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Smart House Microclimate Control Internet of things

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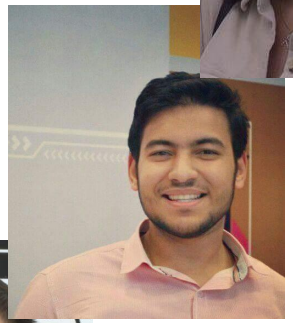
Saigina E

Nazirkhanova K



Morsy B

Isakov A

TEAM

Problem

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- Main problems:
  - It is difficult to attain a certain value of comfort due to different preferences of people
  - When air conditioner is turned on in the room, it can become very cold and uncomfortable
  - The consumption of electricity by the air conditioner (up to 60% of total consumption) at peak loads in the power supply system can lead to increased charges (bills)
  - The room is not prepared for the arrival of the occupants

Main idea

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- Device: Smart microclimate controller
- Technology: monitoring the air parameters and the number of occupants
- Applications:
  - demand response participation
  - prediction of HVAC power consumption
  - individual microclimate parameters
- End user: individual housings, office buildings

Existing control devices

- TION Magic Air Air parameters monitoring and control from smartphone

- Nest thermostat Air parameters monitoring and self-learning

- Daikin controller Air parameters monitoring and local controlling

First iteration

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- Device: Smart temperature controller
- Technology: monitoring of the air temperature in the room, management of the cooling intensity
- Applications:
  - individual microclimate parameters setting
  - control of conditioning, ventilation, heating rate
- End user: individual housings, smart houses, zero-consumption houses

Project objectives

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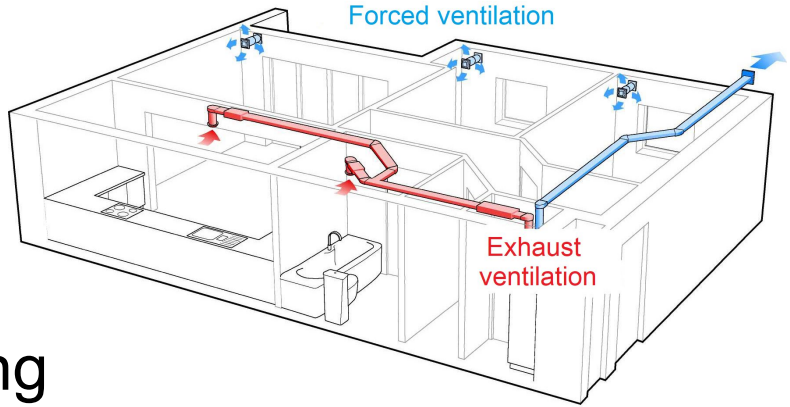
- Objective: To make a regulation of the flow section of the valve according to room temperature and occupancy

- Functionality:
  - Cold air flow rate control
  - Balancing of heat production and cooling
  - Prevention of room overcooling
  - Flexible comfort management



Project implementation

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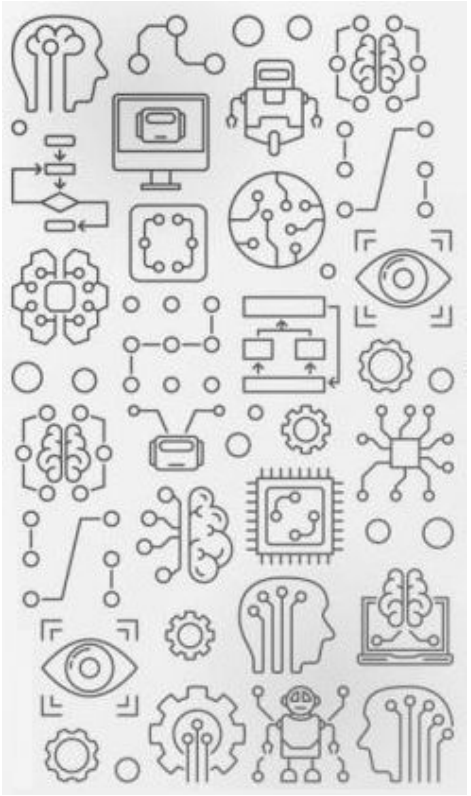
- Problem statement
- Sensor and actuator installation
- Create logic for control
- Create control code and load it to Waspmote
- Test the device
- Results analysis



Task distribution

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Aleksandr

- Problem statement
- Control algorithm creation
- Science side view

Basel

- Sensors and actuator installation
- Device setup and test
- Hardware side view

Elizaveta

- Literature review
- Team management
- Organizer side view

Camilla

- Code implementation
- Device setup and test
- Developer side view

Sensors and platform

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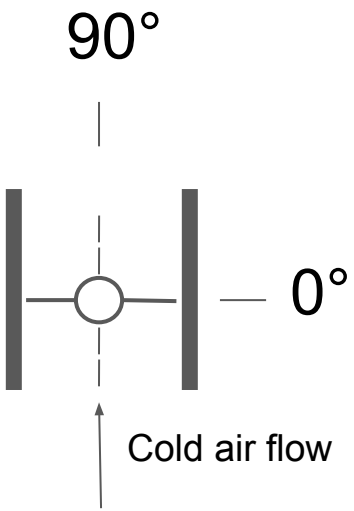
- Waspmote device
- Temperature sensor
- Servomotor
  (as actuator)
- LED light bulb

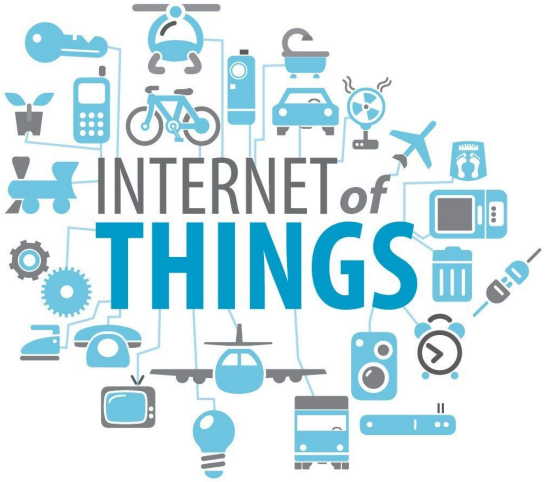
Control algorithm

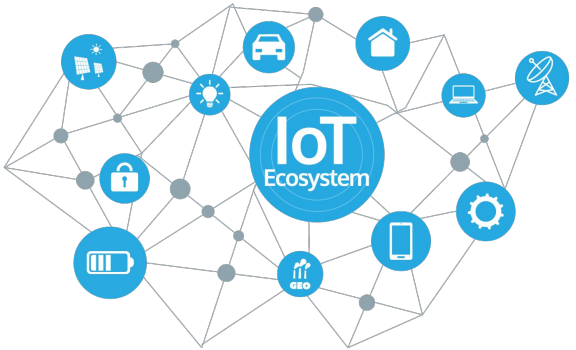


Demo

Relation to IoT

- Working without human participation
- Quick response to changes in indoor air parameters
- Monitoring of temperature and sending data to the cloud
- Wireless





Applications

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- Comfort regulation by tracking the current temperature: stability, fast increasing or fast decreasing
- Control of window open area according to CO2 concentration in the room
- Management of the cooling intensity
- Possibility to build own comfort limits and specify related to it algorithm
- Opportunity to participate in demand response programs
- Optimal control will lead to bills reduction

Conclusion

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- Project objectives reached
- Tangible prototype designed
- Individual householders can use this device to easily control their comfort (especially zero-consumption house)
- The device can be improved using humidity, CO2 concentration sensors
- The cooling intensity can be configured depending on the personal preferences
- We are one step closer to build own smart climate control

What we learned

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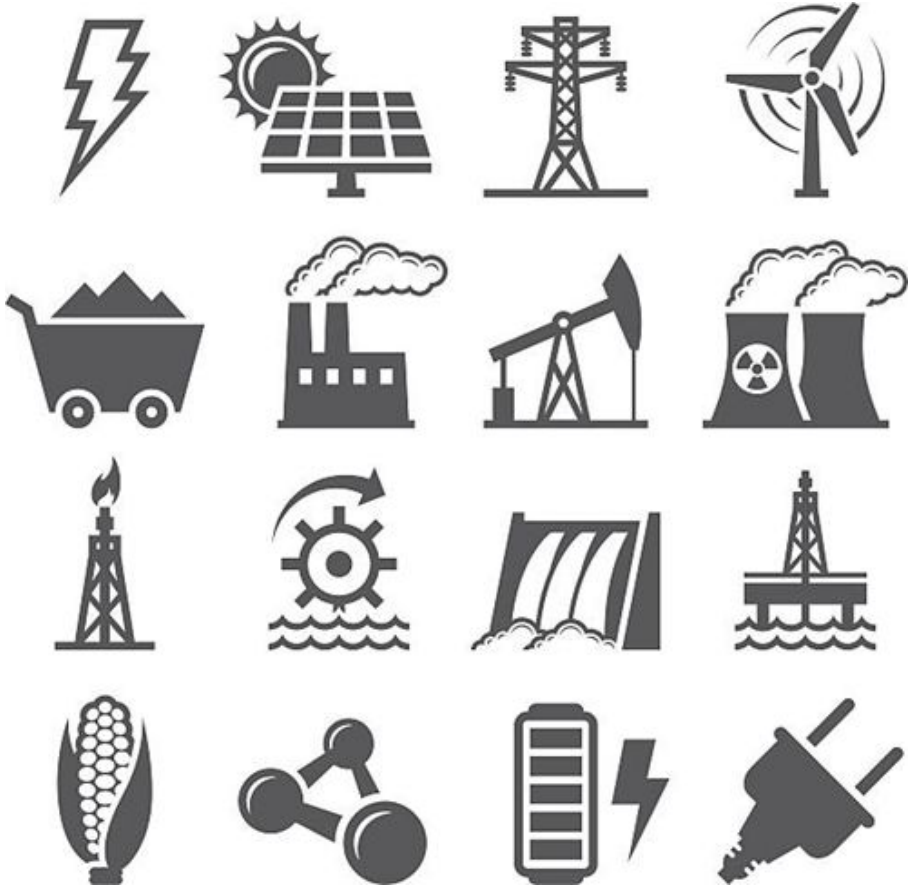
- We can put wireless sensors everywhere
- To share complex tasks and get rid of unnecessary ones
- Sensors are cheap, but their connection and security is not so easy task
- There are many, many more things to learn

THANK YOU FOR YOUR ATTENTION!



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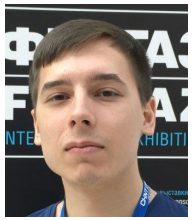

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