SiteView: Tangibly Programming Sensor Environments

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motivation

Sensor environments are difficult for end users to control, but usable environments do not need to be complicated. Even with commodity hardware like X10 devices and the common use of home security systems, users have trouble. Users do have experience interacting with tangible objects and we should leverage off this to support users in performing home automation rules.

example rules

- On rainy afternoons, turn the heat to 75° F and turn on the lights.

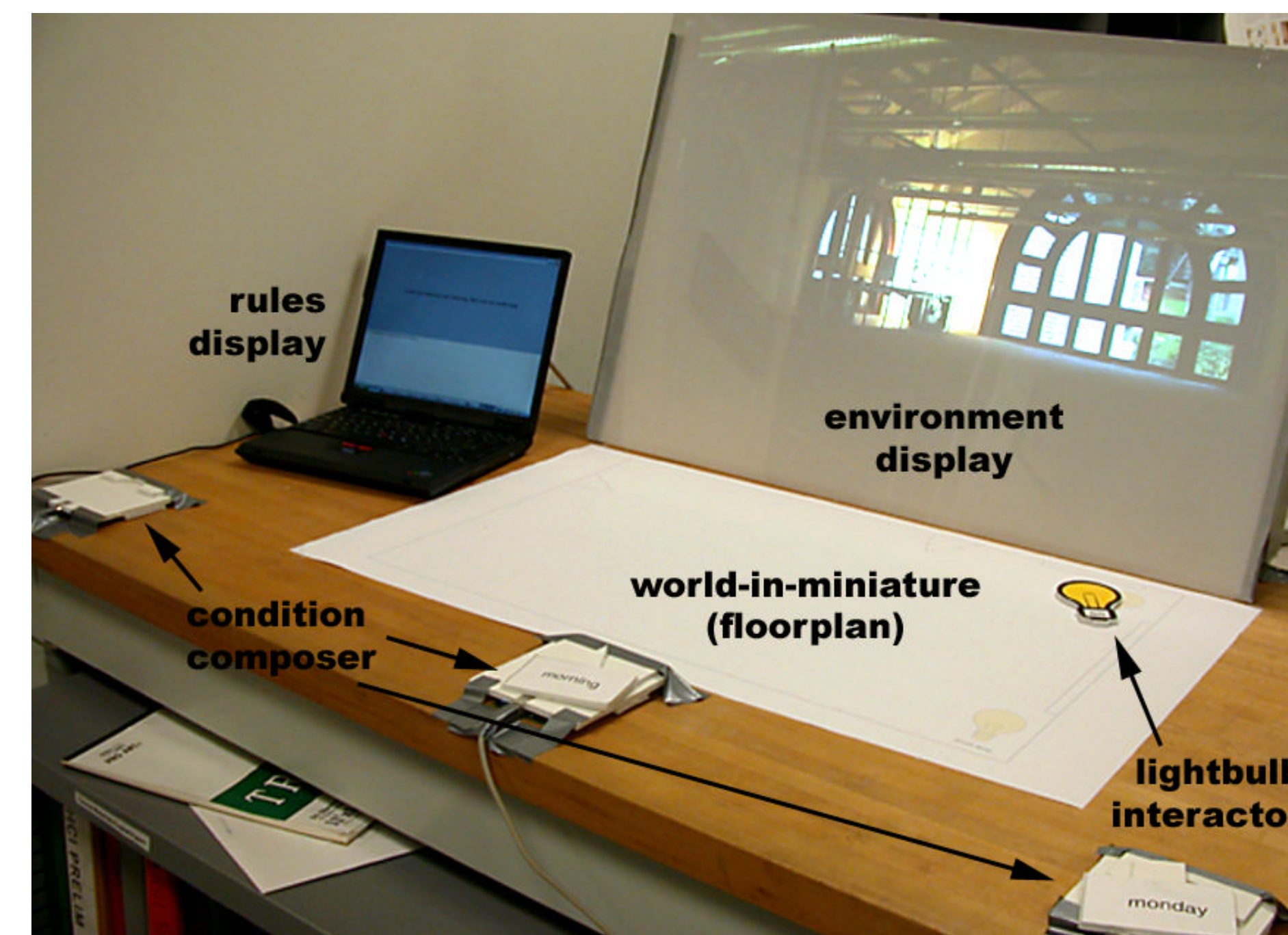- On weekdays after 6pm, turn the temperature down.

goal

Provide a tangible interface that supports users in creating rules for home automation.

Provide both **feedback** and **control.**

Demonstrate the value of tangible interaction in a real setting.

SiteView

rules display
environment display
condition composer
world-in-miniature (floorplan)
lightbulb interactor
monday

SiteView components

- **Interactors: control**
  - Physical objects that logically correspond to rule conditions and automated actions
- **World-in-miniature: model**
  - Small-scale representation of the sensor environment
- **Condition composer: control**
  - Area that senses and structures user's specification of rule conditions
- **Environment display: feedback**
  - Display of what environment will look like when a rule is activated
- **Rules display: feedback**
  - Display of a rule as it is created and display of all rules applicable for given set of conditions

Research at Intel

interaction

keyed edges
rain   monday   morning
on   off
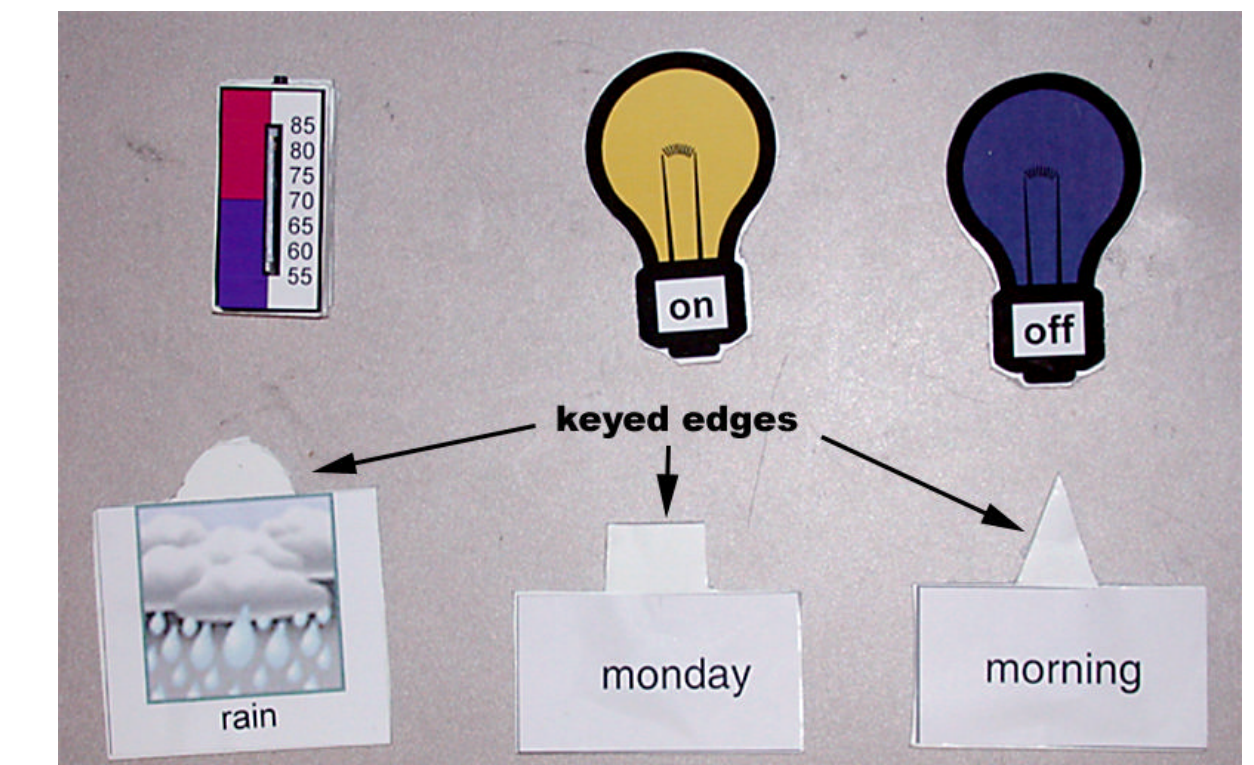
- **Phidgets**
  - Physical slider that allows users to set the temperature
- **RFID**
  - Tags are used by the user to set the rule conditions
- **Papier Mache**
  - Berkeley toolkit for building physically-based interfaces: supports computer vision and is used to sense the location of the light tokens

evaluation

- evaluation of SiteView and X10 with 6 users
  - SiteView made it easier to create queries and rules and faster to create simple rules
- evaluation of SiteView with graphical vs. textual environment display and filtered vs. unfiltered rules display with 14 users
  - Graphical and filtered displays easiest to use
  - Users preferred textual display and filtered display

future work

- Use physical characteristics of interactors to provide constraints

- Test effectiveness of tangible interaction vs. visual interaction

- Support more complexity in rule conditions and rule actions