IoTSim: Designing Interactive Products with Synthetic Data

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An exploration into data-driven design with comprehensive tool support

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Introduction

Designing interactive products means creating complex mappings between inputs and outcomes, that is, between sensor data and external information and actuations in a context. Data is an essential “material” of design in this approach, which increasingly consists of real-time data streams. The more complex the data streams become, the more difficult it becomes to apply traditional design methods without dedicated support for (1) sketching and scaffolding “online” data, (2) scheduling and simulating data, and (3) recording and replaying data as needed. We need active environments that prototypes can be immersed in, such that they receive such data and can respond to them according to their intended and designed behavior.

Concept: IotSim

This poster introduces IotSim, a new design tool that addresses the challenge of providing effective access to data as a design material. IoTSim allows designers to create sequences of events, timed data, that can be scheduled and replayed at varying speeds.

Implementation

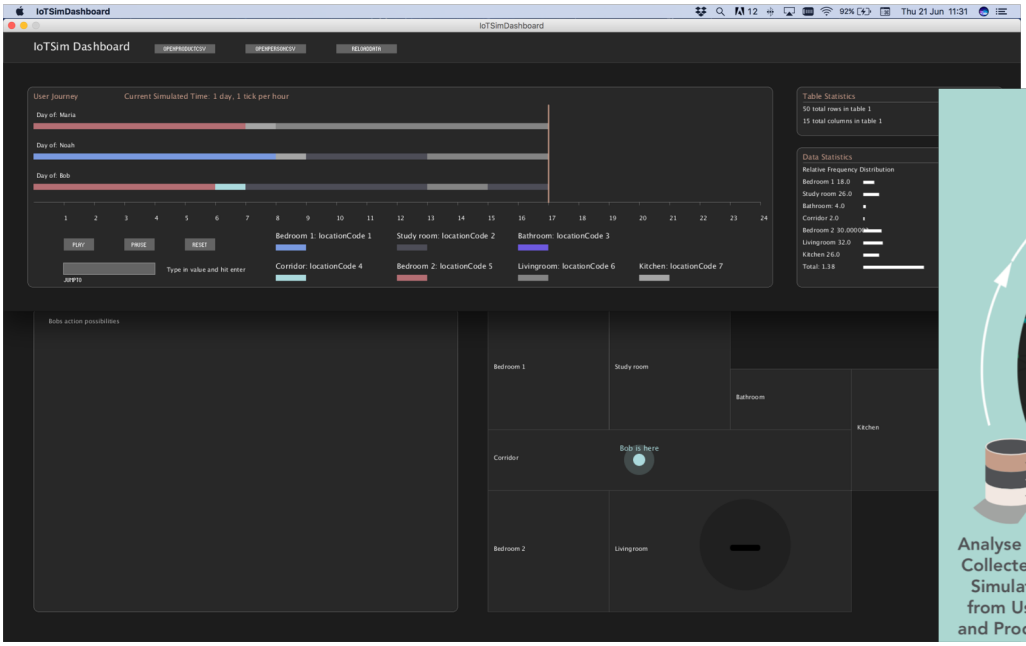
IoTSim was implemented as a Java library that integrates with the Processing language and tooling. The current implementation allows to programmatically construct a data synthesis algorithm or load example data from CSV file. Both approaches lead to a model of the to be generated data, which can be used in an internal scheduler component that facilitates playback over time.

Evaluation

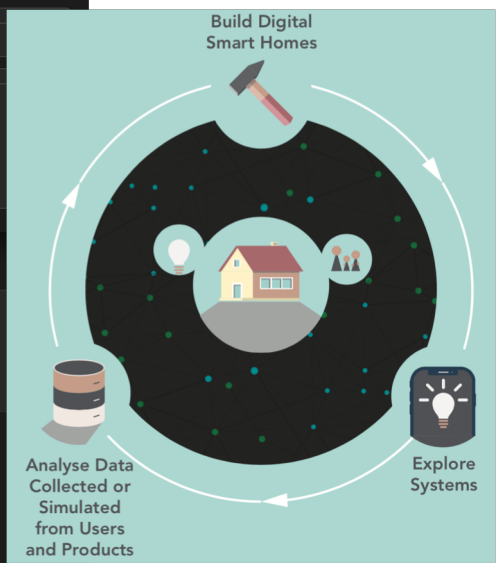
Throughout the design research process of IoTSim, the concept and implementation was evaluated qualitatively, with more formal evaluations during a course session (n=15) and a workshop (n=12). In both evaluations, Industrial Design students were asked to implement a prototype into a smart home system and feed this prototype with live data from IoTSim with the effect of supporting designers to explore data freely and creatively.

Conclusions

IoTSim is a promising exploration of how design tasks might be enriched with data synthesis which allows to better construct and evaluate prototypes.



Overview of design process supported by IoTSim



IoTSim user interface with timeline and properties at the top and spatial event view at the bottom.

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