Companion Light

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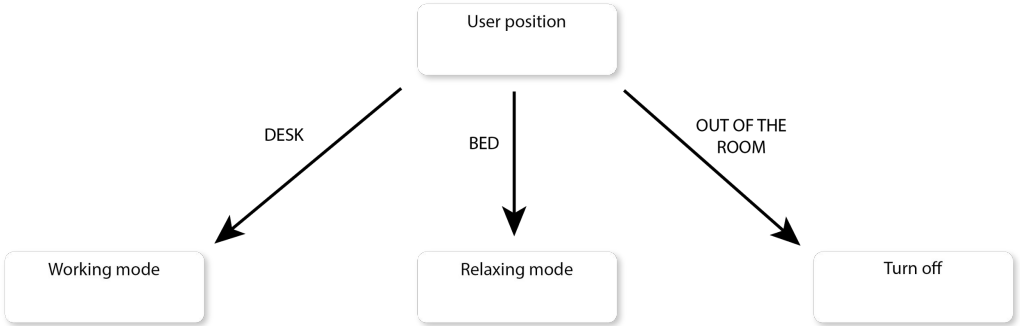
Goals And Context

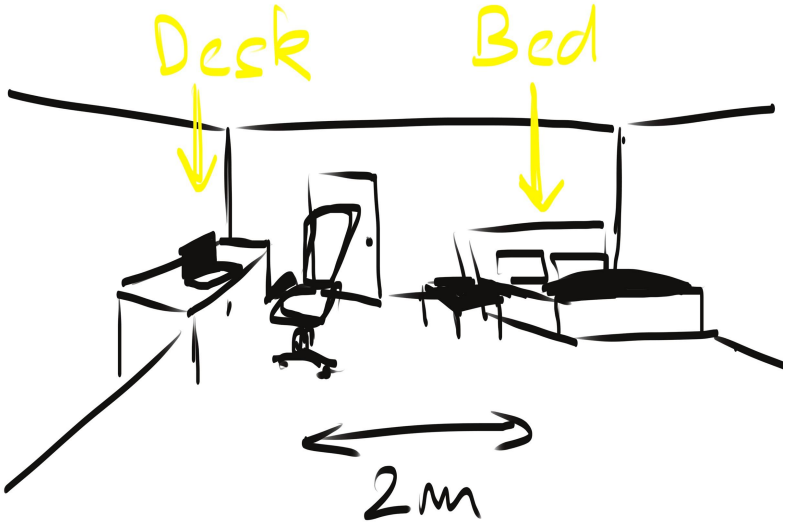
Goal

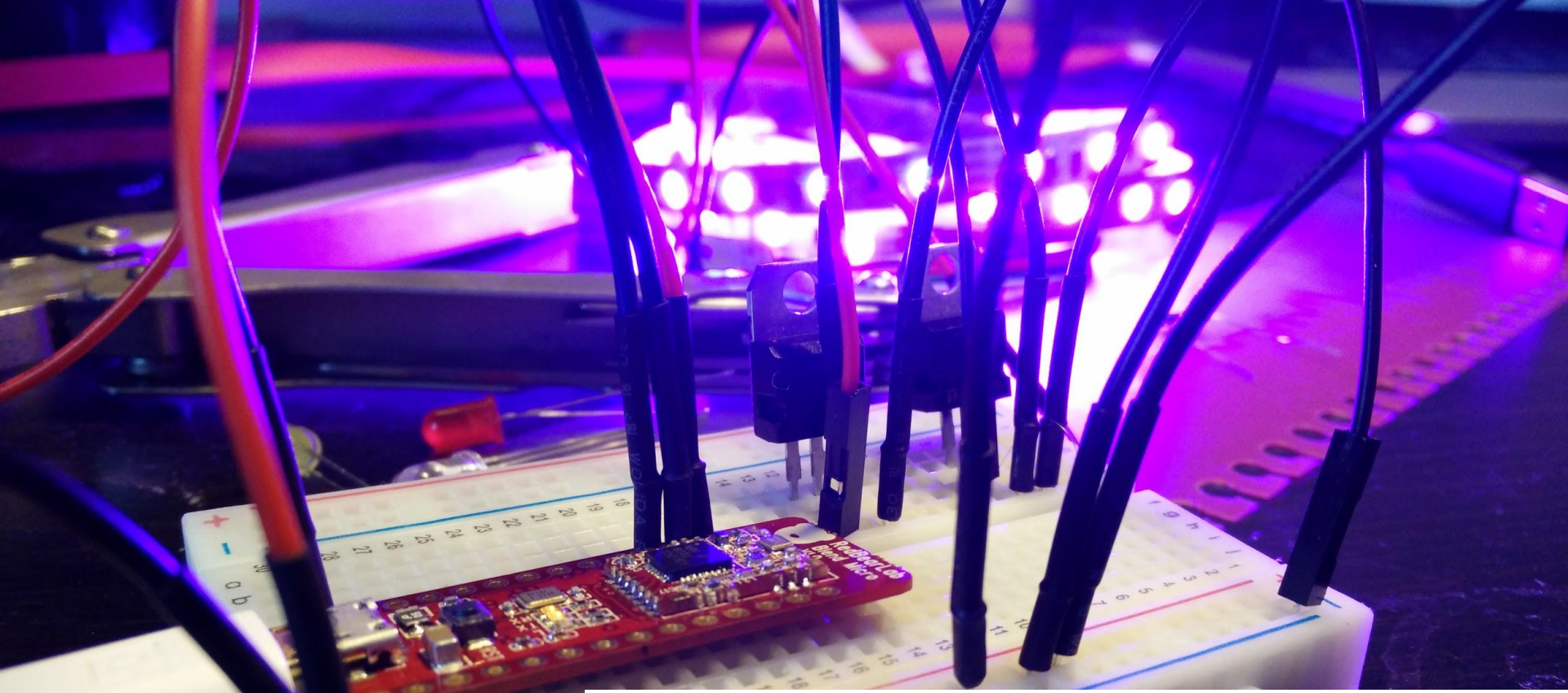
Smart ambient light

- **Adapt the light to the sleep cycles**: change the temperature of the light
- **Adapt the intensity of the light to the environment**
- **Adapt the color** of the light depending on the user's position in the room
- **Turn off/on the light automatically** if the user is not in the room.

Context


User position
DESK
BED
OUT OF THE ROOM
Working mode
Relaxing mode
Turn off


Desk
Bed
2m



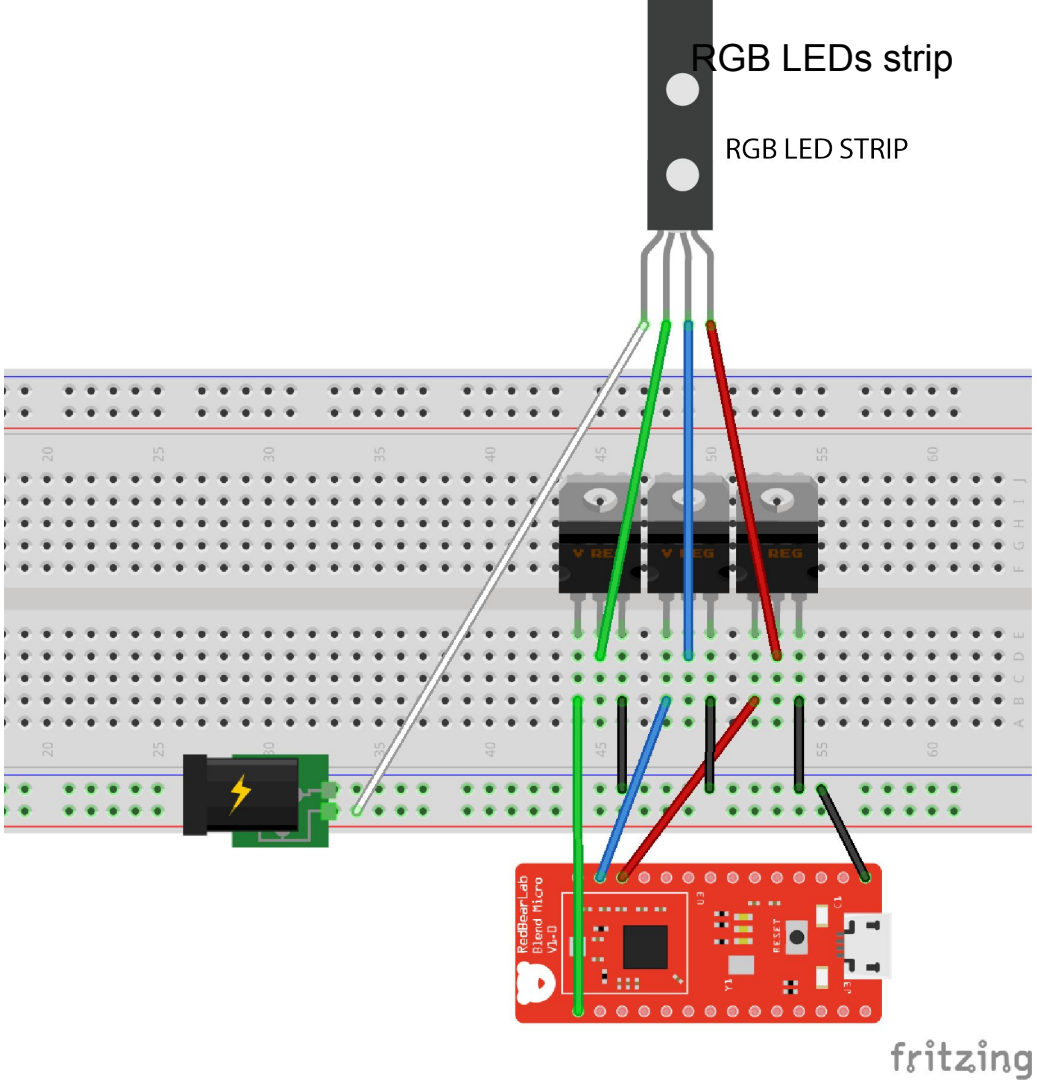
Solution

Architecture

- Blend Micro (**Slave**)
- LED strip
- Power transistors
- External power

+

- Android app (**Master**)



Data transfers

- 5 bytes (R,G,B,Intensity,mode)

Arduino Control

- Receive RGB, intensity and state (Working/Relaxing/Off) values from the Android app.
- Handle the color variations of the relaxing mode

Adapt the light to the sleep cycles

Decrease the blue value depending on the time (f.Lux like)

Adapt the luminosity of the light to the environment

- More ambient light ⇾ More intensity
- Using phone ambient luminosity sensor

Adapt the light to the user's position

- Using signal strength
- Smoothing the signal: averaging filter

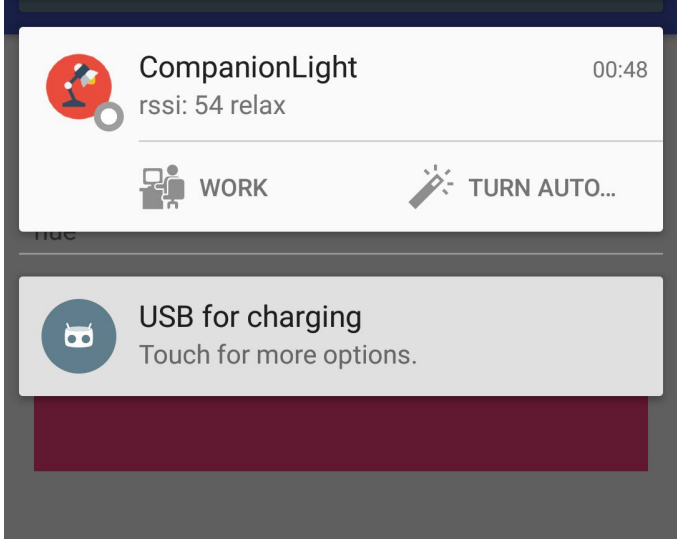
```
int averageRSSI = getAverage(mRssiValues);
if (mHasLearnt)
{
    int averageWork = getAverage(mWorkRssis);
    int averageRelax = getAverage(mRelaxRssis);
    int mThreshRelax = (averageWork + averageRelax) / 2;
    if (averageRSSI < mThreshRelax )
        mWorkMode = true;
    else
        mWorkMode = false;
}
if (averageRSSI > Constants.THRESHOLD_OFF) {
    mSleepMode = true;
}
```

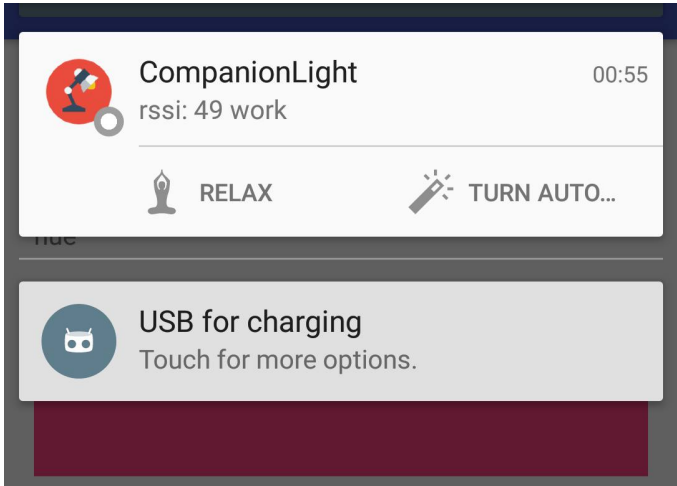
Learning from the user

Learning from the user

How to define this threshold?

➳ The user first selects manually the lighting mode. When a mode is selected, the RSSI is recorded.

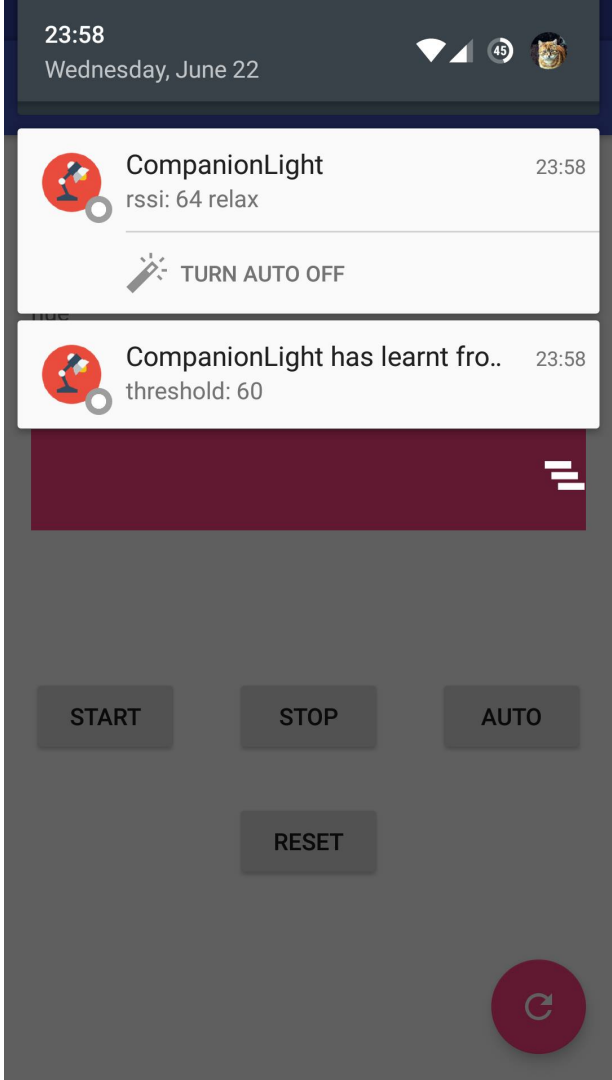


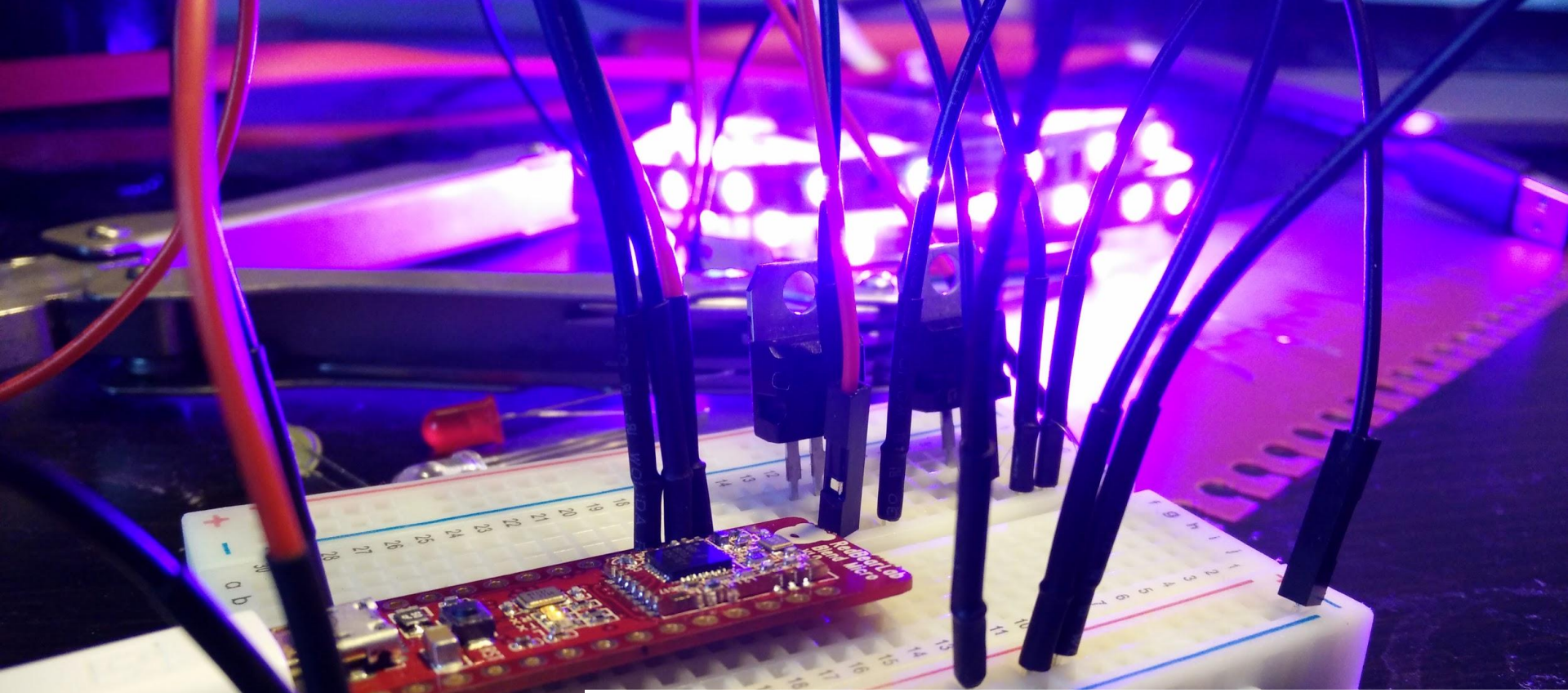


Learning from the user

When the app has enough data, the automatic mode is enabled.

The Threshold is computed from recorded data.

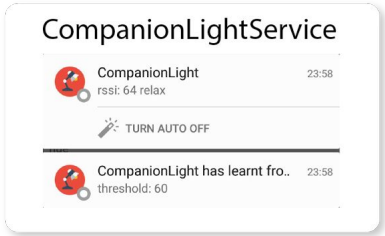




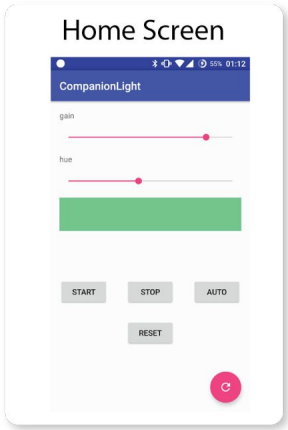
Architecture

Architecture

- Manage LE service
- Computing
- Interact with the user through the notifications
- Scan devices



intents
(parameters / user controls)



- Setting parameters
- Start/Stop main Service
- Controlling service

intents
(Signal Strength)

intents
(BLE messages, new scan)

- Manage BLE connection
- Send messages to the arduino

BluetoothLEservice

5 bytes message

BlendMicro

- Receive information
- Control the light

Future work

Use a classifier and more complex features to predict the state:

- RSSI
- Ambient light intensity
- Ambient sound level
- Time since the phone has been unlocked
- Time of the day

Thanks