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Data Article

Data on the configuration design of internet-connected home cooling systems by engineering students

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ABSTRACT

This experiment was carried out to record the step-by-step actions that humans take in solving a configuration design problem, either in small teams or individually. Specifically, study participants were tasked with configuring an internet-connected system of products to maintain temperature within a home, subject to cost constraints. Every participant was given access to a computer-based design interface that allowed them to construct and assess solutions. The interface was also used to record the data that is presented here. In total, data was collected for 68 participants, and each participant was allowed to perform 50 design actions in solving the configuration design problem. Major results based on the data presented here have been reported separately, including initial behavioral analysis (McComb et al.) [1,2] and design pattern assessments via Markovian modeling (McComb et al., 2017; McComb et al., 2017) [3,4].

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Specifications Table

Subject area	*Engineering, Design*
More specific subject area	*Configuration design by engineering students*
Type of data	*Table*
How data was acquired	*Desktop computer*
Data format	*Raw data*
Experimental factors	*Conditions: (1) individual work and best of three individuals selected, (2) team of three with moderate interaction (3) team of three with high interaction.*
Experimental features	*Engineering students solving a configuration design task in the conditions noted above.*
Data source location	*Pittsburgh, PA*
Data accessibility	*Data is available as a supplementary attachment to this article.*

Value of the data

- This dataset is important to the field of engineering design as it provides a log of design process used by humans solving a configuration design task, both in teams and alone.
- A full and detailed account of the problem-solving process used by participants is encoded in the information shared here.
- This may serve as a baseline for comparison against design synthesis algorithms completing similar tasks, or against other experiments testing design methods with human participants.
- This may also serve to inform researchers exploring problem solving more generally, for instance in cognitive science.

1. Data

This dataset is provided as supplementary data in a CSV format. Each row in the CSV describes a single design produced during the study. Descriptions of the columns headings are provided below in Table 1.

Room numbers referenced as *XX* in Table 1 are designated in the floorplan of the home shown in Fig. 1. Note that temperature sensors were allowed to be placed outside of the home to record ambient temperature. If present, these are recorded in Room 0.

2. Experimental design, materials, and methods

2.1. Participants and conditions

This study was conducted with senior undergraduates and graduate students in engineering with ages 21–31 and a median age of 22. Participants in the study were placed in one of three conditions. Participants placed in Condition 1 worked individually. Participants in Condition 2 worked in teams of three with moderate interaction (interaction was required after every 10 individual design actions) and participants in Condition 3 worked in teams of three with high interaction (interaction was required after every 5 individual design actions). A performance-based comparison between these conditions has been published separately [1,2].