

HomeRules: An End-User, Tangible Programming Interface for Smart Homes



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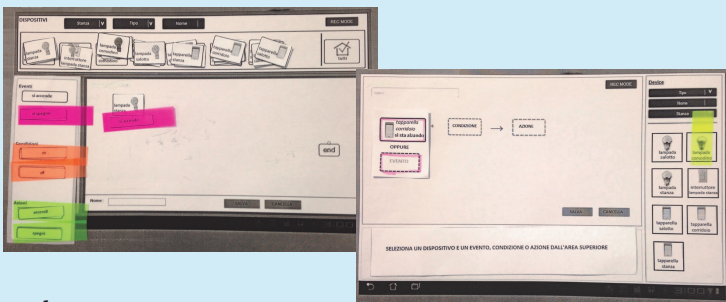
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1. Exploring end-user programming in smart homes

Literature review to summarize the state-of-the-art about end-user programming in smart homes.

We derive 10 guidelines that aims at providing a clear guidance for researchers and practitioners interested in offering smart home inhabitants end-user programming features.

2. Paper Prototyping HomeRules



Goals

Create an end-user and tangible programming interface for a smart home that exploits the guidelines. Two prototypes: one uses *single touch* for rule compositions, the other *drag-and-drop*.

Evaluation

- Informal design evaluation with 3 HCI/UbiComp experts
- Think-aloud with-in subject study with two groups of 6 people: one group with technical background and one with no technical or programming experience

Guidelines

1. Use the Event-Condition-Action format for representing smart home rules, in a visual way.
2. Avoid using natural language for rules creation.
3. Provide a simple and clear visualization of existing rules.
4. Provide both tangible and non-tangible interaction.
5. Provide a step-by-step creation mechanism for first-time users.
6. Handle time-related properties separately.
7. Apply a mobile-first approach, targeting screens larger than 6".
8. Adopt single touch (or click) interactions instead of more complex operations (like drag-and-drop).
9. Supplement the visual representation with other feedback mechanisms, like sound.
10. Prefer testing "in the wild".

Main Findings

- Guidelines seem to be confirmed
- Strong interest on the topic

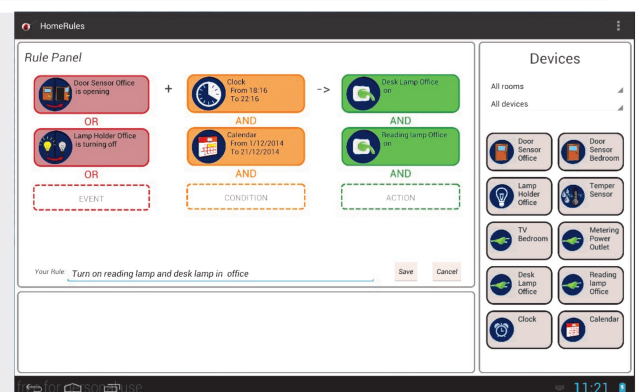
3. Developing HomeRules

Goal

Better investigate the applicability and consistency of the guidelines.

Identity Card

- Fully implement the guidelines
- Android 4.x app, targeting 10" tablets
- Three modalities
 - *interactive learning* (tangible programming, by demonstration)
 - *normal* (non-tangible programming)
 - *with suggestions* (applicable on top of both the previous modes)
- Connected to Dog, an open-source smart home gateway (<http://dog-gateway.github.io>) via WebSocket API



4. Future Works

- User evaluations of the current version of HomeRules, in lab and in the field
- Extension of the application to cover visualization and explanation of rule conflicts, debugging, etc.