



# Embedded and Pervasive Systems Project presentation

Smart Blinds



# Overview

- Introduction
- Presentation
- Project
  - sensor monitoring
    - code snippets
  - Stepper motor
    - code snippets
  - web application
    - code snippets
- limitations
- difficulties
- Conclusion

## **Presenters:**

Wolfgang Holzner k00842263

Andreas Gaderer k01455595

Daniel Baumgartinger k11828579

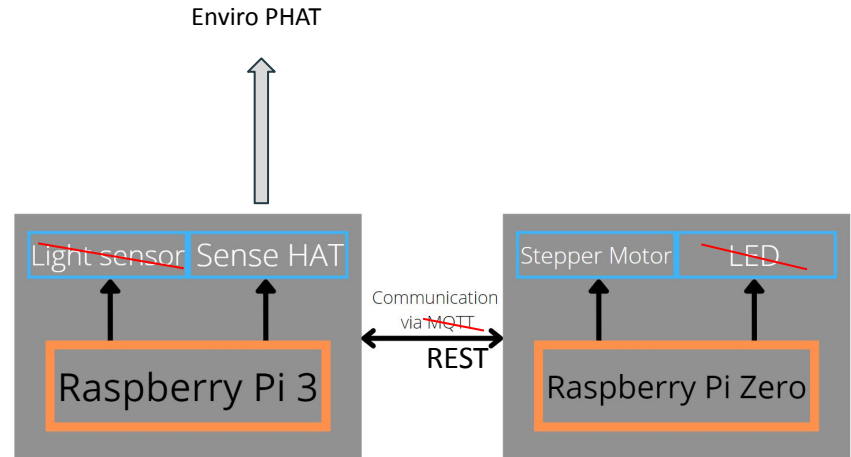
Roland Zopf k01055675

Adrian Vinojcic k11904250

Tobias Pilz k11914471

# Introduction

- Project idea
- 3 Teams
  - Motor Handling
  - Sensors
    - light intensity, pressure
  - Web App



# Presentation

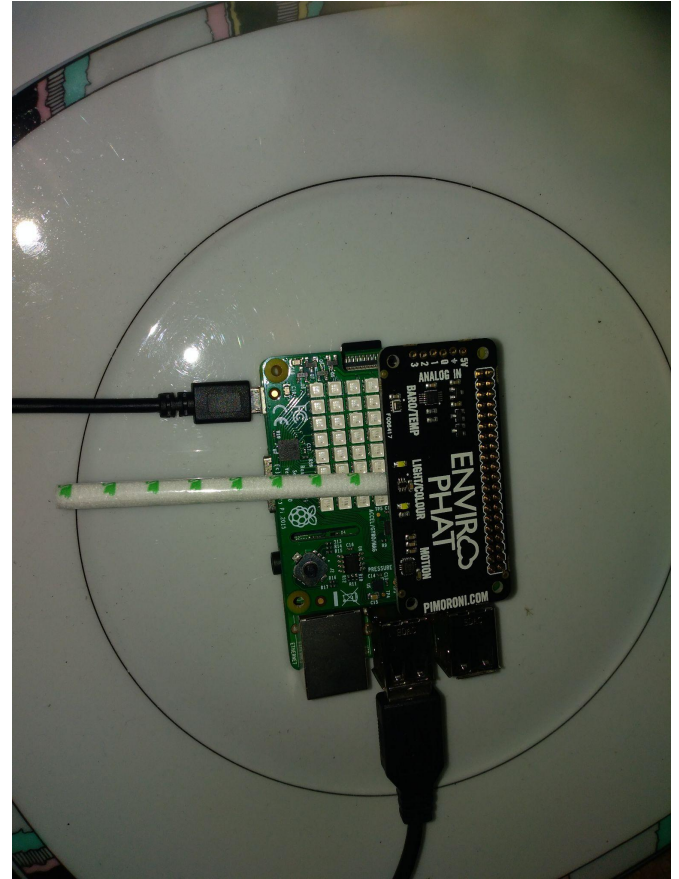
- Stages
  - sensor without light
  - lightsource added
  - sensor sends request to motor
  - motor opens the “shader”
  - light source removed
  - reverts back to original state
- we could not show changes of pressure or humidity in our testing environment



# Projekt

## <sensor monitoring>

- if air pressure drops, shutters always remain open to prevent damage
- high light intensity -> shutters close
- difficulties with data conversion from analog to digital
  - solution–> enviro PHAT
    - we tried different approaches, for example Photocell(Cds photoresistor)



# Sensor monitoring

## <code snippets>

- ranges were chosen by current conditions while implementing
  - for example pressure at the time of testing was around 995
  - pressure drop as a result of weather conditions was defined as below 980
- pressure prevents shutters from closing while thunderstorm is active

```
url = 'http://192.168.0.9:3000/sensorData'

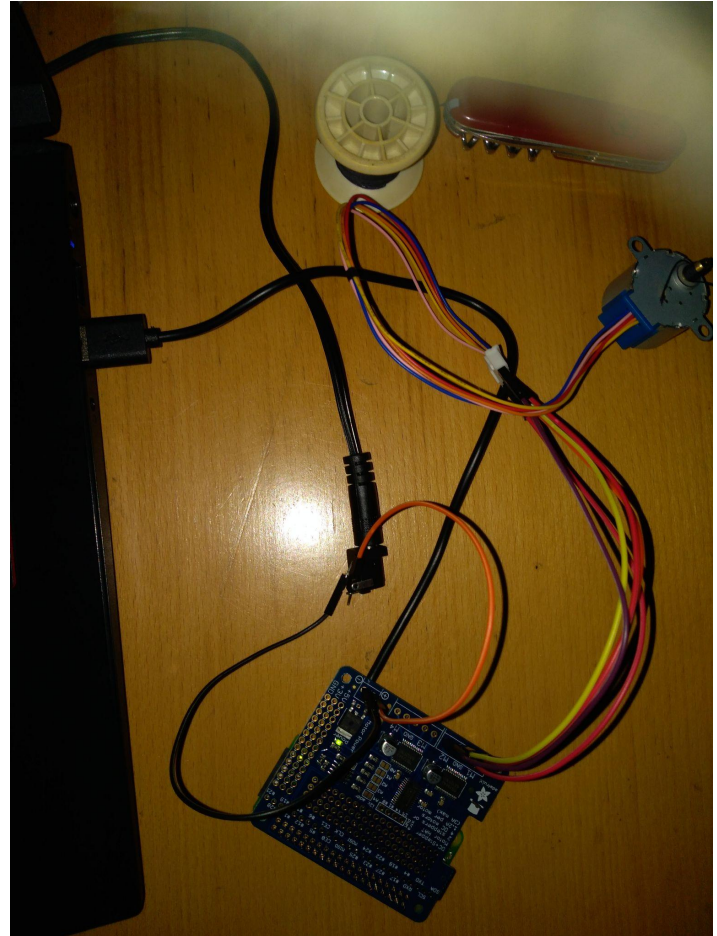
while True:
    if weather.pressure() < 980:
        data = {'blindsRange': '0'}
        requests.post(url, json = data)
        print("opening shades")
    else:
        if light.light() > 1000:
            data = {'blindsRange': '100'}
            requests.post(url, json = data)
            print("closing shades")
        else:
            data = {'blindsRange': '0'}
            requests.post(url, json = data)
            print("opening shades")

    time.sleep(0.5)
```

# Project

## <Stepper motor>

- Stepper motor with 4 coils
- Stepper HAT
- “MacGyver” power supply



# Stepper Motor

## Code snippets

```
while True:
    # Read values from web interface
    json_string = requests.get(address).content
    blinds = json.loads(json_string)
    level = blinds['blindsRange']
    if level != state:
        turn(level - state)
        state = level
```

Read the Data Files

```
def turn(amount):
    down = amount >= 0
    amount = abs(amount) * one_percent

    if down:
        for i in range(amount):
            kit.stepper1.onestep()
    else:
        for i in range(amount):
            kit.stepper1.onestep(direction=stepper.BACKWARD)
```

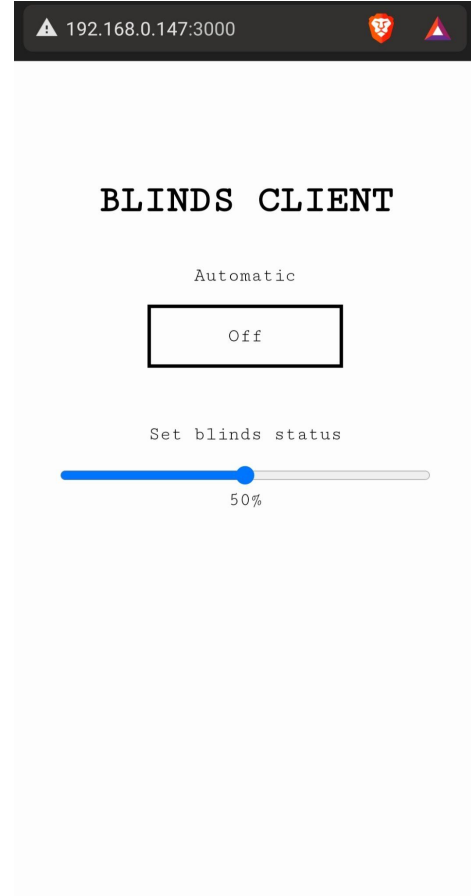
control the stepper motor



# Project

## <Web Application & REST API>

- REST API made with Node.js & express.js
- serves a static html page as UI
- Collects data from sensor PI & website
- Gets requests from Motor PI and sends blinds status



# Wep Application

## <Code snippets>

- Communication
  - REST
- Web App with slider

```
16
17 app.get('/', (req, res) => {
18   res.sendFile(__dirname + "/public" + "/index.html")
19 })
20
21 app.get('/index.html', (req, res) => {
22   res.sendFile(__dirname + "/public" + "/index.html");
23 })
24
25 app.post('/automatic', (req, res) => {
26   console.log(req.body)
27
28   automatic = req.body.automatic
29   res.sendStatus(200)
30 })
31
32 app.post('/blindRange', (req, res) => {
33   console.log(req.body)
34   blindsRange = parseInt(req.body.value)
35   res.sendStatus(200)
36 })
37
38 app.get('/data', (req, res) => {
39   res.send({
40     "automatic": automatic,
41     "blindsRange": blindsRange
42   })
43 })
44
```

# Limitations

## The project could be expanded:

- Measuring the inside temperature to change the temperature by opening and closing the shutters.
- The evaluation of the data from the sensors could also be used to control other systems in the house. (e.g. heating or air conditioning)



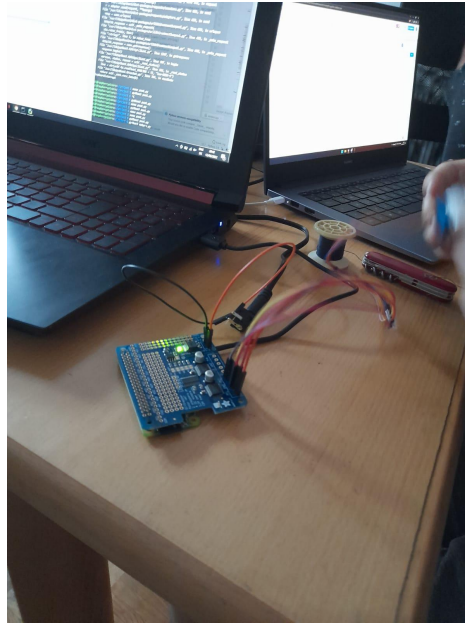
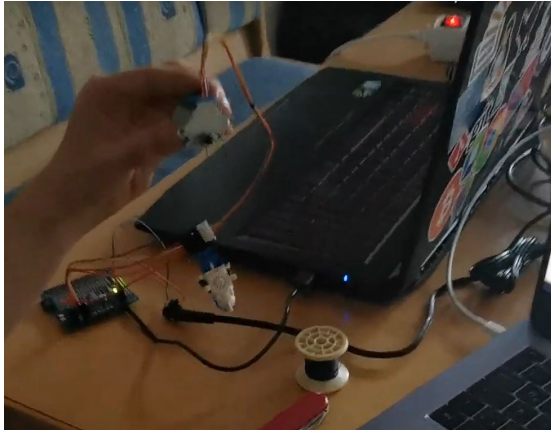
Link: <https://businesswest.com/blog/smart-home-technology-puts-homeowners-in-full-control-wherever-they-are/>

# Difficulties

Problems we encountered during project development:

- Defective SD card
- Problems connecting the Raspberry Pi to the Internet
- The connection between Raspberry Pi and Sensor Pack did not work for the time being.
- Problems with the light sensitivity sensor
- Problems with the contacts of the enviro PHAT
- We had to replace our Raspberry Pi several times, which required us to reconfigure and rebuild our system and Raspberry Pis several times

# Conclusions



Thank you for your attention

