Studying Mathematical Reasoning through the Gadget Game

Jonas Bayer
University of Cambridge, Cambridge, United Kingdom

Jacob Loader
University of Cambridge, Cambridge, United Kingdom

Katherine Collins
MIT, Cambridge, Massachusetts, United States

Simon Frieder
University of Oxford, Oxford, United Kingdom

Adrian Weller
University of Cambridge, Cambridge, United Kingdom

Joshua Tenenbaum
MIT, Cambridge, Massachusetts, United States

Timothy Gowers
University of Cambridge, Cambridge, United Kingdom

Abstract

Mathematicians regularly come up with multi-step solutions to difficult problems, formulating intermediate statements and subgoals, deciding which ones to attempt to prove, and judging when to start, stop, or come back to a question. What drives these and similar cognitive processes? Studying mathematical reasoning is challenging, in part because of a lack of engaging yet controlled environments in which to do so. We introduce a new game – the Gadget Game – for this purpose. Each level in the Gadget Game can be an encoding of a provable mathematical statement, together with hypotheses and deduction rules, that obscures the semantic content of the original problem. The resulting puzzles are enjoyable to play. We conduct a series of preliminary experiments involving a web-based crowdsourced experiment and a "think aloud"' deep-dive with two experienced mathematicians. We believe that the Gadget Game is a ripe domain for interesting cognitive science that engages deeply with mathematical thought.

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