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Human Tool Creation Involves Strategic Search for Possibilities

Abstract. Humans flexibly create tools to solve physical problems, yet the cognitive processes underlying this ability remain unclear. A natural hypothesis is that tool creation involves searching for designs that maximize success probabilities using an internal intuitive physics model. We investigated this by having participants freely construct tools in virtual environments by adding or removing pieces. Despite solving the tasks, participants' choices were only weakly related to estimated success probabilities under a noisy physics engine and were poorly captured by a simple physics-based search model. Crucially, analysis of tool creation trajectories revealed that participants systematically passed through intermediate configurations without treating them as candidate solutions, even when those tools were predicted to succeed. These findings suggest that rather than purely evaluating intermediate designs via physical simulation, human tool creation is guided by a strategy-constrained, action-based search process that structures exploration of the tool space.