

# SE101 Project Proposal: Smart Speaker

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## Summary

The speaker volume and screen brightness of our devices must be adjusted often throughout the day according to external noise levels and lighting conditions. Our idea is to automate this process by creating a device using Raspberry Pi, a light sensor, and microphone. This device will detect the ambient noise and brightness levels in a room and send this data via Bluetooth to a Windows device. We will also build an application that will use this data to adjust the volume and screen brightness levels of the computer to match the external conditions.

## Software Components

- **Audio Processing:** Read raw data from USB microphone with PyAudio library and extract ambient noise level.
- **Bluetooth:** Transmit processed data from Raspberry Pi to clients, using PyBluez library.
- **GUI:** Allow user to calibrate brightness and volume for each monitor and audio output device.
- **Brightness Control:** Use DDC/CI protocol to enumerate monitors and control their screen brightness.
- **Volume Control:** Identify current audio output devices, and set their volume.

## Hardware Components

- **Raspberry Pi 3 Model A+:** Controls noise and light sensors, sends data from noise and light sensors to an app on the device, the device will then adjust its brightness and speaker volume.
- **USB Microphone:** Records and detects the level of volume or noise of the user's environment.
- **Ambient Light Sensor:** Highly sensitive to light and will detect the brightness of the user's environment, transforms light intensity of environment into a digital signal output.

## Challenges

- Integration of the hardware components
  - Integrate the ambient light sensor and microphone with the Raspberry Pi, which none of us have experience with
- Integration of hardware with software
  - Communicate the raw data via Bluetooth (so far seems most viable)
  - Convert data from camera and microphone into a form that we can easily work with in Python
  - Convert the processing in Python into a command that can be sent via Bluetooth to adjust volume/brightness
- "Filtering" input