Mouselab-MDP: A new paradigm for tracing how people plan

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Motivation

Planning is a latent cognitive process that cannot be observed directly. This makes it difficult to study how people plan. To address this problem, we propose a new paradigm for studying planning that provides experimenters with a time-course of participant attention to information in the task environment.

Background

Planning is a fundamental aspect of higher-order cognition, and it has accordingly received much attention in cognitive psychology. Research on planning is complicated by the fact that we cannot directly observe the cognitive processes of planning. One approach to this problem is to design *process tracing* paradigms that externalize some aspect of the cognitive process. ? (?) developed one such methodology for studying multi-alternative risky choice: the "Mouselab" paradigm. Thus, to apply the Mouselab process tracing method to planning, we simply replace the single decision with a Markov Decision Process (MDP), in which a participant must make a sequence of choices, each one affecting the choices that will be available in the future. Something about pruning?

Usage

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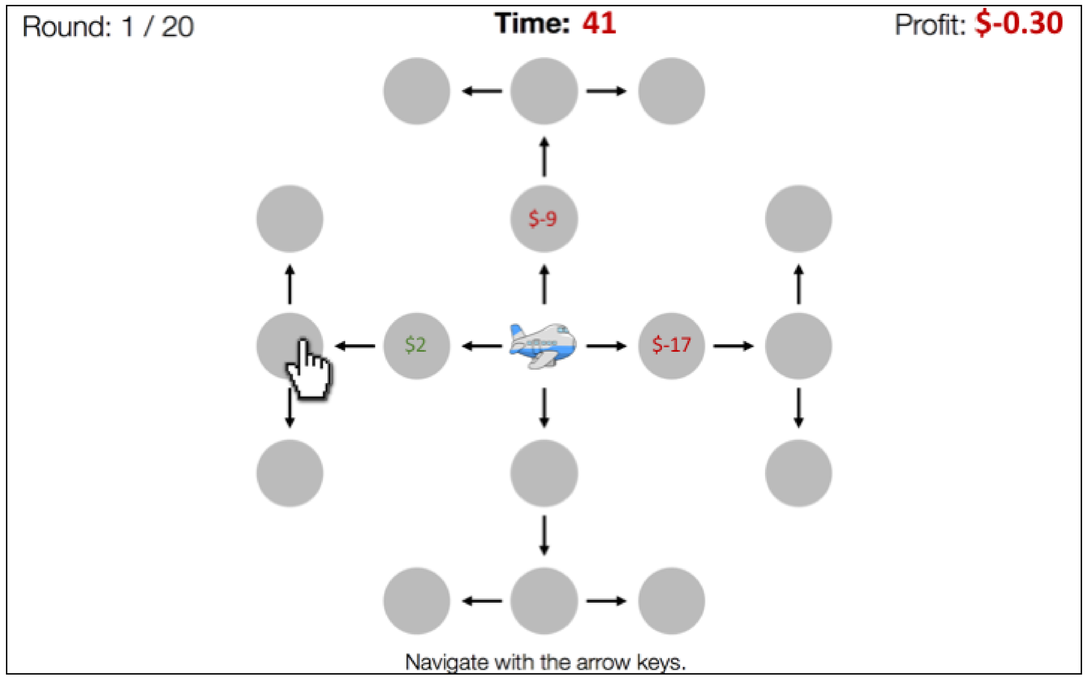
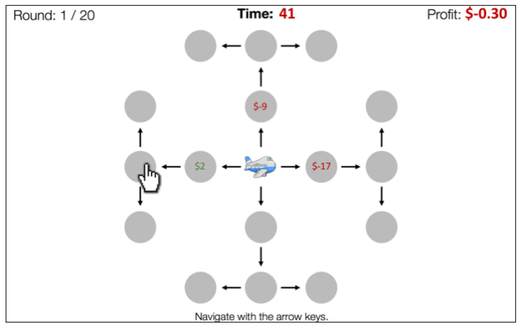
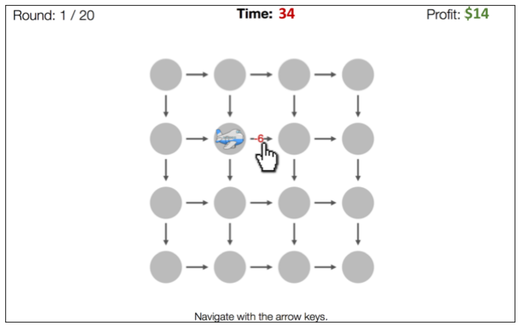
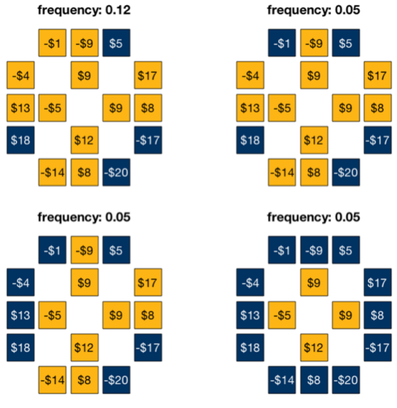
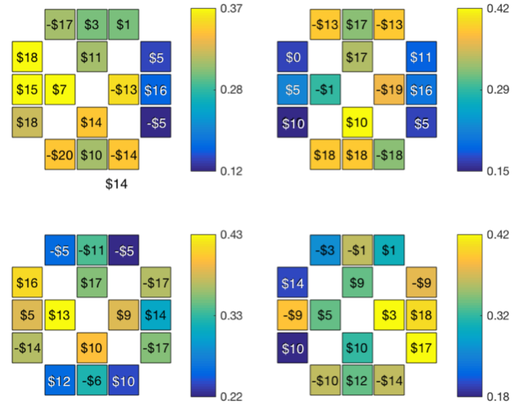




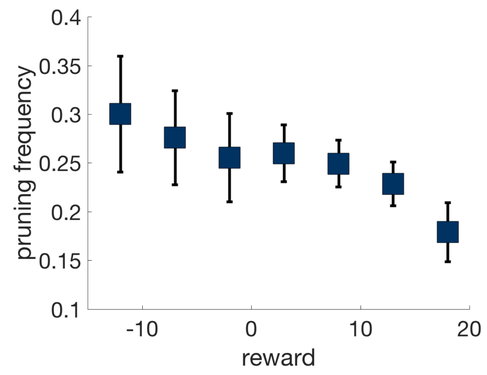






Experiment

Foobar navigated a spider through the *Web of Cash* (Fig. 2), attempting to collect the maximum amount of money. On some trials, pseudo-rewards (computed with Eq. **??**) were presented every 1, 2, or 3 steps. Only the pseudo-rewards at the nearest column were visible; when one of those pseudo-rewards was attained, the next batch appeared. Participants were informed that the number of stars on a node was the maximum profit one could achieve starting from that node.



Results

- Pseudo-rewards improved the **quality** and **speed** of participant's decisions (Fig. 2).
- Pseudo-rewards facilitated **hierarchical decomposition** of the planning problem, as evidenced by reaction times (Fig. 3).

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