

# Crowdsourcing Creativity: Experiments in Design

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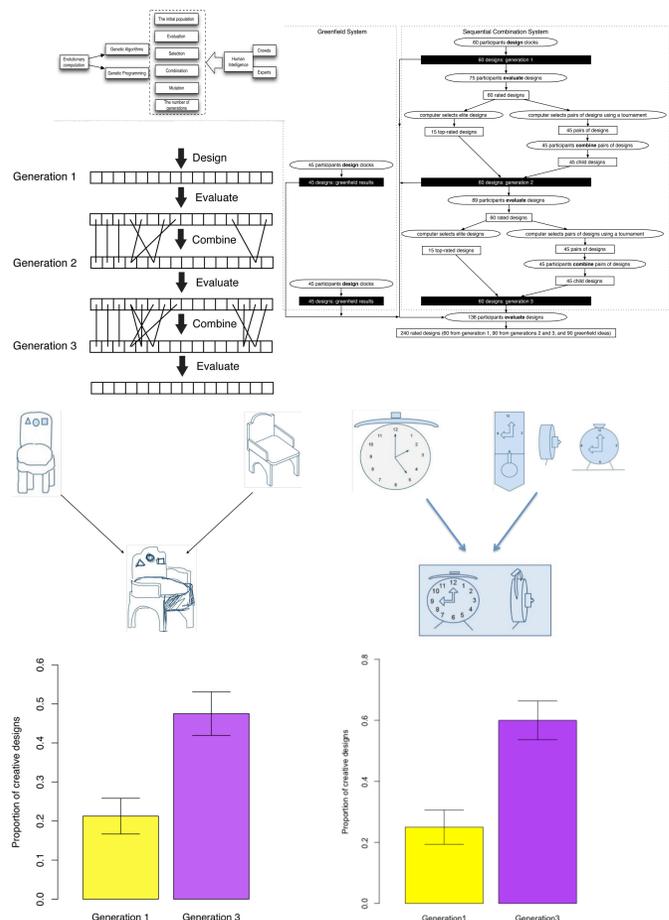
## Introduction

The Internet makes possible a different kind of design, based on a new phenomenon: the emergence of crowds, individuals who will undertake small tasks for fun, nominal compensation, or both. What if the iterative application of a crowd's energy is used to generate, combine and refine ideas, possible solutions to social and technical problems?

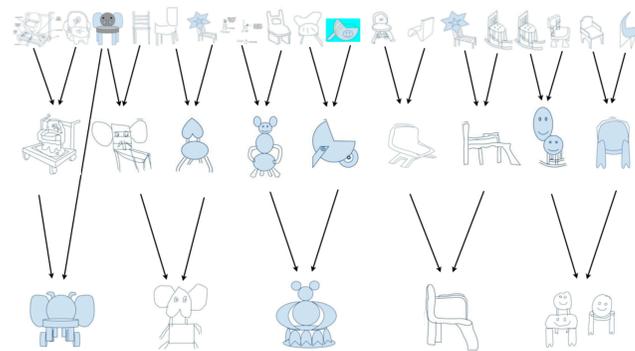
This research is being performed both through experiment and through observation. The experimental approach has made use of human-based evolutionary algorithms, testing the ability of the crowd to evolve effective designs. The observation approach has looked at two different sites, Scratch and Thingiverse, to understand the dynamics related to sharing and remixing projects.

## Human-based evolutionary computation

Designs evolved through crowd work. The mechanism used, a human-based evolutionary algorithm, is shown in Figure 1. This algorithm asks different crowds to generate ideas, combine them, and evaluate them, through several generations. The quality as judged by the crowd increases. Shown below are process schematics, followed by the results of experiments in which the crowd designed chairs and clocks.



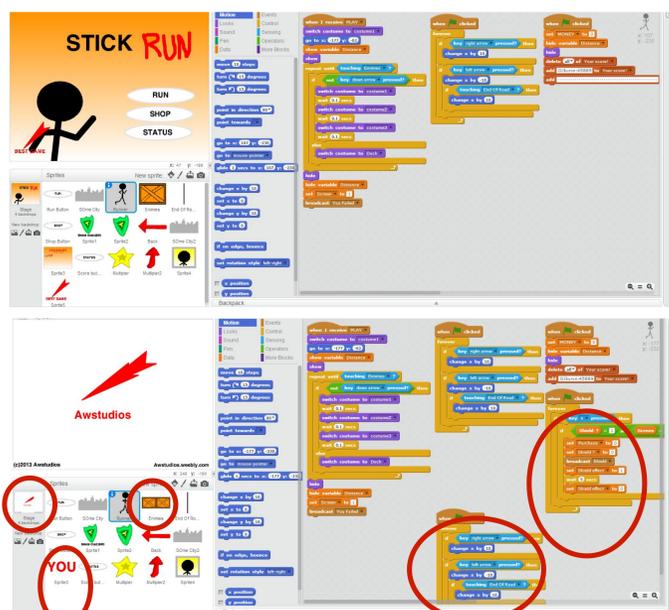
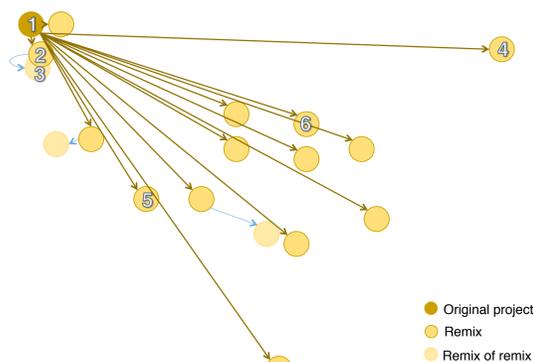
Comparisons of creativity across generations. Designs were judged by the crowd on both originality and practicality, and those above the median on each dimension were scored as creative.



The evolution of design – chairs for children – through a mechanical Turk experiment with 1047 participants. Features can be traced from generation to generation.

## Program evolution: Scratch

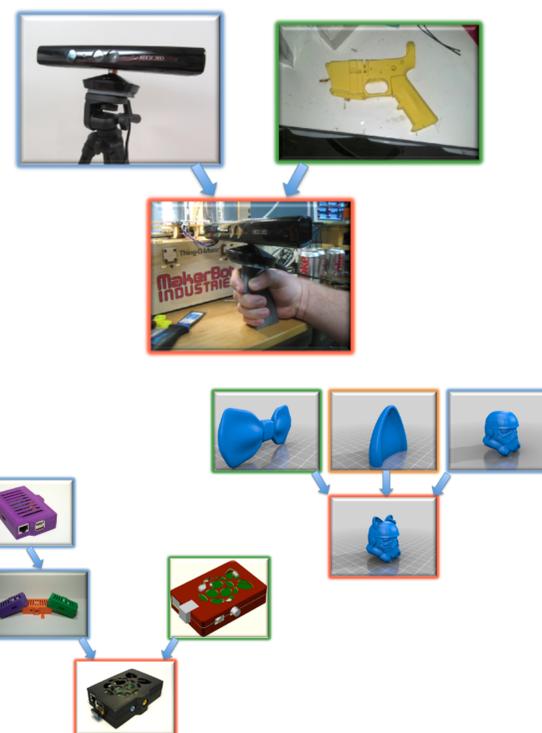
Scratch is an opening programming environment hosted at MIT's media lab, primarily for youths, who freely post and modify each other's programs. On Scratch, we have found that members create their own contests, and reward each other by producing drawings. Thus, they motivate each other. When code is remixed, the differences in the code can be calculated, and the degree of originality seen. Directly below is an mds plot of a set of remixes, with projects 1 and 6 shown in detail.



Top, inheritance tree for a set of remixed programs. Bottom, the changes circled between project 6 and project 1.

## Product evolution: Thingiverse

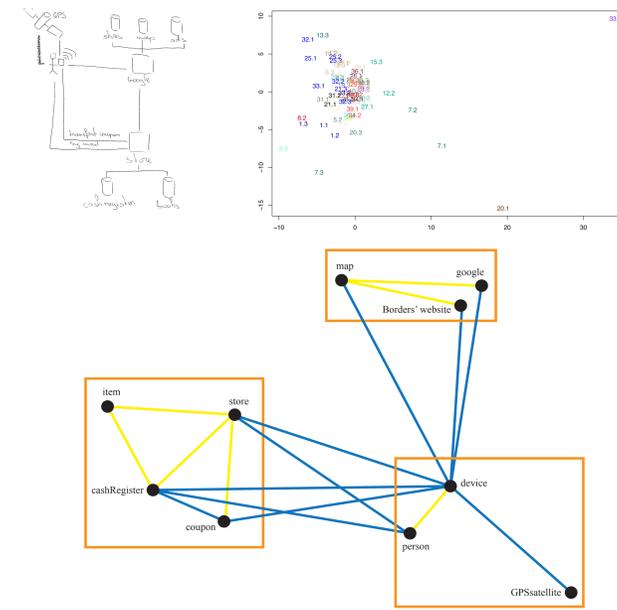
Thingiverse is a site for the sharing of designs to be manufactured on 3D printers. Users can remix each other's projects. We look at what factors determine the manufacturing and remixing of a particular design. Harris Kyriakou's poster explains the work in more detail; below are three examples of remix trees in which designs were combined.



Designs on thingiverse, showing the acknowledged inheritance path.

## Systems design

In these experiments, student designers sketched software systems. The systems were measured using graph edit distance. A consensus graph was created by combining edges shared by most graphs.



Designs for a mobile system that will offer coupons for a nearby bookstore. Top left, a single design; top right, all designs in an mds plot, bottom, the consensus graph based on the most used edges.

## Discussion

All of the above explorations of design space hinge on concepts of distance between design. Distances help us measure the originality of a design. They also suggest future research. Will prompts of designs near current ones have stronger effects than prompts of designs further away? Can semantic networks be used to encourage exploration of new parts of a design space?

## Conclusion

Creative work can be produced by crowds. Large scale parallel design effort can be effected through human based evolutionary algorithms. And, in the field, remix sites exhibit an organic evolution, as community members choose which designs to implement and which to improve. It is possible to catalyze social creativity.

## Acknowledgements

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