



IBM Almaden Research Center

Quantifying Magic in Ubicomp Systems Scenarios

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Quantifying Magic in Ubicomp Systems Scenarios

- Ubicomp scenarios: futuristic by design
 - technically exciting, often practically useless
- We need 2 part evaluation of Ubicomp systems
 - 1) The motivating, potentially realizable scenario
 - 2) A system that implements that scenario
- We know how to evaluate systems
How should we evaluate scenarios?
- Proposal:
 - Assemble guidelines for assessing “magic” in scenarios
 - Understand different categories of magic
 - Develop quantitative estimation techniques

Barriers and Evaluation in Ubicomp Systems

- Why do Ubicomp systems seem to require 'magic'?
 - Magic: amazing leaps over barriers to adoption
 - The way the world is now ...*barriers* ... *presto!*...the world of the scenario
 - Magic: underspecified assumptions or predictions
 - how people, society, and technology will change
- Futuristic scenarios, predictions of change, reliance on technological progress
 - All vital to ubicomp research
 - We need to account our magic not eliminate it
- Explicit Accounting for Magic
 - Create common understanding of the possible dimensions of change
 - Develop effective mechanisms for describing the likelihood of changes

Some Dimensions of Magic

- **Computational:** a scenario might require a known NP-hard algorithm
- **Algorithmic:** a scenario might require impossible or non-existent algorithms
- **Financial:** a scenario might require the expenditure of money by individuals, corporations, or governments that is unlikely or impossible
- **Technological:** scenarios often require changes in technology (e.g. scale, cost, power) that are not the focus of the described research
- **Biological:** a scenario might require perceptual and cognitive resources that people do not have
- **Sociological:** a scenario might assume that individuals, groups, or institutions will change (e.g. toward trust, altruism, selflessness, etc.)
- **Logistical:** scenarios almost never consider maintenance or upgrade costs.
- **Legal:** scenarios may presume legally difficult or impossible uses of technology or information
- **Infallibility:** scenarios tend to ignore the possibility of technological failures, either as a result of design mistakes or as a result of actions by (potentially malicious) individuals

Quantifying the Limits of Magic

- Explicitly enumerating and discussing the dimensions of magic in a scenario
 - a *first* step toward evaluating its practicality and usefulness
- The next step: quantitative analysis
 - allow researchers to more effectively compare and contrast scenarios
 - Allow developers to gauge time scale and investment.
- Some types of magic are quantifiable:
 - Techniques for evaluating an algorithm's computability and computational complexity
 - Methods for estimating the current and future costs of devices
 - Known price points for product and service adoption
- Quantifying other types is still difficult, but:
 - Almost any analysis is an improvement on the status quo
 - We can work as a community to create, share, and improve tools

Let's Get Started!