Voice Controlled Lighting System

Project Name: Harry Potter Spell (Lumos / Nox)

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Technology Stack: Python, Arduino UNO, SoundDevice, Google Speech Recognition

Abstract

This project demonstrates a real-time voice-controlled lighting system inspired by the Harry Potter spells 'Lumos' and 'Nox'. The system captures voice input using a laptop microphone, processes the speech using Python and Google Speech Recognition, and communicates with an Arduino UNO via serial communication to control an LED. The project integrates embedded systems, speech processing, and hardware control into a complete functional prototype.

1. Introduction

Voice-controlled systems are widely used in modern smart homes and IoT applications. This project replicates a simplified smart lighting system where specific voice commands are mapped to hardware actions. The system uses the spell 'Lumos' to turn the light ON and 'Nox' to turn the light OFF.

2. Objectives

1. To design a voice-controlled LED system.
2. To establish serial communication between Python and Arduino.
3. To implement real-time speech recognition.
4. To create a reliable ON/OFF command protocol.

3. Hardware Components

Component	Purpose
Arduino UNO	Microcontroller for LED control
LED	Output device (light source)
2.2k Ohm Resistor	Current limiting resistor for LED
Laptop Microphone	Voice input source
USB Cable	Serial communication & power

4. Software Architecture

The system operates in the following sequence: 1. Audio is recorded using the sounddevice library. 2. The recorded audio is converted into text using Google Speech Recognition. 3. If the recognized text contains 'lumos', the command 'ON' is sent to Arduino. 4. If the recognized text contains 'nox', the command 'OFF' is sent. 5. Arduino reads the serial input and switches the LED accordingly.

5. Results

The system successfully responded to voice commands. When 'Lumos' was spoken, the LED turned ON. When 'Nox' was spoken, the LED turned OFF. The system demonstrated reliable serial communication and command execution.

6. Conclusion

This project demonstrates a complete end-to-end embedded voice control system. It integrates speech recognition, serial communication, and microcontroller-based hardware control into a functional prototype. The project serves as a foundation for developing advanced smart home and IoT systems.

7. Future Enhancements

1. Add relay module to control real AC appliances.
2. Implement offline speech recognition.
3. Expand to multiple device control.
4. Develop a GUI dashboard for monitoring.