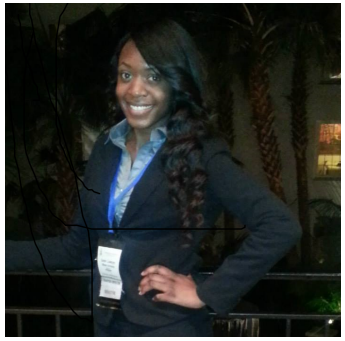
InteL-E-Ds

Arseny Izotov

Alden Michaels

Justin Lad

Sade Luwoye



A Lightshow for Me?

- NewVision-Tech
- CUBEecho
- Cheaper, Inferior alternatives

Light-O-Rama

What’s Missing?

- None/Poor beat detection
  - Poor microphone
- Linear Cost Scalability
- Private devices rarely used
- Interface

We can top it:

- Comfortable Integration
- Accurate Music Analysis
- For club and personal use

The InteL-E-Ds Solution

- LED Music Controller
  - Sophisticated Music Analysis
  - App Interface
  - Plug & Play
  - Controls variable number of LED Modules

Requirements

- Easy to set up
- Seamlessly stream music
- Aesthetic Case
    - Small, Sturdy Enclosure
- Intuitive App

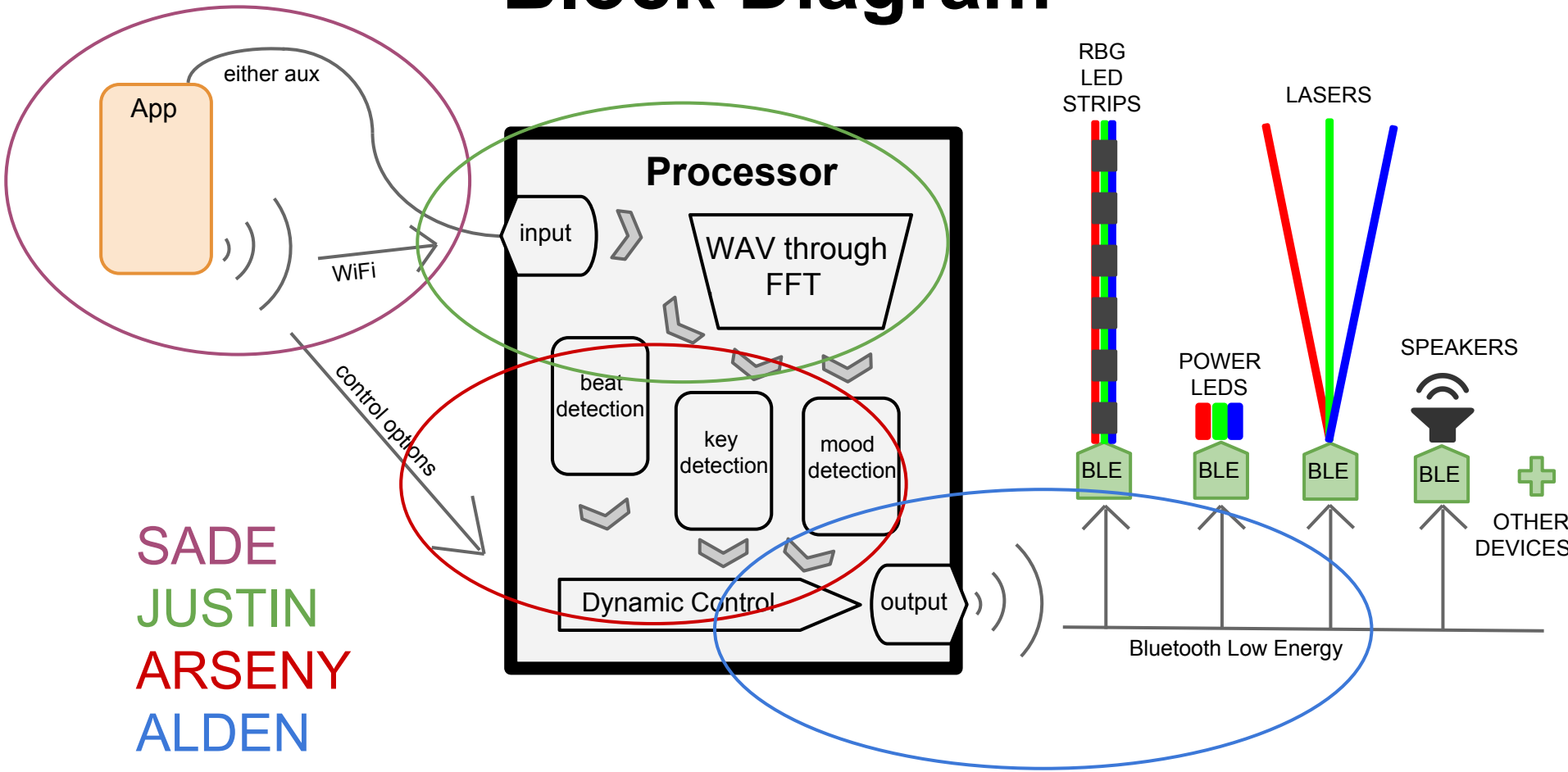
Specifications

- Stream standard format music
- Recognize beat, key, mood in real time
  - Control light modules accordingly
- App to control lights and stream music

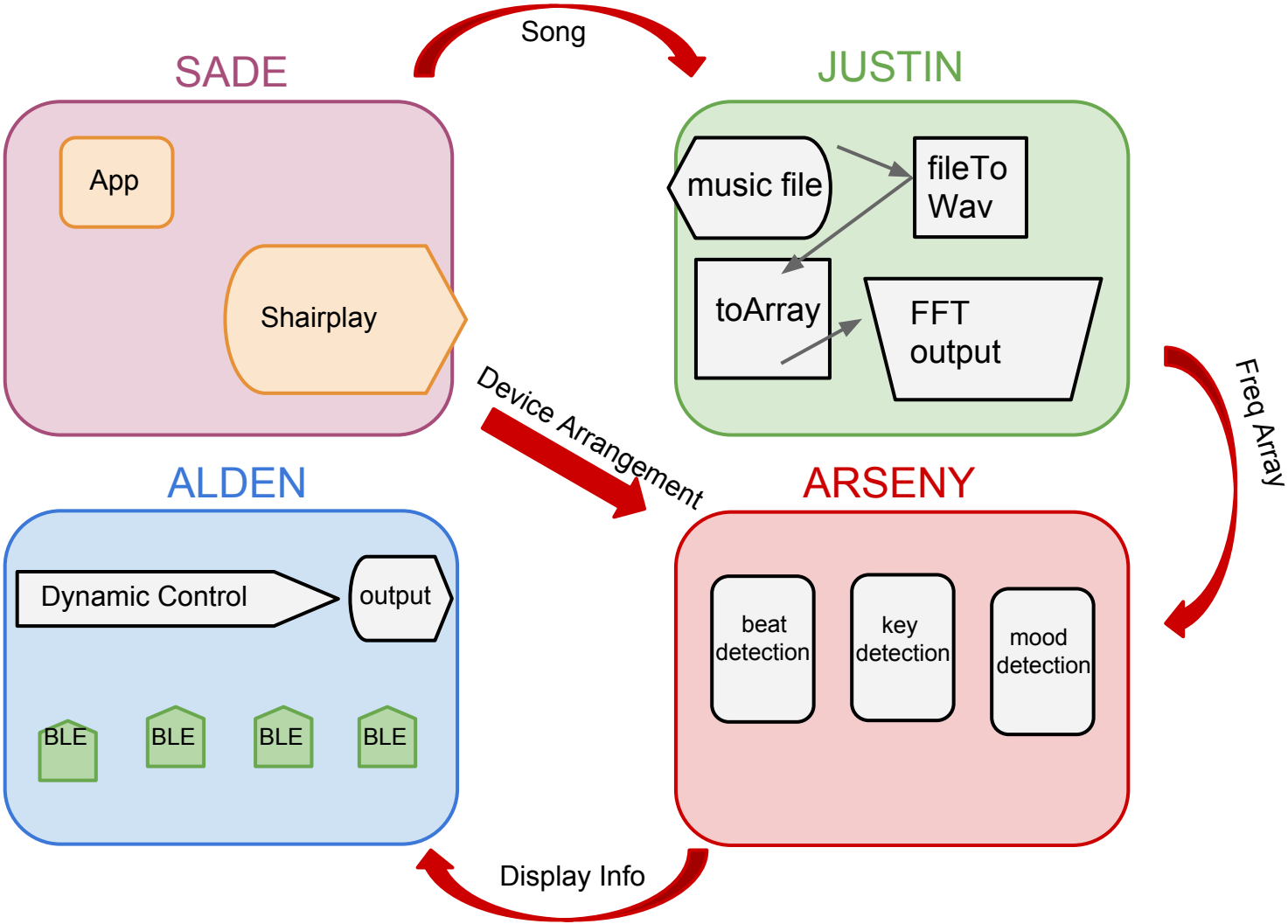
Design Alternatives

- Input Types: Aux / Airplay / Volumio / WiFi / Bluetooth
- Processor: BBB vs DSP vs Higher End
- Supported Modules: LEDs / Lasers / Speaker / Fog

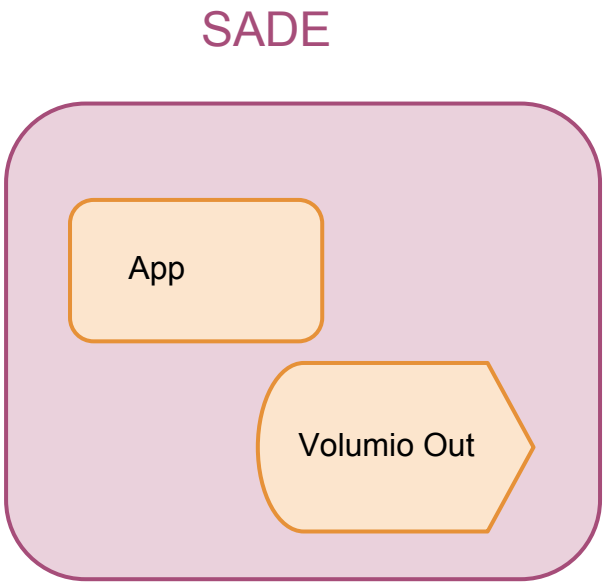
Block Diagram



SADE
JUSTIN
ARSENY
ALDEN


SADE
App
Shairplay
Song
JUSTIN
music file
fileTo Wav
toArray
FFT output
Freq Array
Device Arrangement
ALDEN
Dynamic Control
output
BLE
BLE
BLE
BLE
ARSENY
beat detection
key detection
mood detection
Display Info

Block 1:



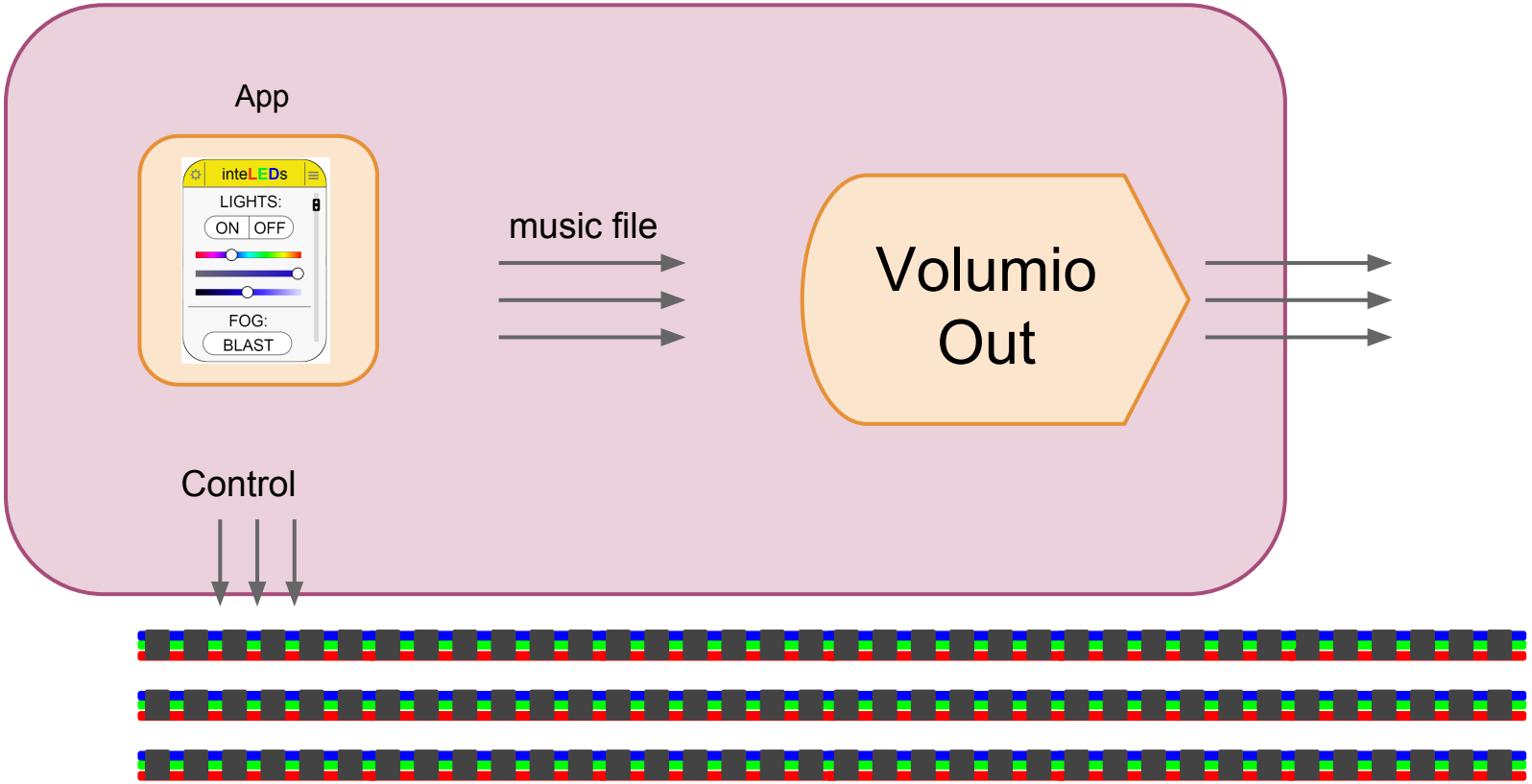
Input:

- Standard format music file
- LED configuration

Output:

- Music file over airplay
- Light Control Signals

Block 1: work plan



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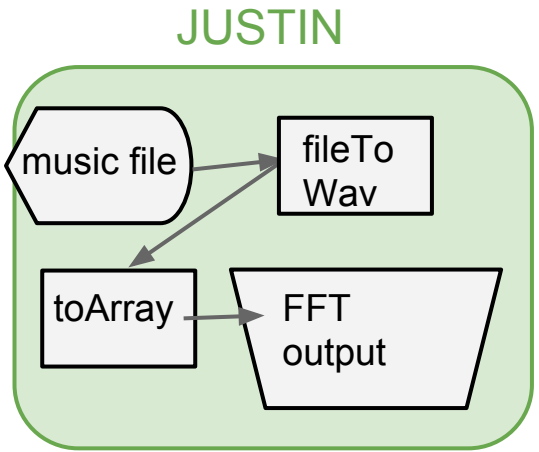


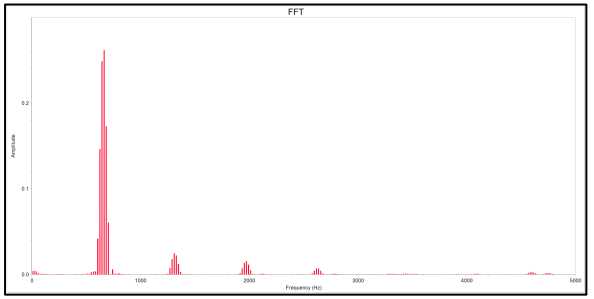
Input:

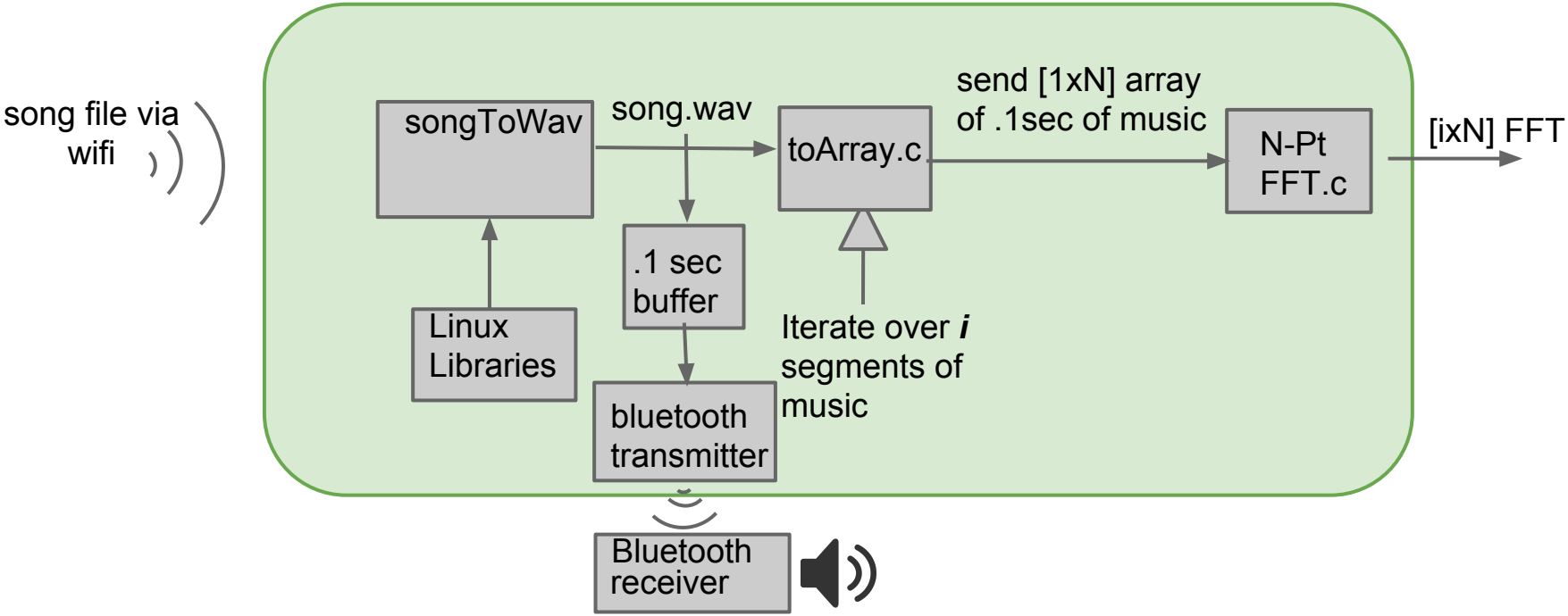
- song
  - file
  - live

Output:

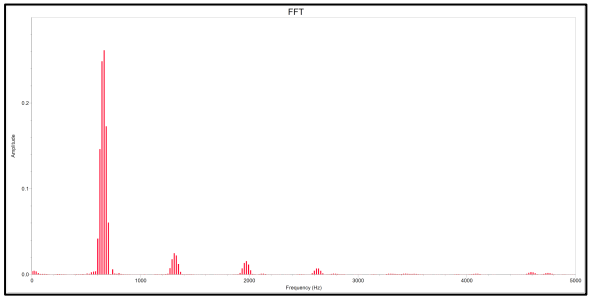
- array of FFT samples
- song.wav

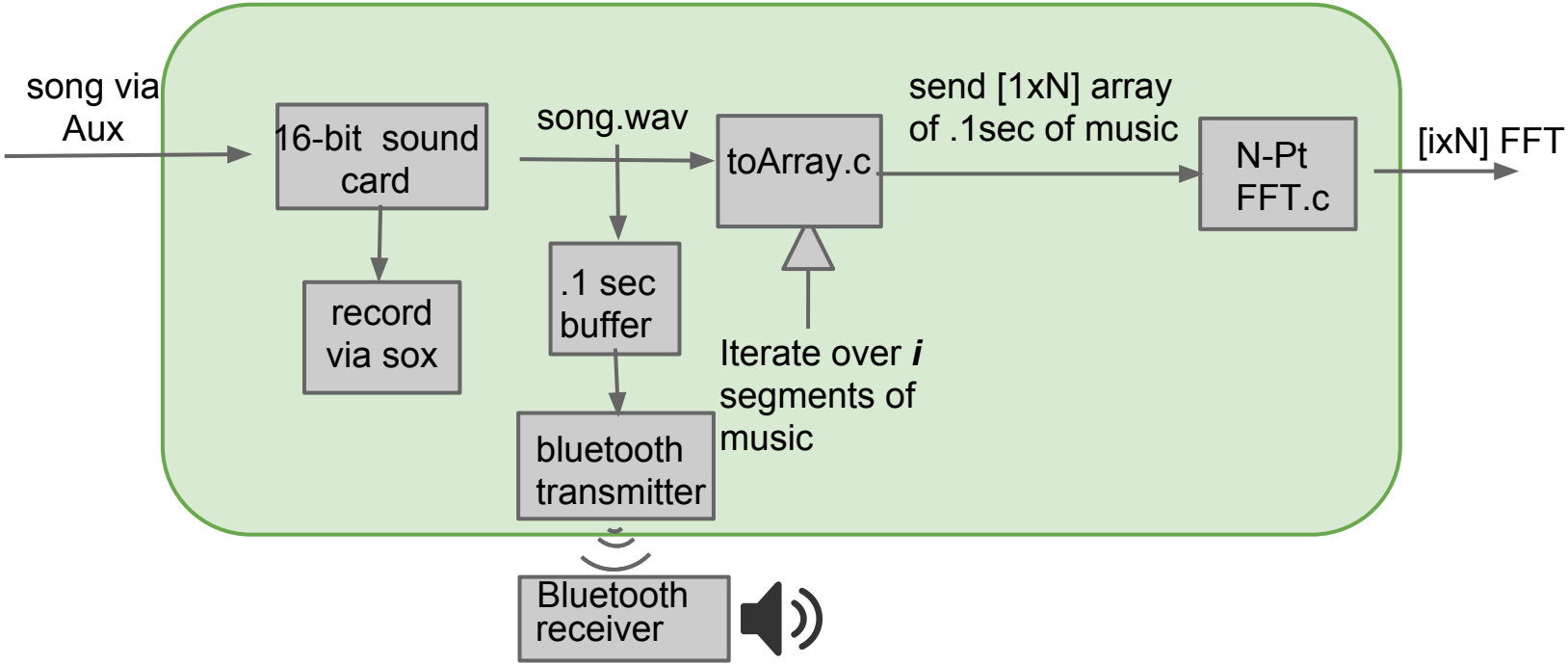
Block 2: work plan





Block 2: work plan





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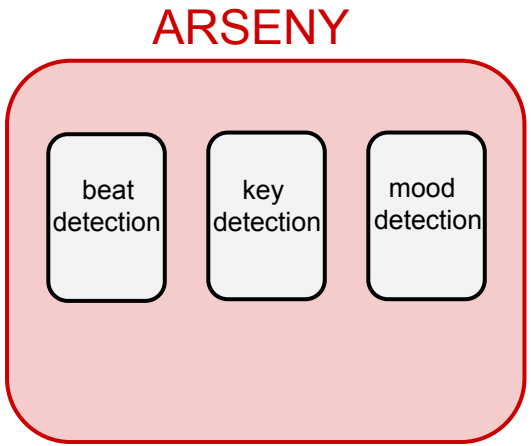


Input:

- Freq Arrays Over Time
- Arrangement of Modules

Output:

- Light Display According to
  - Beat presence
  - Dominant Key
  - Mood

Block 3: work plan

Beat Detection:

- FFT #2
- Peak detection
- Low Frequencies

Block 3: work plan

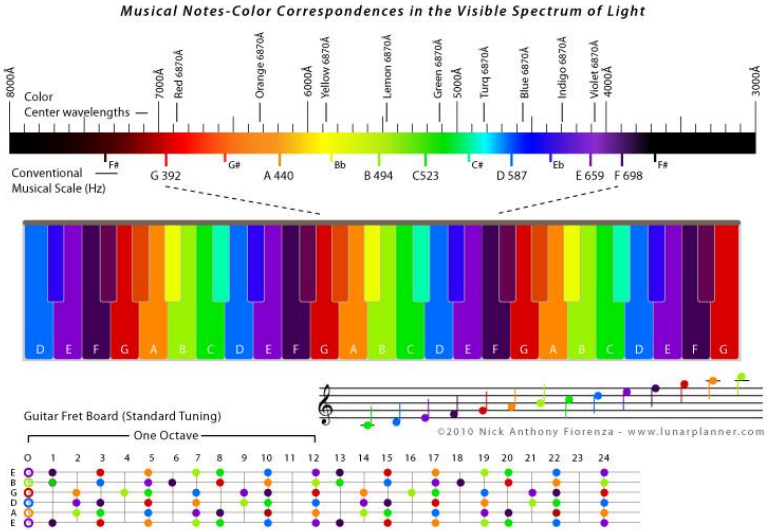
Dominant Key Detection:

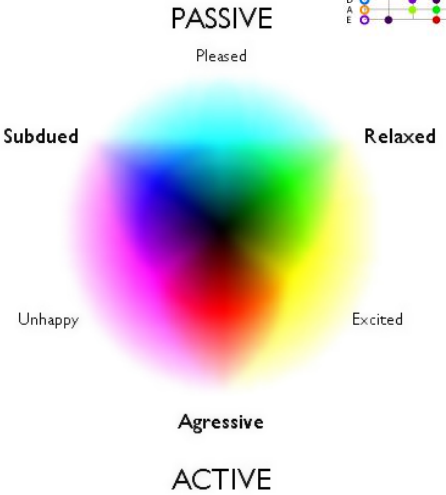
- Popular Chords
- Freq to most matching chords
- Chord positions => Key

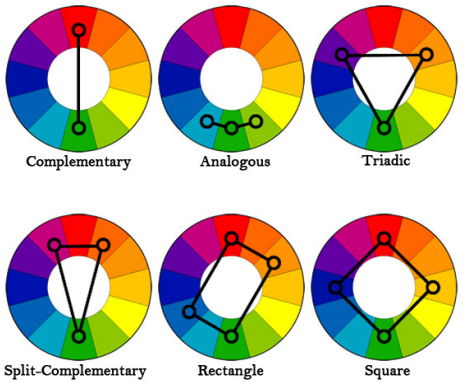
Block 3: work plan

Mood Detection:

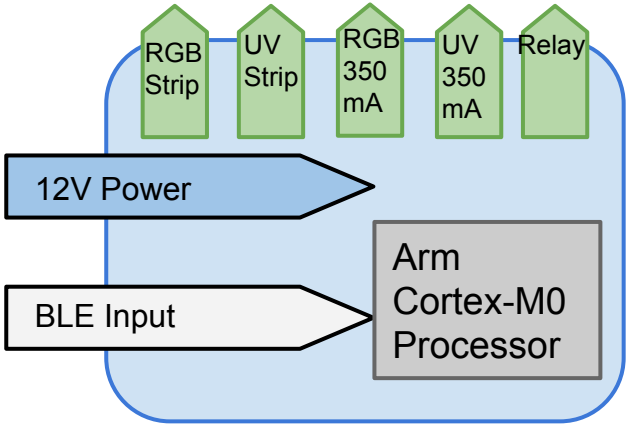
- Psychology keys => mood
- Frequency => color
- Color => mood







Block 4:



ALDEN

Input Requirements:
- Accept noisy 12V supply from cheap adapters
- Maintain stable 2.4GHz Bluetooth connection
- Firmware must support custom lighting protocol
- Any Bluetooth 4.0+ device can interface (phone, tablet)
- Buttons for manual “mood lighting” input
- IR receiver for additional control (“stretch goal”)

Output Requirements:
- 4 Channel 12V LED strip output
- 4 350mA constant current outputs
- At least 10bit & 1kHz PWM

Physical Requirements:
- Accept 2.1mm 12V barrel jack (ubiquitous in consumer elec)
- Enclosure doesn't greatly attenuate 2.4GHz signal
- Rugged enough for 4ft drops
- Water resistant

Block 4: Alternatives - CPU

- Low frequency proprietary radio - 915MHz
  - Greater indoor signal penetration
- BlueGiga Scripting Module or equivalent
  - Already FCC certified
  - Scripting language is primitive
  - Not suited for mass production
- T.I. BLE SoC - CC2540, with 8051 uC
  - ARM Cortex is more modern and more powerful
  - Nordic nRF51822 SoC is better suited

Block 4: Alternatives - Output

- Power LEDs with spotlight lenses
  - Excellent lumen density
  - Difficult thermal constraints
  - Difficult to diffuse light indoors (worse when dim)
- 12V LED Strips
  - Excellent optical and thermal diffusion characteristics with proper installation
  - Mass market penetration removes burden of production from small startup company
  - Difficult to install and remove

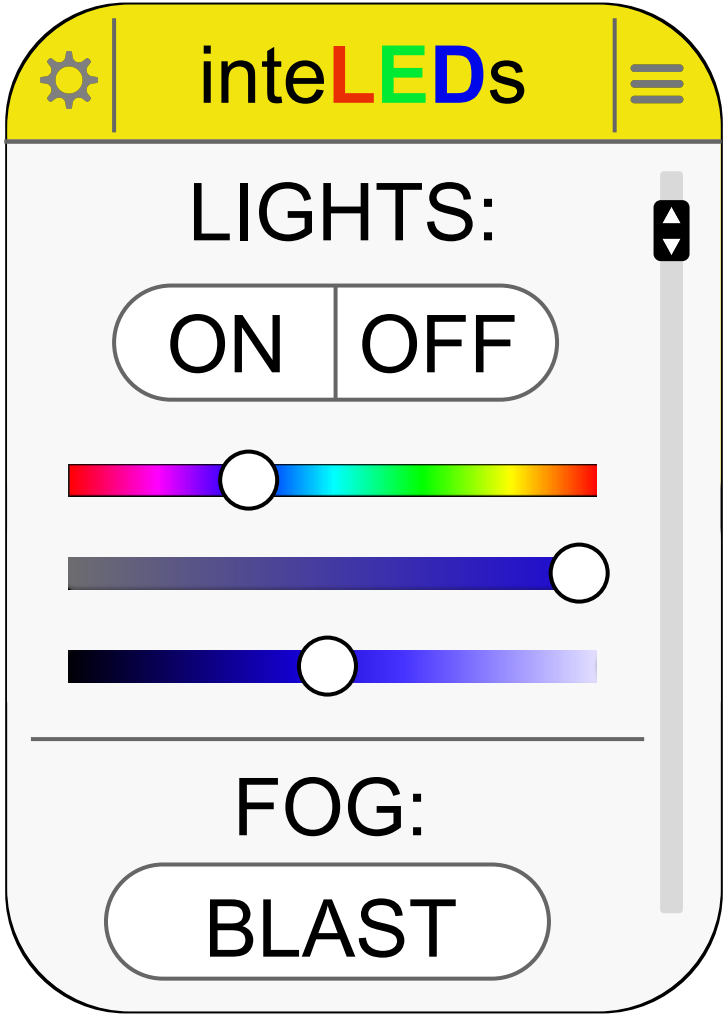
Block 4: MDR Deliverables

- nRF51822 based system interfacing via BLE
- Clean 12V power supply
- 4 Channel PWM output
- 4 Channel 12V drivers
- 1 Channel Relay driver (fog machine etc)

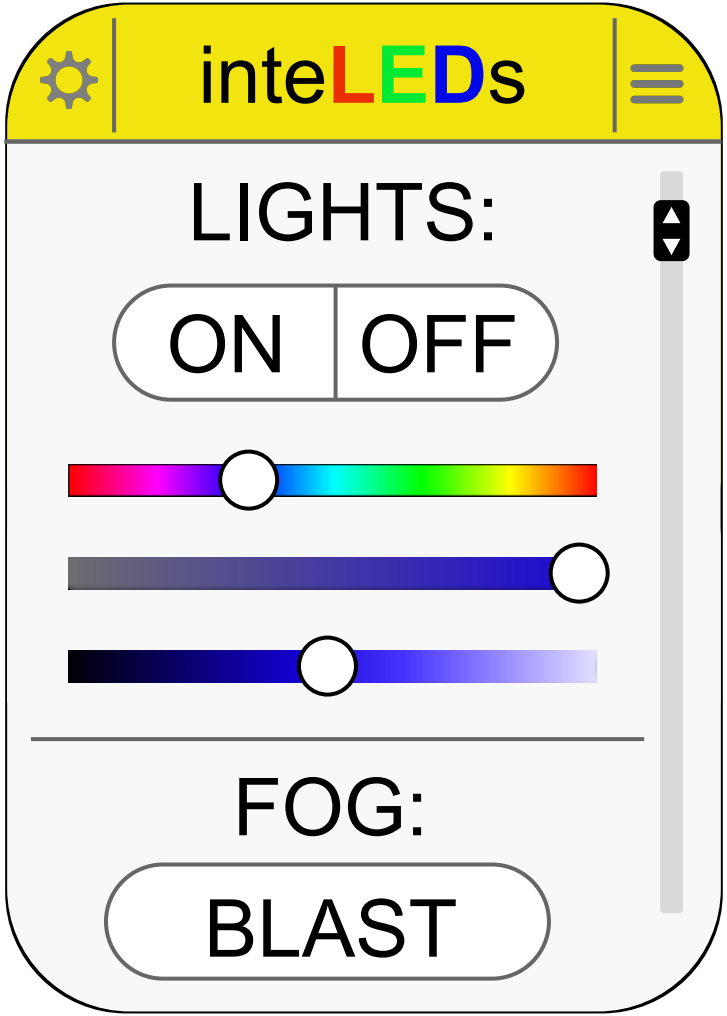
MDR deliverables

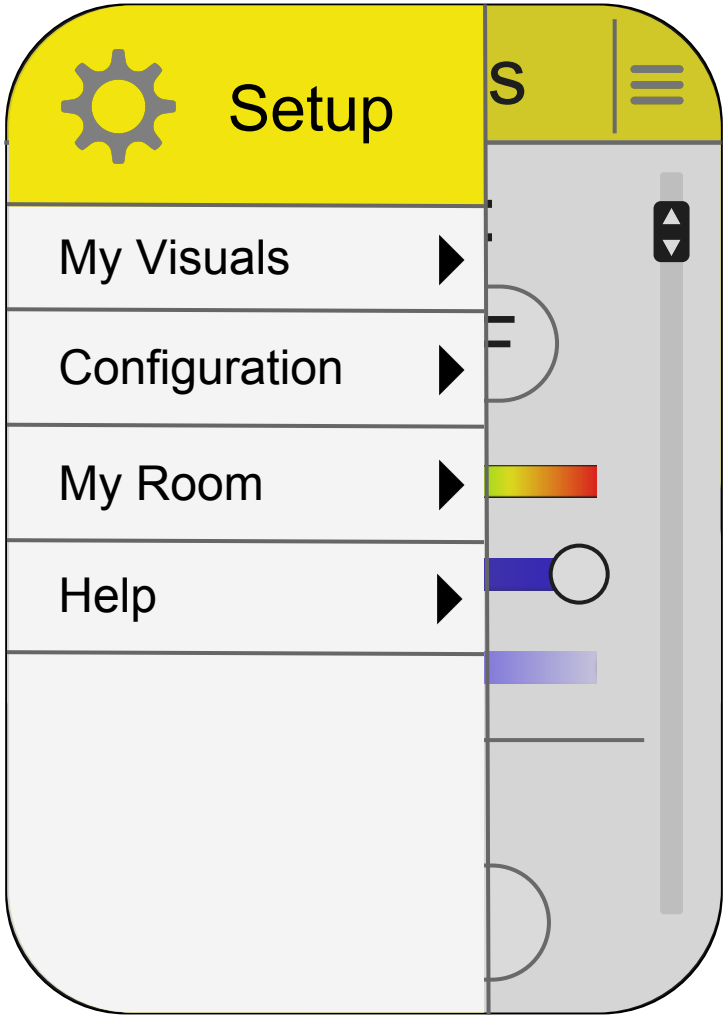
- Send song to BBB from app
- From song to FFT array
- Beat Detection
- Lights blink to beat of song

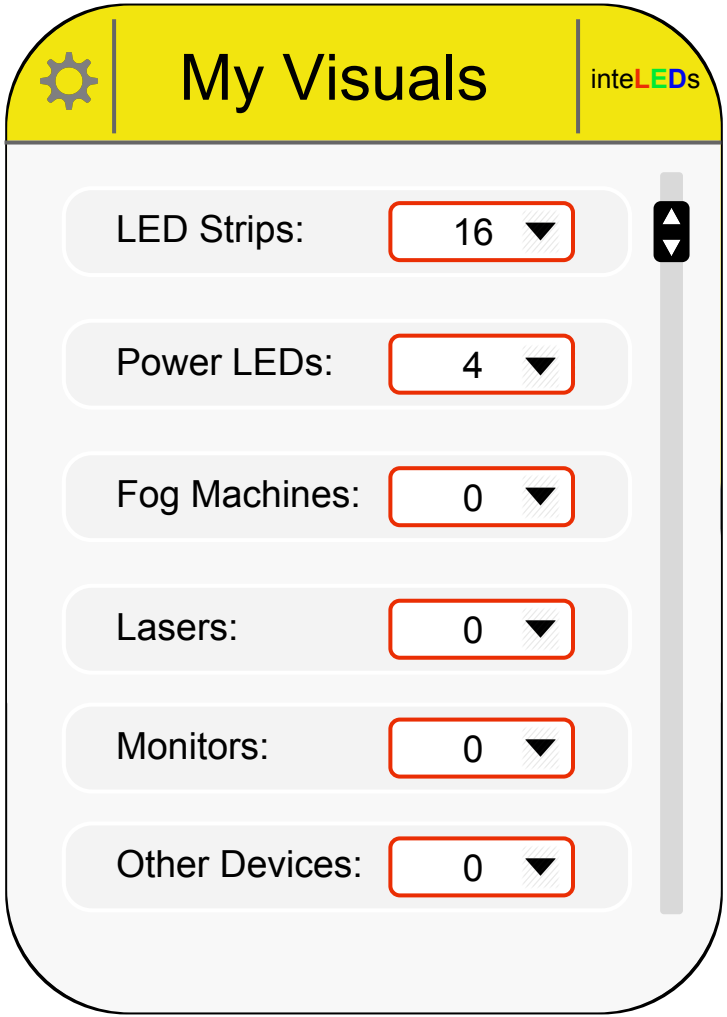
Questions?

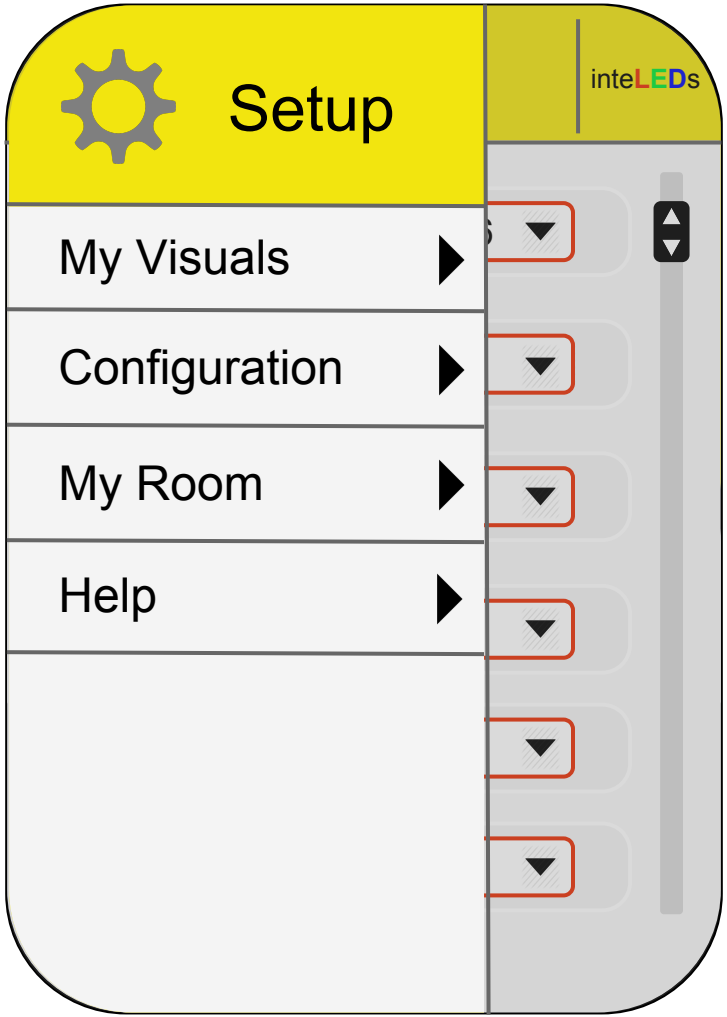

inteLEDs
LIGHTS:
ON
OFF
FOG:
BLAST


inteLEDs
PARTY MODE: Off
Setup Party Mode
Load Playlist:
Select
Allowed Brightness:
FOG:
BLAST


inteLEDs
LIGHTS:
ON
OFF
FOG:
BLAST


Setup
S
My Visuals
Configuration
My Room
Help


My Visuals
inteLEDs
LED Strips:
16
Power LEDs:
4
Fog Machines:
0
Lasers:
0
Monitors:
0
Other Devices:
0


Setup
My Visuals
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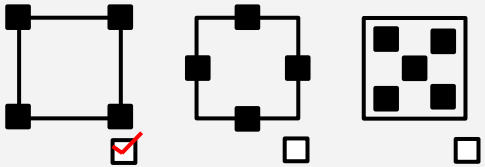
My Room
Help
inteLEDs

Configuration

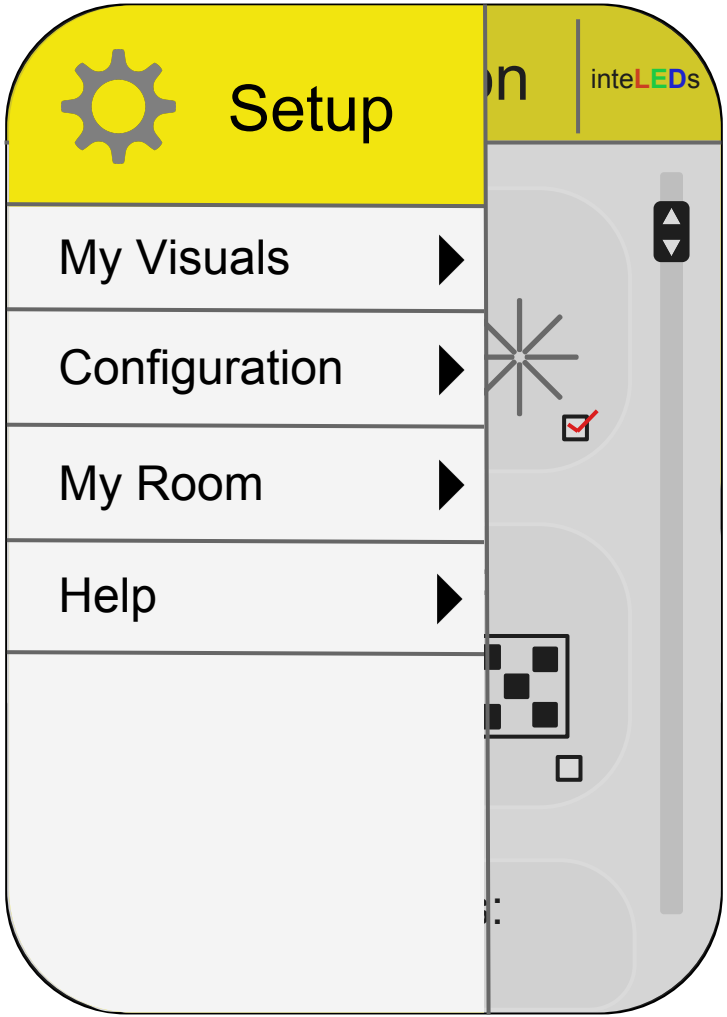
inteLEDs

LED Strips:

Power LEDs:



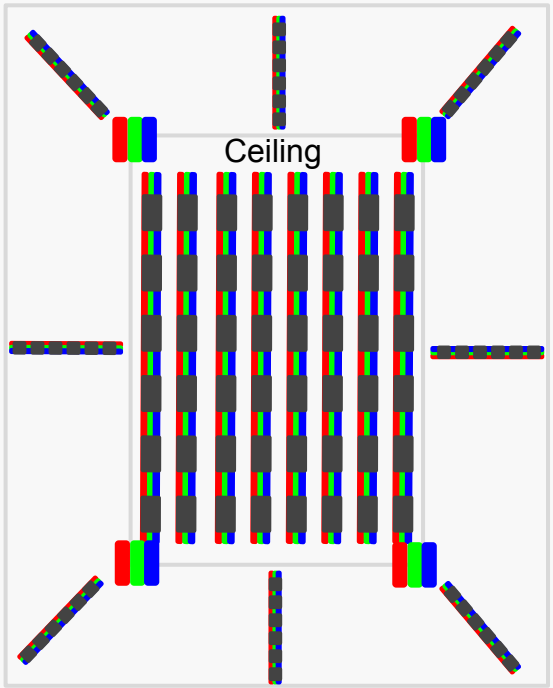
Fog Machines:


Setup
My Visuals
Configuration
My Room
Help
inteLEDs

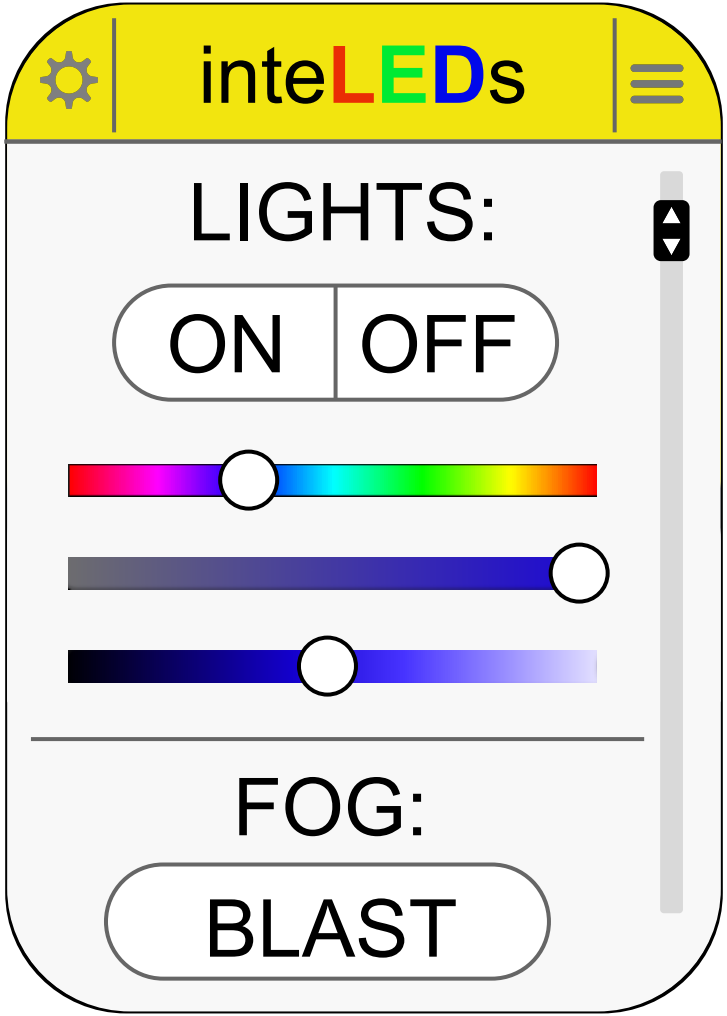
My Room

inteLEDs

Walls



MOVE ITEMS


inteLEDs
LIGHTS:
ON
OFF
FOG:
BLAST