Lighting Change
- Emotional Changes
- Emotional Feedback
- Unique Decor





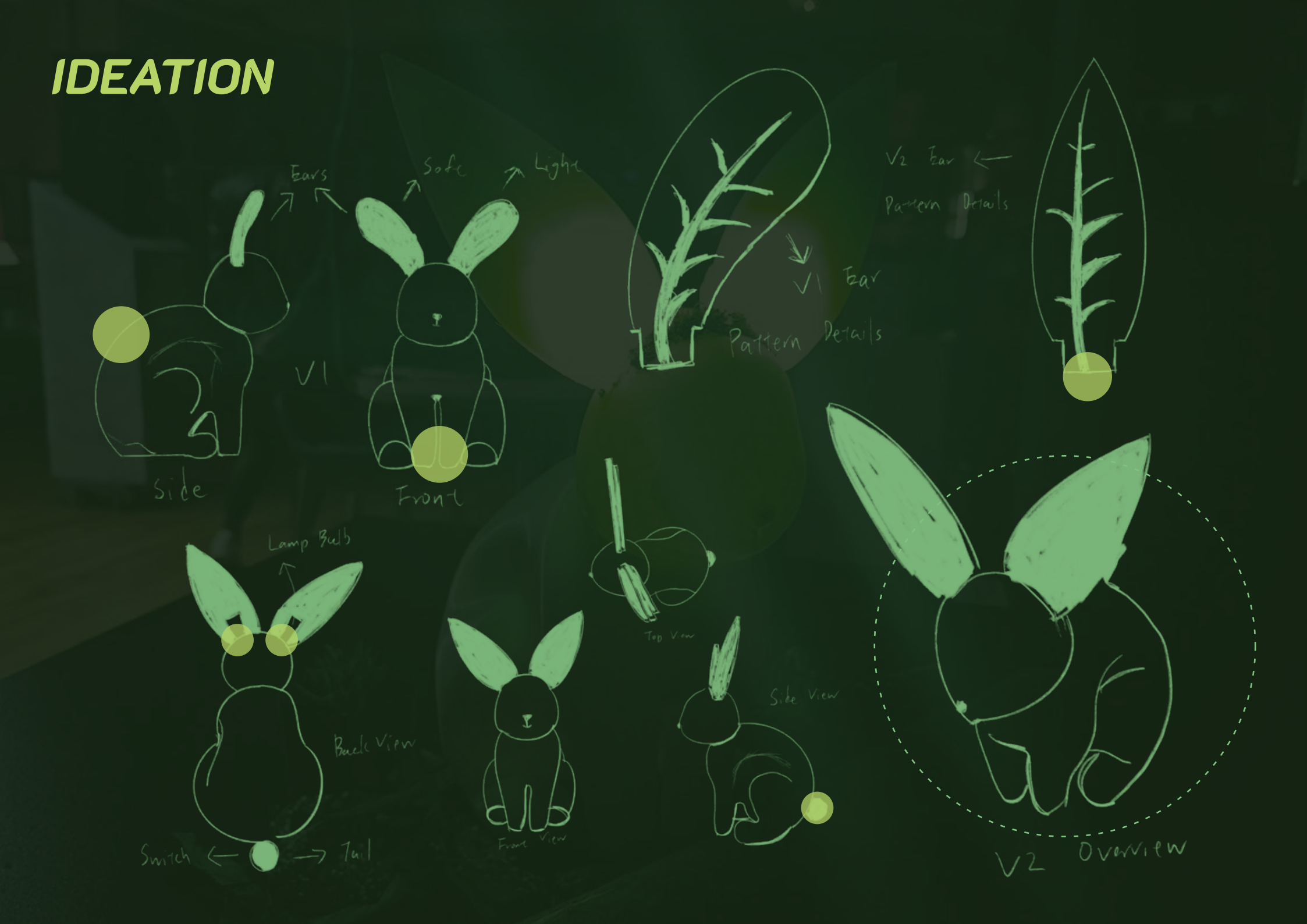




SUMMARY

This is a soft robot lighting product that simulates the emotional changes of rabbits. Sensors that touch the body of the model affect the shape change and the lighting change of the soft material to which it is connected.

IDEATION


Ears
Side
Light
V1
Side
Front
Pattern Details
V1 Ear
V2 Ear
Pattern Details
Lamp Bulb
Back View
Switch
Tail
Front View
Top View
Side View
V2 Overview

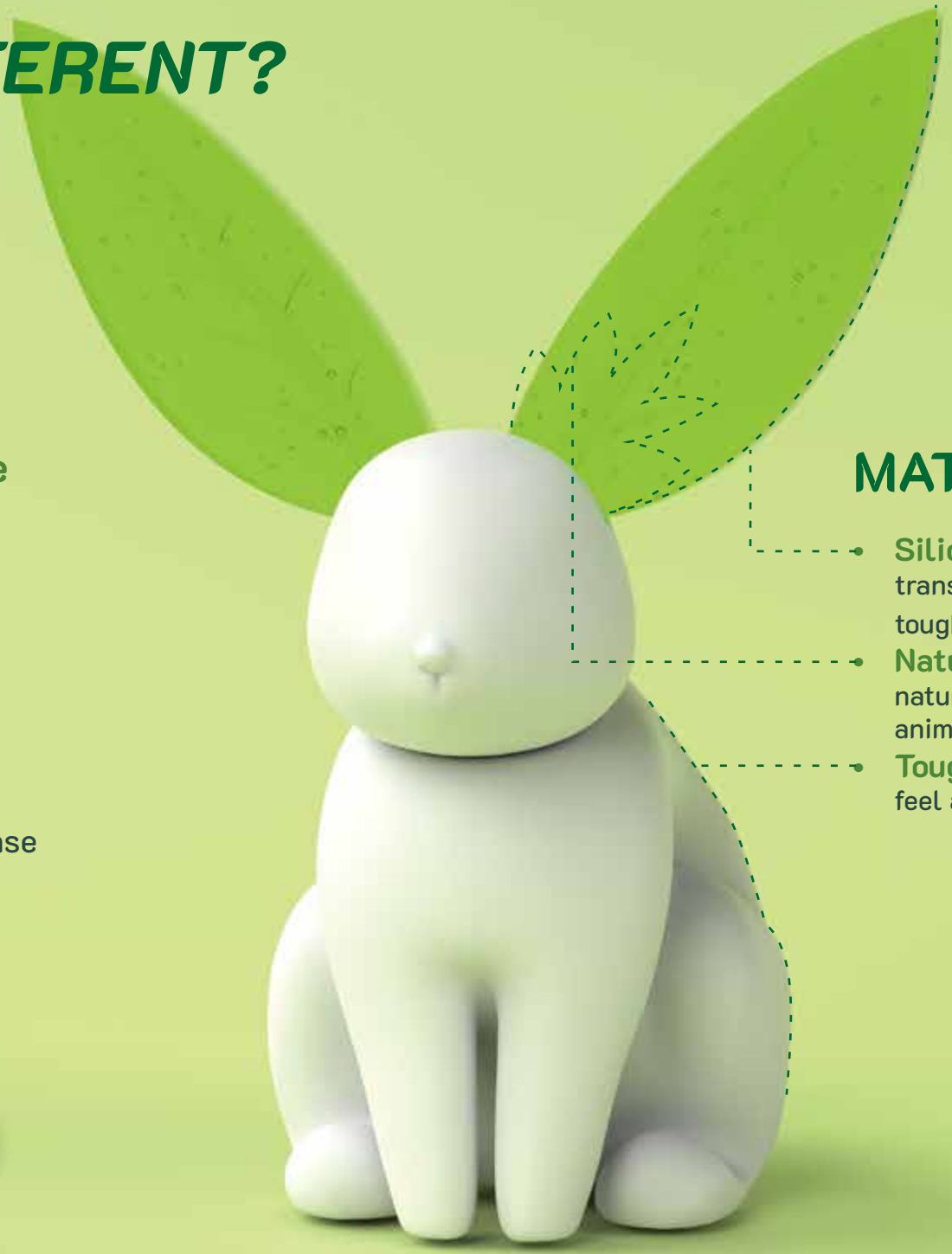
WHAT IS DIFFERENT?

FEATURES

- Emotion Simulation
- Sensor Interaction
- Innovative Material Use
- Emotional Feedback
- Unique Design
- Market Positioning

COLORS

- **Ears:** Use light green to increase light transmission.
- **Decor:** Use natural green to
- represent plants.
- **Main Body:** Use white to
- represent clean white rabbits.



MATERIALS

- **Silicone:** It has good light transmitance and inflatable toughness.
- **Natural leaf:** Respond to natural themes and combine animal elements into products.
- **Tough PLA:** It has a smooth feel and a hard structure.

ASSEMBLY & TESTING

1

Get the Arduino Nano & Programmable Air ready

2

Make silicone tails out of 3D printed molds

3

Solder the circuit board & try to fit half the body

4

Making the silicone ears & connect the gas pipe

5

Connect circuits to test inflation & lighting

6

Combine & test two color lighting effects

PROGRAMMING PROCESS

```
#include "programmable_air.h"
//Maximum torsional pressure 750
//Normal 500
#define pressurePin A0  // Assume that the pressure sensor is connected to digital pin 8
int ledPin = 7;   // The pin of the Arduino is connected to the transistor base
bool isPumped = false;  // Track the current status of the balloon: false means not inflated, true means inflated
int loopnum = 0;
bool initial_status = true;
void setup() {
  initializePins();
  pinMode(pressurePin, INPUT_PULLUP);
  pinMode(ledPin, OUTPUT);
  Serial.begin(9600);
  closeAllValves();
}

void deflateToPressure(int targetPressure) {
  while (readPressure() > targetPressure) {
    vent();   // Air extraction
    delayWhileReadingPressure(10); // Short delay for pressure stabilization
  }
  closeAllValves();
}

void inflateToPressure(int targetPressure,int speed = 80) {
  while (readPressure() < targetPressure) {
    setValve(2, OPEN);
    switchOnPump(2, speed);  // Assume that pump number 2 is used for inflation
    delayWhileReadingPressure(100);  // Short delay for pressure stabilization
    switchOffPumps();
    closeAllValves();
  }
}

void inflate(){
      deflateToPressure(600);
    inflateToPressure(750,80);
        deflateToPressure(580);
    inflateToPressure(750);
        deflateToPressure(550);
    inflateToPressure(750);
        deflateToPressure(500);
    inflateToPressure(750);
    deflateToPressure(500);

}
void deflate(){
    inflate();
        switchOffPumps();
    closeAllValves();

}


void loop() {

  if(initial_status == true){
    inflateToPressure(750);
  }

  if(readPressure()>790){
    deflateToPressure(500);
    initial_status = false;
  }

  int pressure = readPressure();  // Continuous reading pressure
  loopnum++;
  Serial.println(readPressure());

  int sensorState = digitalRead(pressurePin);  // Read the status of the pressure sensor
  if (isPumped) {
    digitalWrite(ledPin, HIGH);
  };
  if (sensorState == HIGH) {  //If the sensor is touched
    if (!isPumped) {              // If the balloon is not inflated
      // digitalWrite(ledPin, HIGH);  // turn on LED
      Serial.println("Inflating the balloon...");
      // setValve(2, OPEN);
      // switchOnPump(2, 100);       // Open inflate
      // delayWhileReadingPressure(3000);
// Give the balloon enough time to inflate
      inflate();
      switchOffPumps();
      closeAllValves();
      isPumped = true;           // Update status to Inflated
    } else {                    // If the balloon is inflated
      Serial.println("Deflating the balloon...");
      // Suppose you need to adjust the pressure of the balloon to a specific range
      deflate();
      isPumped = false;         // Update status is not inflated
      digitalWrite(ledPin, LOW); // Turn off the LED after venting
    }
    delayWhileReadingPressure(1000); // Add some dejitter delay
  }
}
```

USER EXPERIENCE

FINAL OUTCOME