



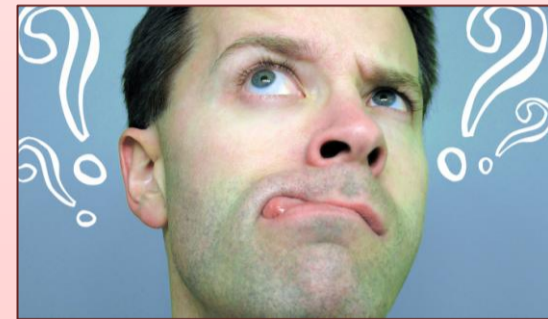
Answering why and why not questions in ubiquitous computing



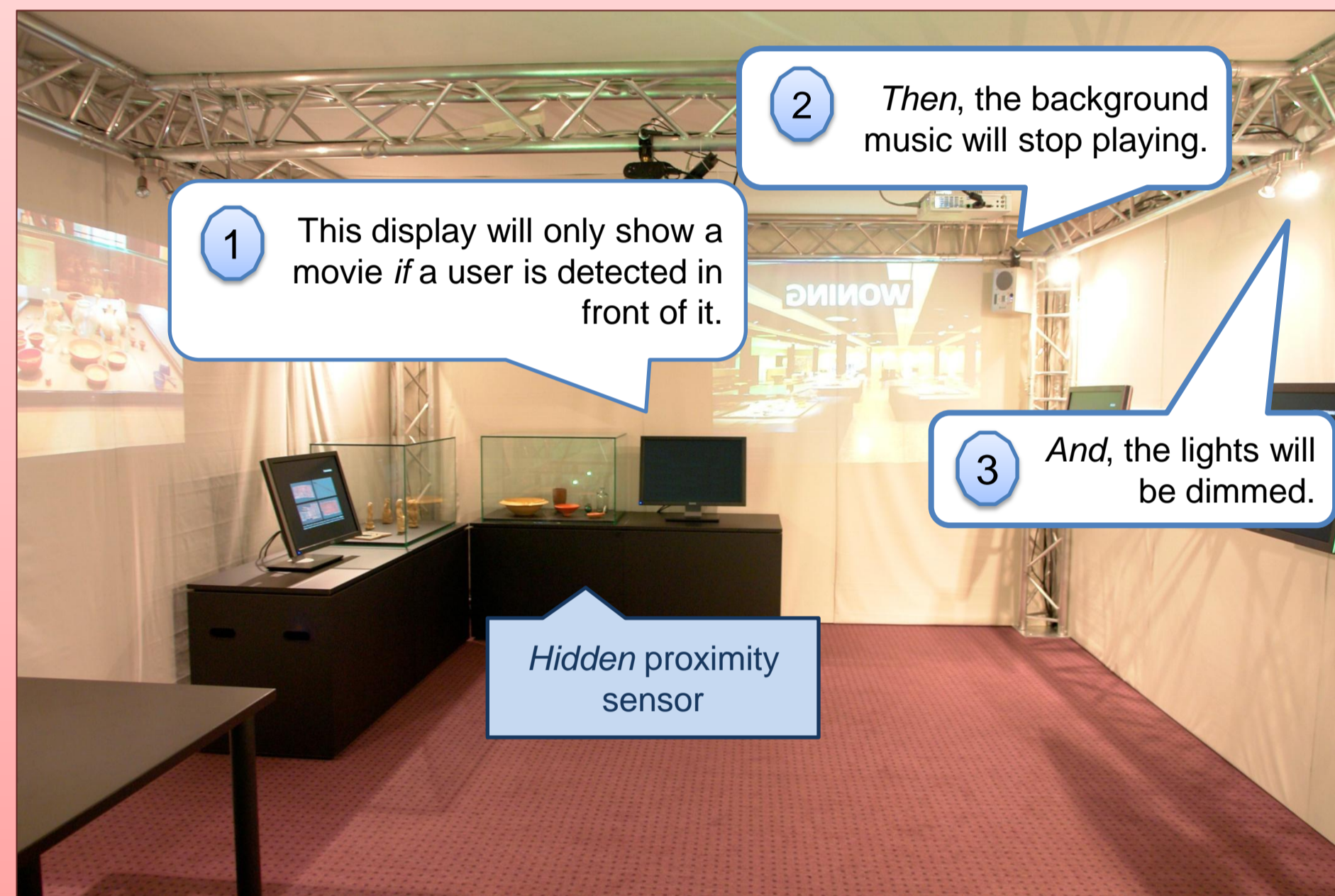
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The Problem



Users often find it hard to *understand* and *control* the behavior of a ubiquitous computing environment [1].



References

- [1] V. Bellotti and W.K. Edwards, "Intelligibility and accountability: human considerations in context-aware systems," *Hum.-Comput. Interact.*, vol. 16, 2001, pp. 193-212.
- [2] Ko, and Myers, "Debugging Reinvented: Asking and Answering Why and Why Not Questions about Program Behavior," *Proc. ICSE '08, ACM*, 2008, pp. 301-310.
- [3] Myers, Weitzman, Ko, and Chau, "Answering why and why not questions in user interfaces," *Proc. CHI '06, ACM*, 2006, pp. 397-406.
- [4] B.Y. Lim, A.K. Dey, and D. Avrahami, "Why and Why Not Explanations Improve the Intelligibility of Context-Aware Intelligent Systems," *Proc. CHI '09, ACM*, 2009, pp. 2119-2128.
- [5] G. Vanderhulst, K. Luyten, and K. Coninx, "ReWiRe: Creating interactive pervasive systems that cope with changing environments by rewiring," *Proc. IE '08, IET*, 2008, pp. 1-8.

Further Information

Please contact jo.vermeulen@uhasselt.be for more details.

More information on this and related projects can be found at:

<http://research.edm.uhasselt.be/~jvermeulen/ubicomp09/>

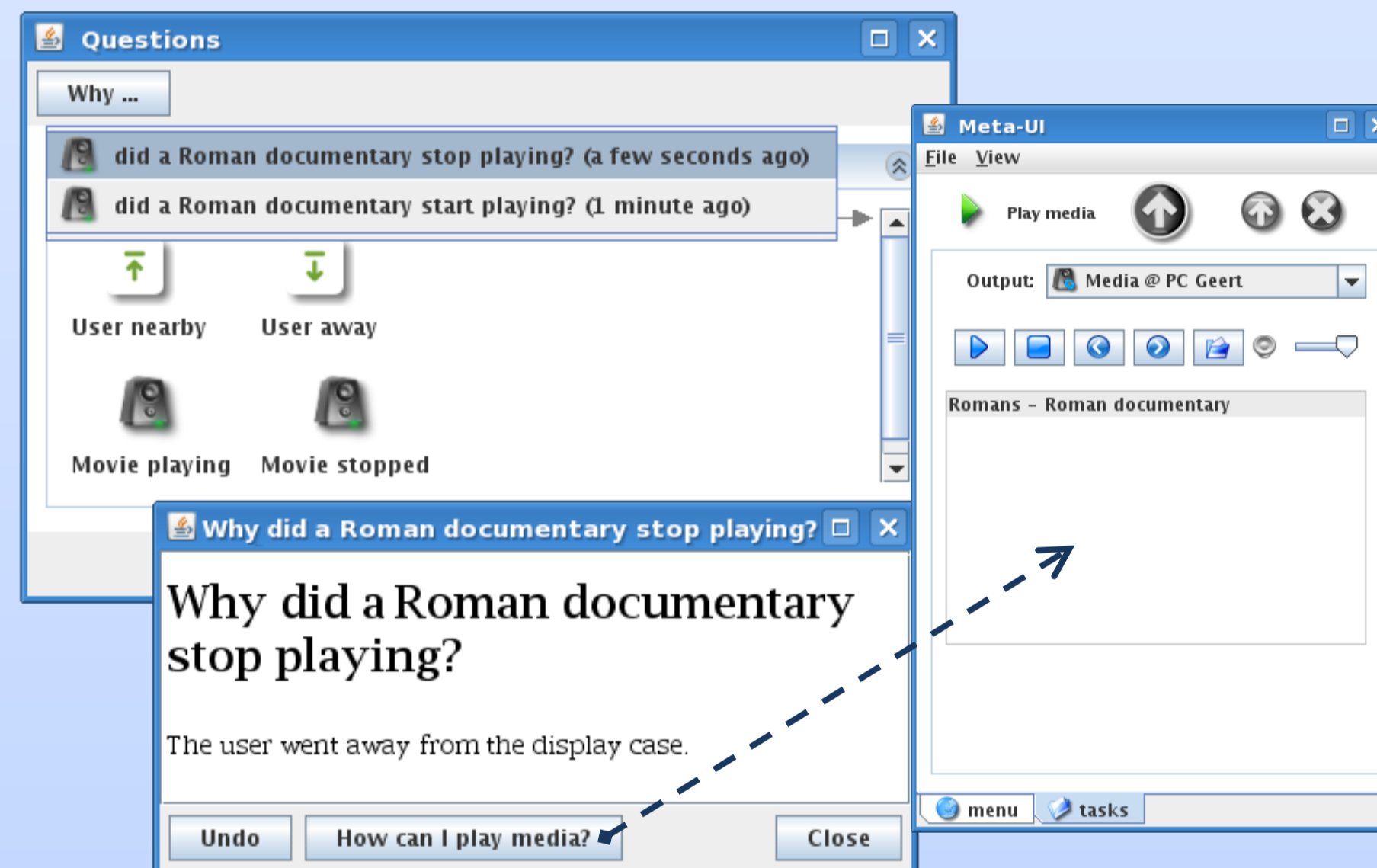


Our Solution

1. Allows users to *ask* two types of questions:

- why?* → arising from *unexpected* events that *occurred*
- why not?* → arising from *expected* events that did *not occur*

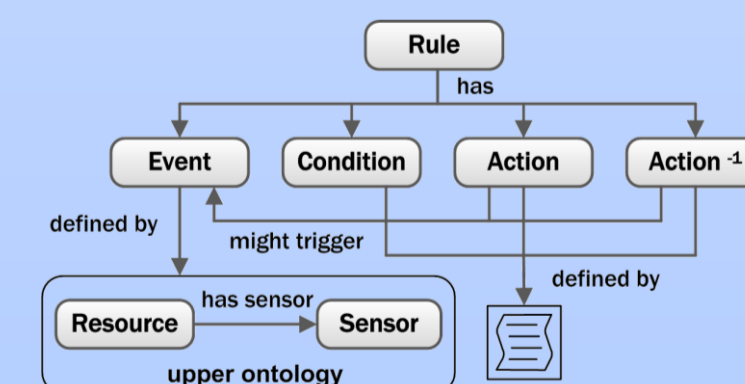
2. Provides basic *control mechanisms* (undo, redo) and *specific control UI's* (e.g. to play media)



How?

We rely on the existing Ubicomp framework *ReWiRe* [5], which allows us to *trace events* across distributed components.

To support why questions, *ReWiRe's rule-based behavior model* was annotated.



Motivation

• *existing studies* have demonstrated the *potential of why questions* in debugging [2], user interfaces [3] and context-aware systems [4].

• to date, there has been *no practical reusable implementation* of why questions for *ubiquitous computing* environments.

Preliminary User Study

Method

- 5 voluntary participants from our lab
- 3 tasks in which behavior occurred that users had to understand and control using our prototype

Results

- ✓ all subjects *were able to use the why questions* to find the cause of events in each of the three tasks.
- ✓ in a post-test semi-structured interview, participants generally indicated that they found our technique *useful and easy to use*.
- ✗ the *why menu* sometimes became *cluttered*
- ✗ it was not always easy to *predict the outcome* of invoking the *control mechanisms* (e.g. undo)



Future Work

- *improving our prototype* based on feedback from the informal user study
- *formal evaluation*
- investigating the *required developer effort* to make ReWiRe applications "why-question"-ready