

---

---

# PROTOTYPE

SE4YH

---

---

# Bob

## Contact Information



- 40 years old
- teacher
- married
- 2 children
- own house
- many appliances
- energy is cheaper in the evenings

## Problem

difficult to schedule different activities like wash dishes, clothes

## Need

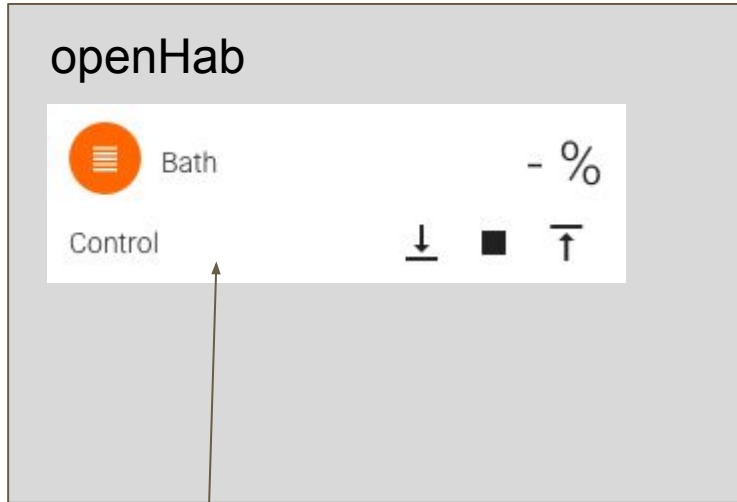
save time & energy

## Current Solution

define rules like:

- only use washing machine in the evenings

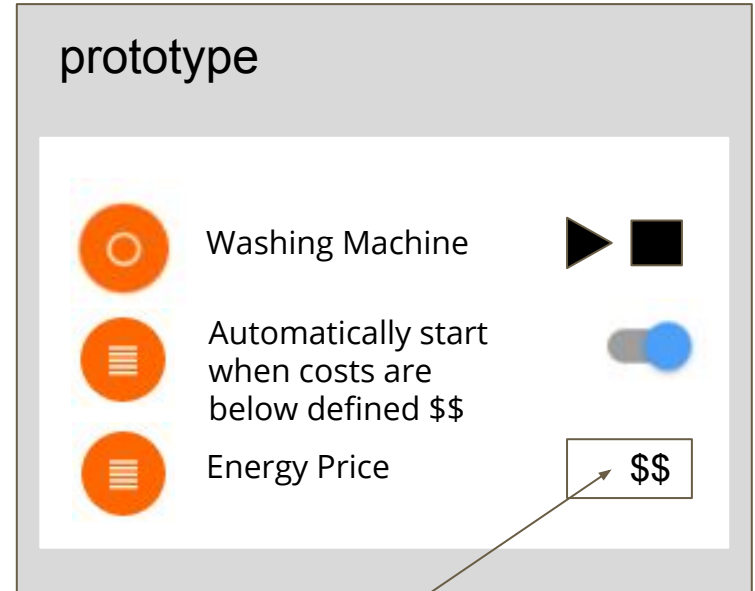
# Bob prototype



No showcase / demo for washing machines

Price information can be used to start washing machine manually or it will be started based on the defined price

vs.



# Alice

## Contact Information



- 38 years old
- housewife
- married
- 3 children
- own house
- some appliances
- energy is cheaper in the evenings

## Problem

tries to avoid unnecessary energy consumption

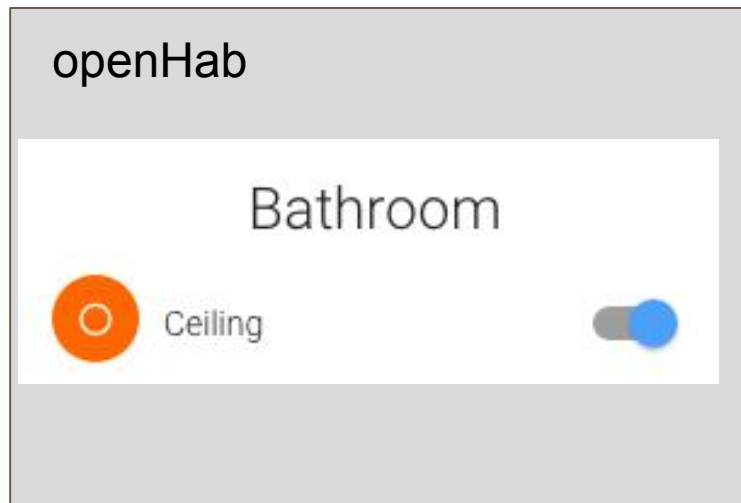
## Need

save energy

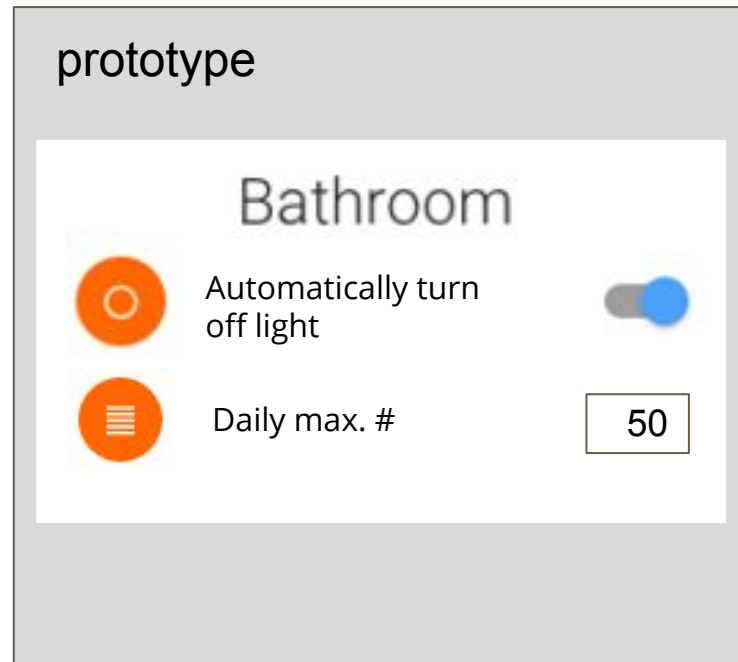
## Current Solution

e.g. tries to educate their children to turn off light when they are leaving the room

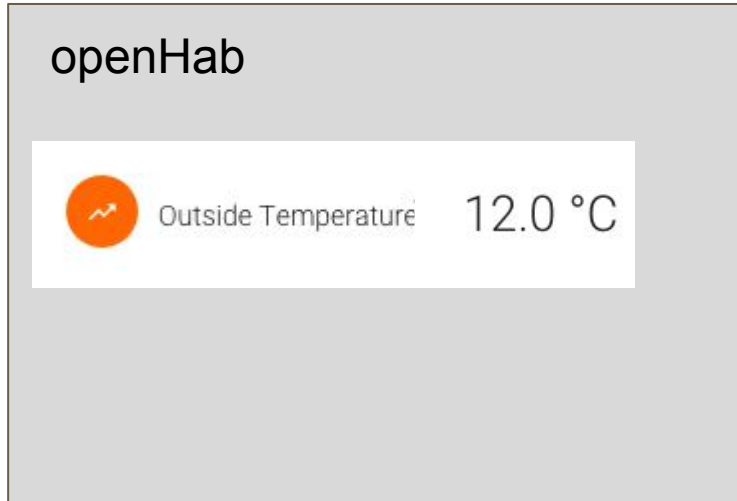
# Alice Prototype - Inside



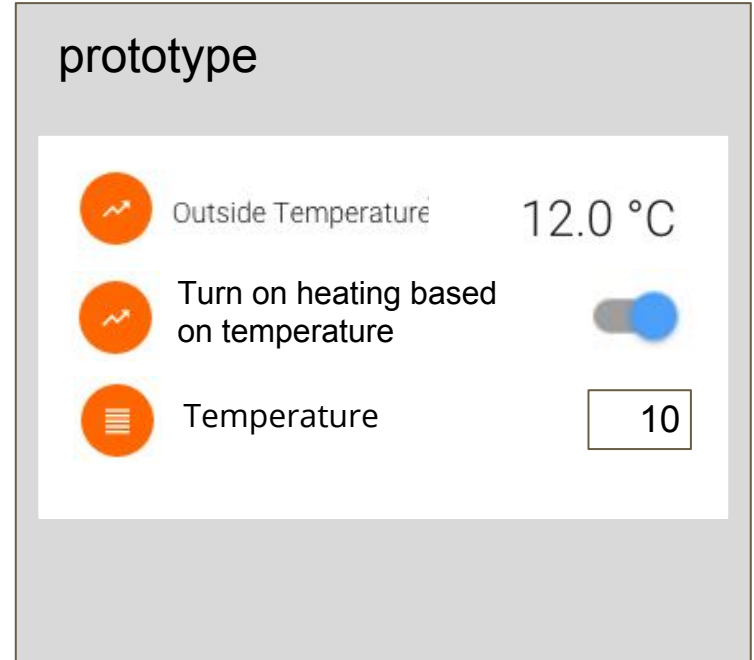
vs.



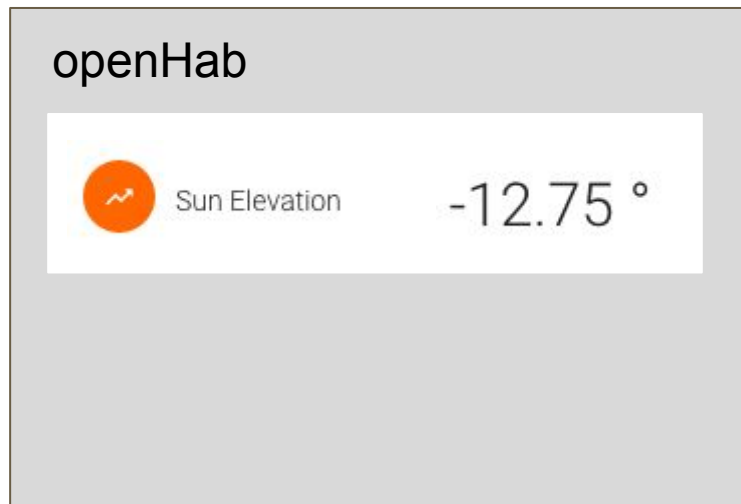
# Alice Prototype - Outside #1



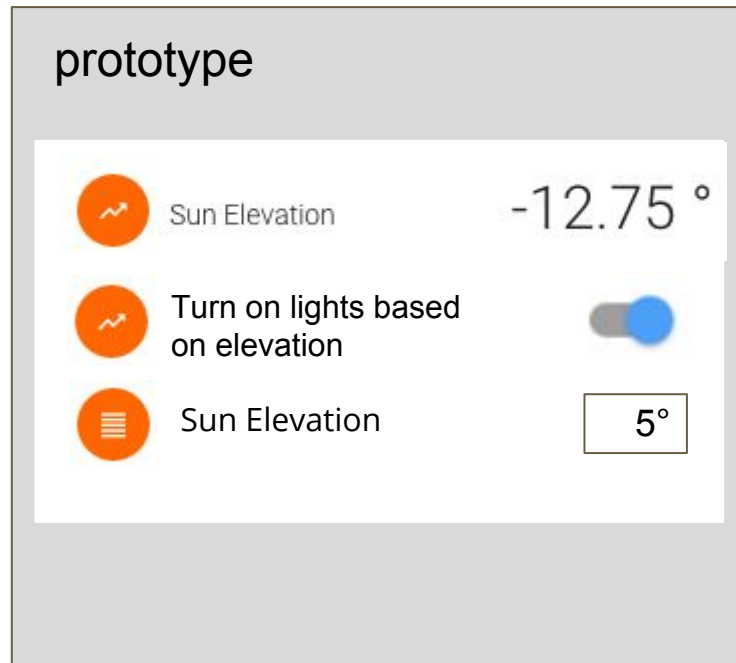
vs.



# Alice Prototype - Outside #2



vs.



# John

## Contact Information



- 55 years old
- office worker
- married
- 1 child (moved out)
- apartment
- some appliances



## Problem

forgetful

## Need

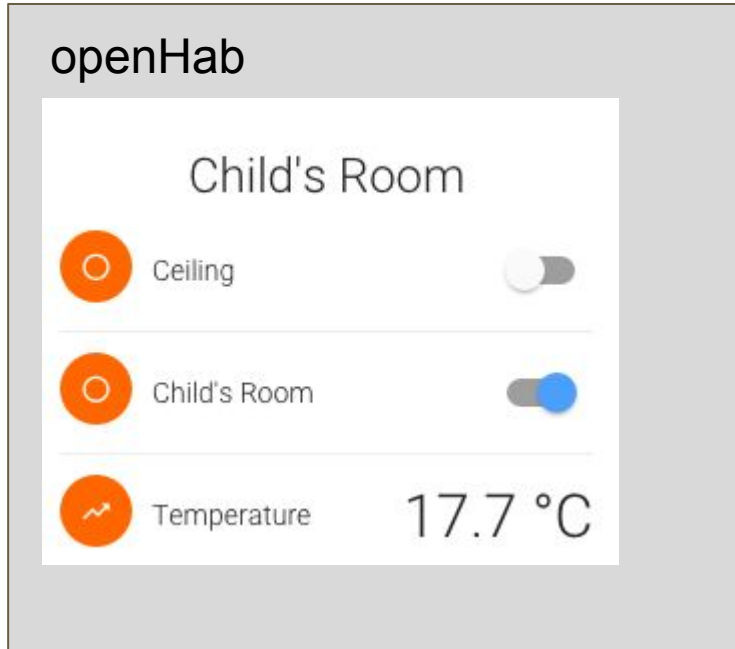
wants to know the status of his appliances

## Current Solution

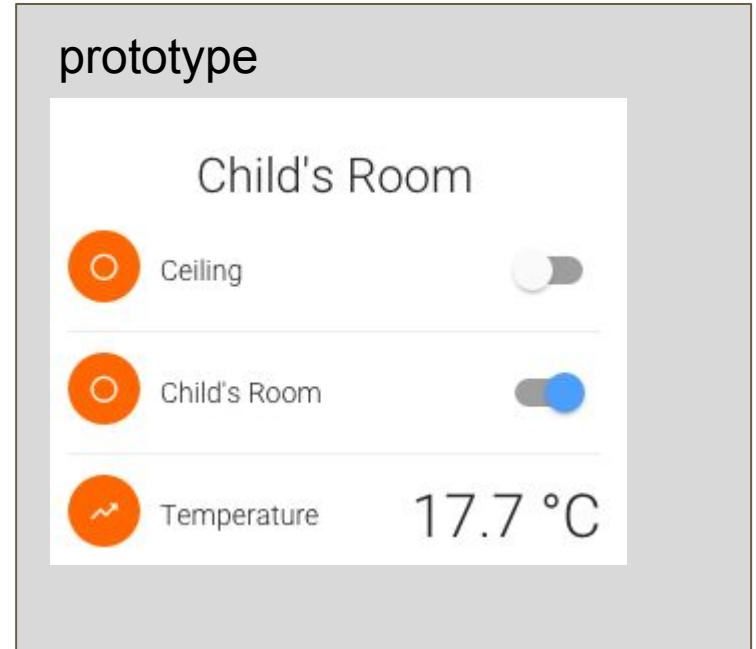
ask neighbors to look after it



# John Prototype



VS.



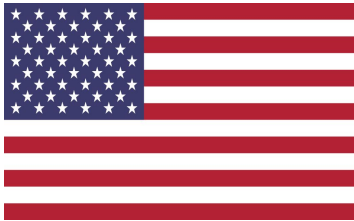
maybe there is no need to change this concept / visualization.  
maybe some new bindings for washing machines / dish washer etc.  
are required

# Viktor

## Contact Information



- 49 years old
- Top Manager
- married
- no children
- own houses
- many appliances



## Problem

can't be everywhere

## Need

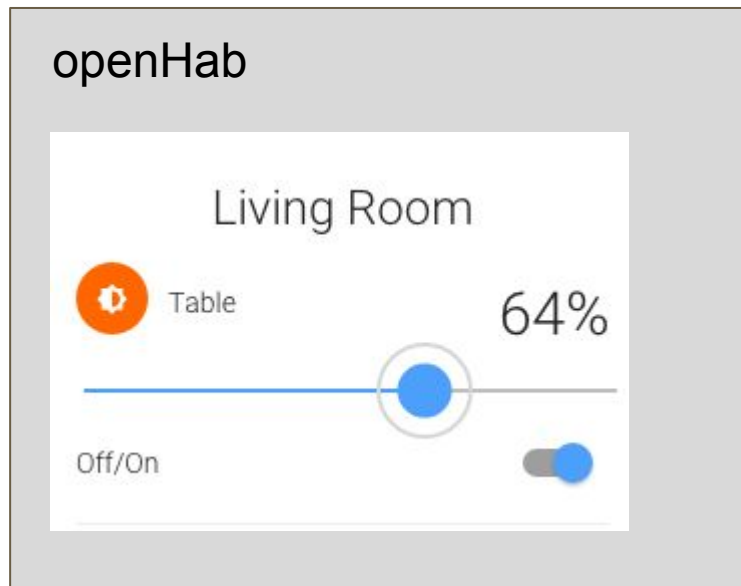
safety

simulate physical presence

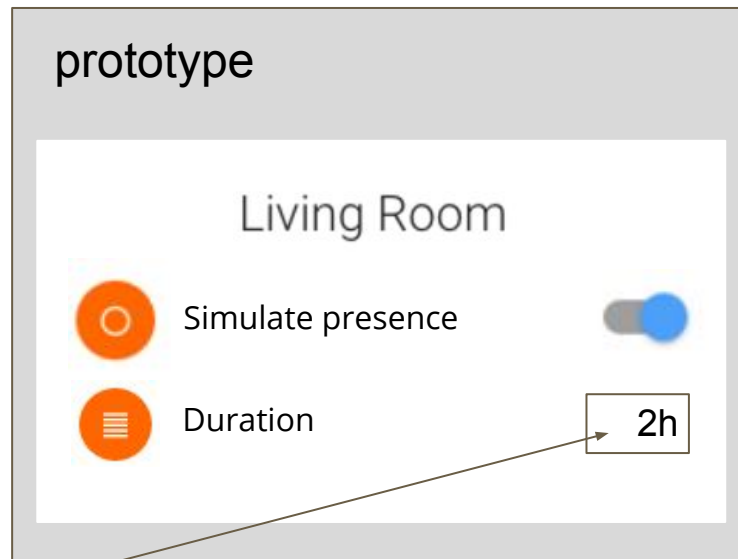
## Current Solution

ask friends or neighbors to  
look after his houses /  
apartments

# Viktor Prototype - Room based #1



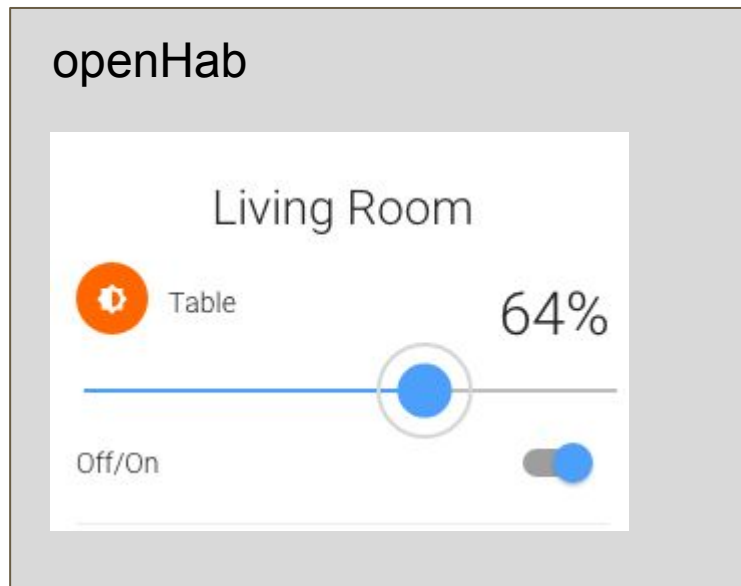
vs.



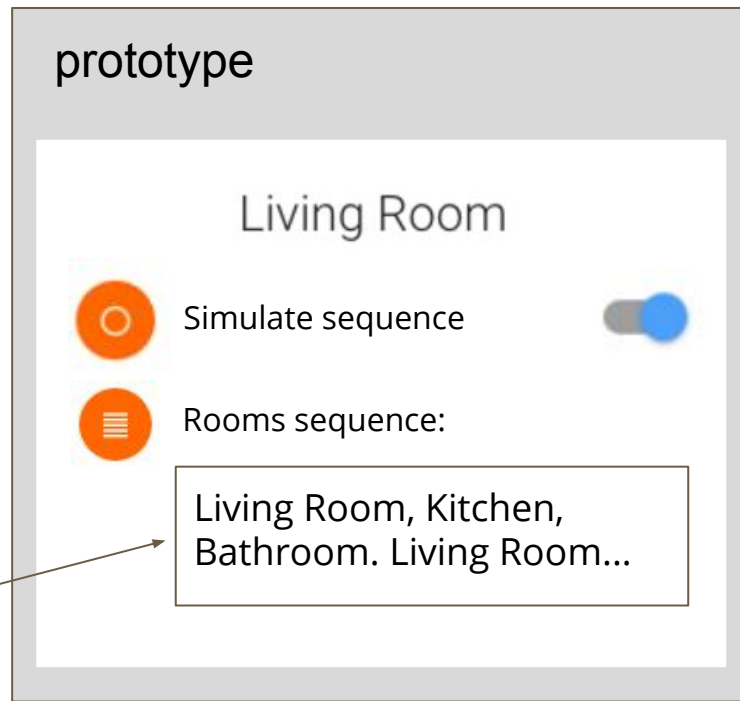
e.g. dimm light for 2h with random scenarios like:

- 20% -> 40% (wait 20 minutes for next event)
- 40% -> 80% (wait x minutes for next event)
- etc

# Viktor Prototype - House based #1



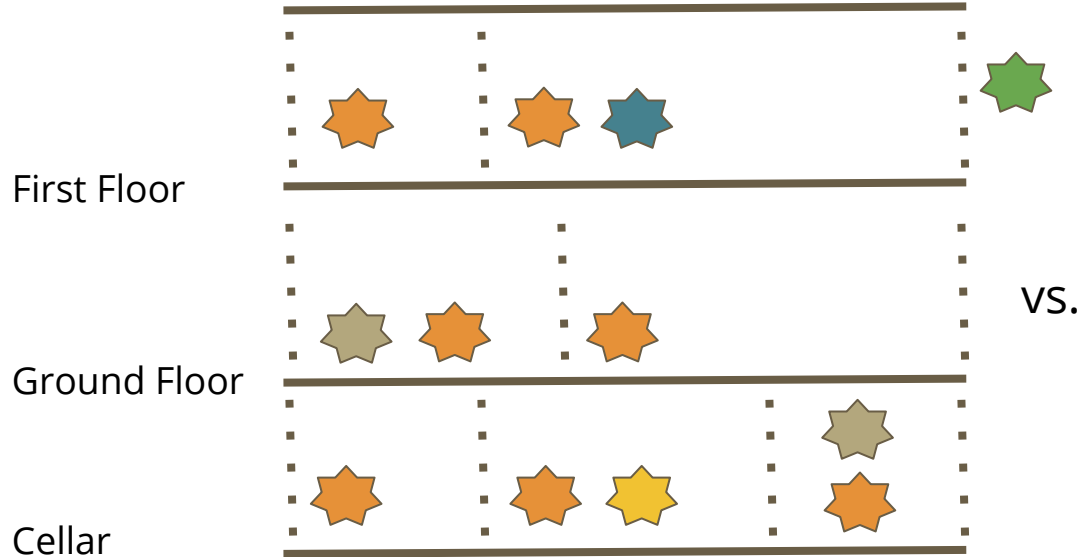
vs.



e.g.

- #1 Turn on light: Living Room
- #2 Turn off light: Living Room & turn on light: Kitchen
- #3 Turn off light: Kitchen & turn on light: Bathroom ...

# Prototype - Rule Concept



- e.g.
- # Rule 1 - Wash clothes if price is \$\$
  - # Rule 2 - Turn off light if no presence is detected
  - # Rule 4 - Turn on light when Sun Elevation is  $x^\circ$



# Requirements

- Features to save energy



- Dynamic Rules



- Conflicts, Priorities, Goals



- Save Time



# Rules



- Rules which are related to location / presence of a user
  - is the person in the room?
  - is the person on the way home?
  - is there a specific need based on the presence and the time?
  
- Rule proposals
  - turn off light if the person left the room
  - turn on heating if the person is on the way home (transmit gps position -smartphone)
  - turn on tv every day at 06pm / turn off tv after 01am...

# Rules

- Rules which are related to **energy price**
  - request energy price / costs?
  
- Rule proposals
  - start e.g. washing machine if price is below x\$
  - stop e.g. washing machine if price is above x\$
  - pause e.g. washing machine if price is above x\$ .....



# Rules

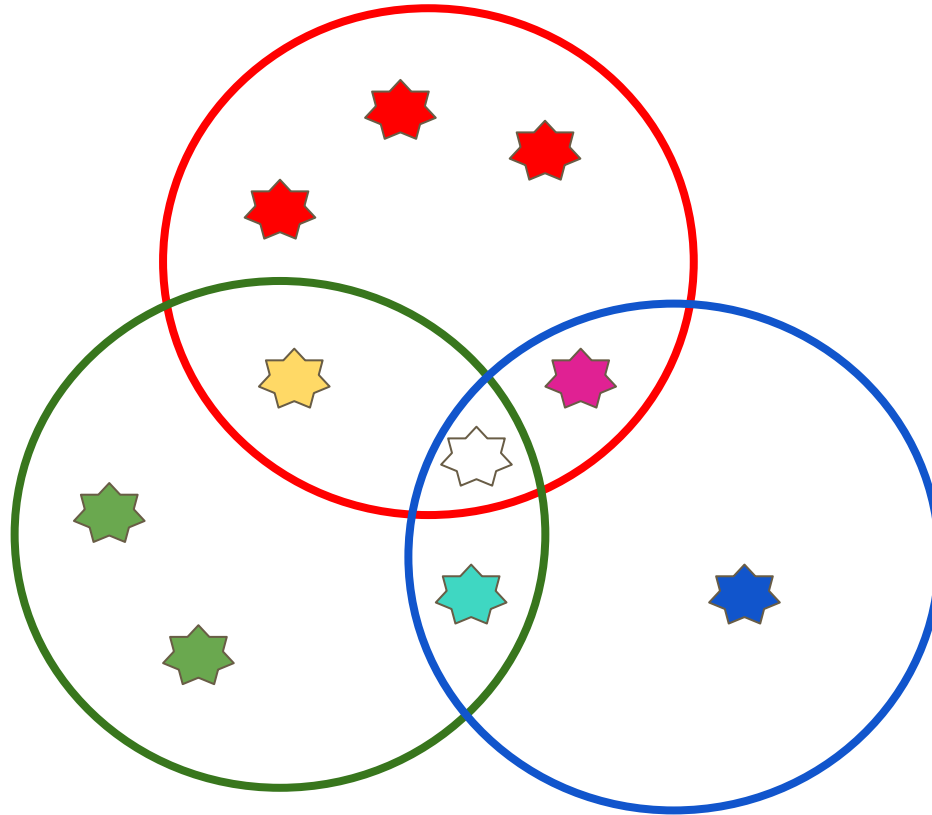
- Rules which are related to **environmental conditions**
  - detect outside temperature
  - detect inside temperature
  - detect sun elevation
  - detect luminance (cloudy...)
- Rule proposals
  - turn on light if sun elevation is  $< x^\circ$
  - turn off light if sun elevation is  $> x^\circ$
  - turn on light if luminance is  $x$
  - turn on heating if outside temperature is  $x^\circ$  .....

Location / Presence

Rules

Environment

Costs



# Rules combined

## presence & environmental conditions

- turn on light if person is at home & sun elevation is  $< x^\circ$
- set temperature to  $x^\circ$  if person is at home & outside temperature is  $< x^\circ$
- set temperature to  $x^\circ$  if person is not at home & outside temperature is  $< x^\circ$
- set temperature to  $x^\circ$  if person is on the way home & outside temperature...
- ....

# Rules combined

## presence & energy price

- turn on dishwasher if costs are below x \$ & person is on the way home
- turn on washing machine if costs are below x \$ & person is at home
- ...

# Rules combined

## environmental conditions & energy price

- set temperature to  $x^\circ$  if outside temperature is  $< x^\circ$  & costs are below  $x$  \$
- set temperature to  $x^\circ$  if inside temperature is  $< x^\circ$  & costs are below  $x$  \$
- set temperature to  $x^\circ$  if inside temperature is  $< x^\circ$  & costs are above  $x$  \$
- ...

# Rules combined

## environmental conditions & energy price & presence

- set temperature to  $x^\circ$  if outside temperature is  $< x^\circ$  & costs are below  $x \$$  & person is at home ...

# Rule Concept

First Floor

Ground Floor

Cellar

&

Environment

Presence

Energy

# Rule Application

Environment

- if sun elevation is  $< x^\circ$



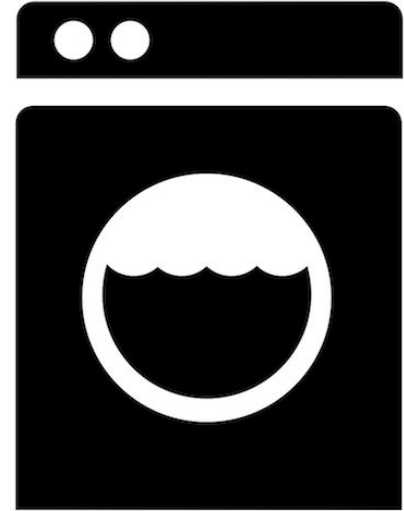
Costs

- if costs are below  $x \$$



Presence

- if I am at home





# Rule Application

Environment

- if sun elevation is  $< x^\circ$



Costs

- if costs are below  $x \$$



Presence

- if I am at home



# Prototype - Split Screen



Garden	First Floor	Cellar	....	Costs	Environment	Presence
<p>Decoration Light</p> <p>if sun elevation is <math>&lt; x^\circ</math></p> <p>if costs are below <math>x \\$</math></p> <p>if I am at home</p>				<ul style="list-style-type: none"><li>- if I am at home</li><li>- if I am on the way home</li><li>- if I left my home <math>x</math> minutes ago</li><li>- if I am in room <math>X</math></li></ul>		



# Requirements

- Features to save energy



- Dynamic Rules



- Conflicts, Priorities, Goals



- Save Time



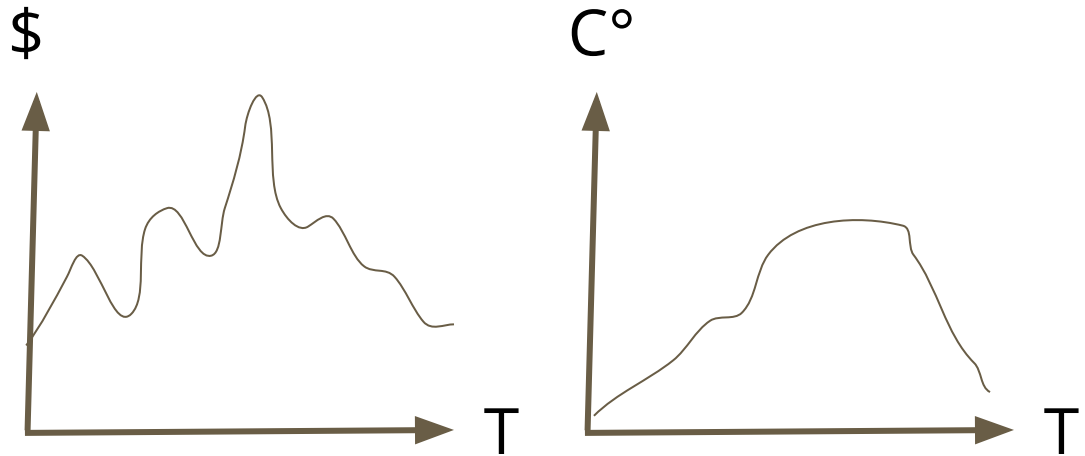
# Conflicts

discrete

- presence {at home, not at home, in the room, not in the room}

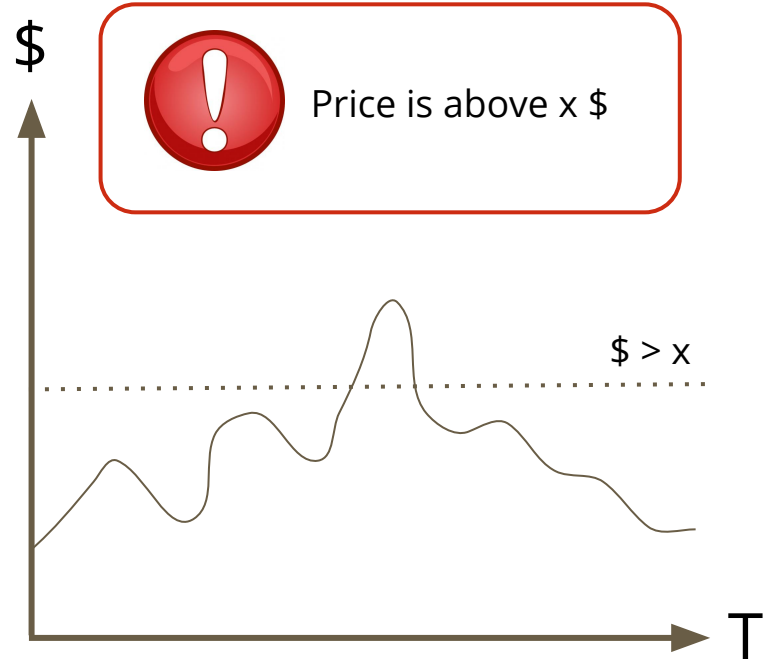
continuous

- energy price  $\{f(x)\}$
- sun elevation  $\{f(x)\}$
- temperature  $\{f(x)\}$



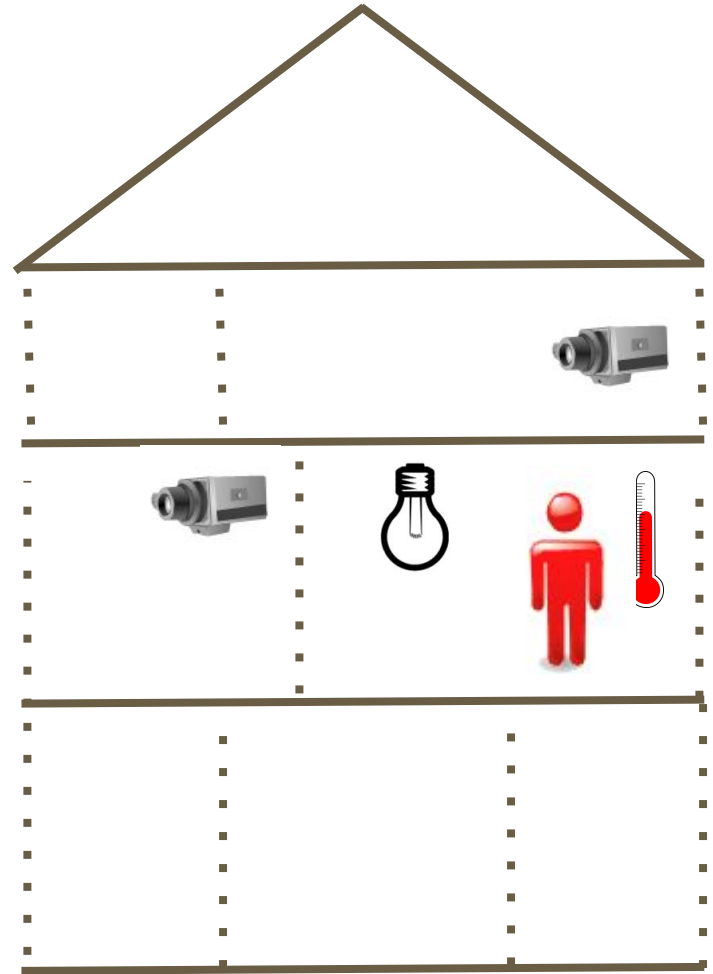
# Conflicts - continuous

Garden	<b>Kitchen</b>	Cellar	....
Dishwasher			
if costs are below $x$ \$			
if I am at home			

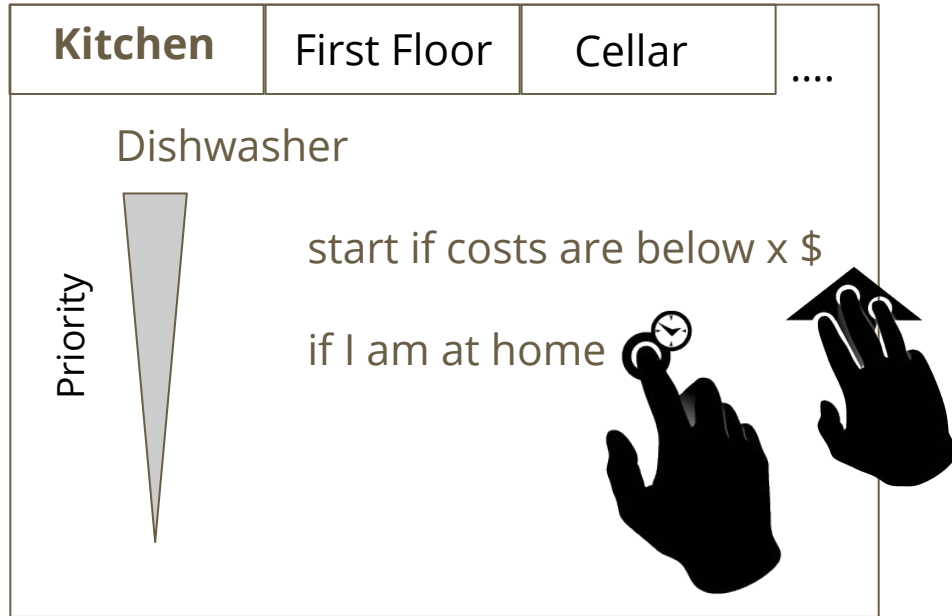


# Conflicts - discrete

Garden	<b>Kitchen</b>	Cellar	....
Ceiling Light			
if I am in the kitchen			
 No presence sensor in kitchen			



# Prototype - Priority Split Screen



The users mainly wants to save energy. This can lead to the situation that he has to wait long time until the dishwasher starts.


# Requirements

- Features to save energy
- Dynamic Rules
- Conflicts, Priorities, Goals
- Save Time





# Prototype - Global

Bathroom	First Floor	Cellar	....	Washing	Environment	Light
<p>Washing Machine</p> <p>selected program: p1...</p> <p>Status:</p> <p>running</p> <p>costs...</p>				<p>- start machines if energy is cheap </p> <p>....</p>		

# Prototype - Global Split Screen

Bathroom	<b>First Floor</b>	Cellar	....	Washing	Environment	<b>Light</b>
Ceiling Light				- turn off lights if no presence is detected		
Status:				- Idle Time in minutes		
On				- Daily max. On/Off #		
Idle Time: 5 minutes				<input checked="" type="checkbox"/>		
On/Off count: 20				<input type="text" value="10"/>		
				<input type="text" value="50"/>		

# Requirements

- Features to save energy



- Dynamic Rules



Less flexible as the Priority Split  
Screen Prototype

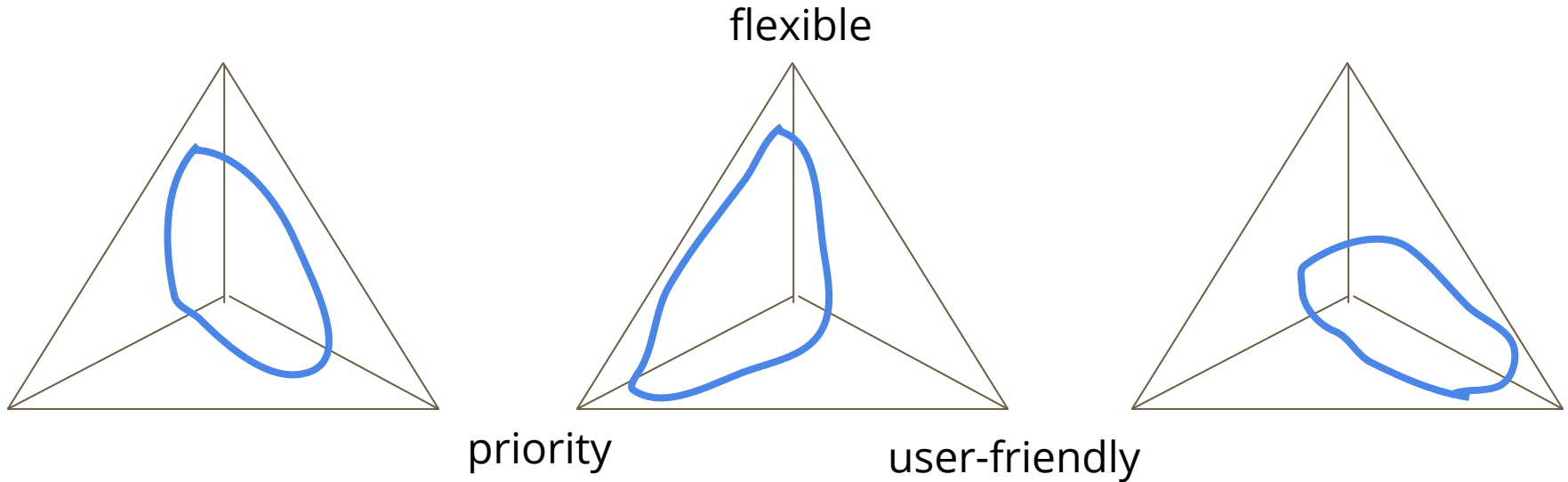
- Conflicts, Priorities, Goals



- Save Time



# Evaluation



Split Screen Prototype

Priority Split Screen  
Prototype

Global Split Screen  
Prototype

# Next Steps

- Understand the user needs
- Understand potential conflicts
- Understand useful prioritizations

