Construction and use of cultural environment structure through simple decisions

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Abstract:

Cognitive mechanisms are shaped by selection to match their environments. But through their use, these mechanisms exert a shaping force on their surroundings as well. These forces are particularly evident when a population of decision-makers create, through their combined decisions, the cultural environment that they share. What happens to the usefulness of these cognitive mechanisms when they alter the environment they are applied to? Here we explore this cognition-environment interaction by looking at how using a very simple cognitive mechanism, the recognition heuristic for making choices, can result in some objects in the constructed cultural environment being much more often recognized and "talked about" than others. An analytic model and an agent-based simulation are used to show what behavioral factors affect the emergence of this environmental structure.

We start with a very simple cognitive mechanism that aims to select the "bigger" of two options, where "bigger" is defined on some unobservable criterion dimension. This decision can be made even simpler when the only information available is whether or not each option has ever been encountered before. In this case, the decision maker can do little other than to rely on his or her own partial ignorance, e.g. choosing recognized options over unrecognized ones. This kind of "ignorance-based reasoning" is embodied in the recognition heuristic: When choosing between two objects (on some criterion), if one is recognized and the other is not, then select the former. This heuristic works well—that is, it is ecologically rational—when the environment is structured in such a way that "bigger" objects (that is, those that score higher on the criterion in question) are more recognized that "smaller" ones. It turns out that many environments are structured this way—people tend to talk about prominent landmarks, individuals, and cultural events (e.g., the tallest mountains, richest billionaires, or biggest-selling movies) and hence recognize these more than other, "smaller," ones—which in turn means that they can use the recognition heuristic to accurately judge which things are bigger.

What happens when a population of decision-makers uses the recognition heuristic to choose items in their world, and talks to each other about what they have chosen? We have created both analytical models and agent-based simulations to find out. Over time, recognition of some objects spreads disproportionately through the population, resulting in the emergence of a J-shaped distribution of which objects are selected most often. Such J-shaped distributions (where a very few objects have very high rates of being chosen, and most objects have quite low rates) appear commonly in real-world domains that people think about, talk about, and make decisions about, such as records sold, movies watched, brands purchased, and the like. Such environment structure can in turn make the recognition heuristic ecologically rational, that is, able to make beneficial choices. In this talk, I will present the models we have developed and use them to show how salient cultural environment structure can emerge from the interactions of simple decision makers, and show how this structure in turn impacts the decisions that are made in this environment.

List of six relevant publications:

Todd, P.M., and Gigerenzer, G. (in press). Bounding rationality to the world. *Journal of Economic Psychology*.

Todd, P.M., and Kirby, S. (2001). I like what I know: How recognition-based decisions can structure the environment. In J. Kelemen and P. Sosík (Eds.), *Advances in Artificial Life: 6th European Conference Proceedings (ECAL 2001)*, pp. 166-175. Berlin: Springer-Verlag.

Todd, P.M. (2001). Fast and frugal heuristics for environmentally bounded minds. In G. Gigerenzer and R. Selten (Eds.), *Bounded rationality: The adaptive toolbox* (Dahlem Workshop Report), pp. 51-70. Cambridge, MA: MIT Press.

Todd, P.M., and Gigerenzer, G. (2000). Simple heuristics that make us smart. *Behavioral and Brain Sciences, 23*(5), 727-741.

Todd, P.M. (2000). The ecological rationality of mechanisms evolved to make up minds. *American Behavioral Scientist, 43*(6), 940-956.

Todd, P.M. (1999). Simple inference heuristics versus complex decision machines. *Minds and Machines, 9*(4), 461-477.

(Note: these publications all relate to the theme of the simple decision heuristics that people use to make good decisions in specifically-structured environments. The second paper focuses more specifically on how the use of these simple heuristics can in turn shape the structure of the environment in which they act. This is the main theme of my talk as well, which expands on this earlier work.)