Thesis Abstract

Epidemiology of Representations: An Empirical Approach

(original title may change)

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Abstract

Recent years have seen several attempts to unify cognitive science and social science. The fields of Social cognition and Cultural evolution, involving an increasingly diverse range of disciplines, have emerged as promising approaches over the past decade. My thesis is concerned with a subject formalised by Dan Sperber in the mid-nineties: in a series of innovative articles gathered in Sperber (1996), the author suggests what is now known as Cultural Attraction Theory (CAT), aiming to provide the cognitive and social sciences with a common framework to address interdisciplinary questions. CAT starts from an ontology made only of "mental representations" (those from cognitive science) and their expressions in the outer world, "public representations". By proposing to study the distribution of public representations that circulate in a society, it provides a framework in which knowledge from cognitive science and anthropology can be combined to explore the interactions between evolution and culture (as exemplified in Baumard, André, and Sperber 2013).

Over the last decade, the approach has benefited from several theoretical developments with genuine mathematical models (Claidière and Sperber 2007; Claidière, Scott-Phillips, and Sperber 2014). A growing community also explores these questions with empirical approaches. Artificial transmission chains in the laboratory, for instance, have been used extensively to study iterated language evolution, as Tamariz and Kirby (2016) review. That paradigm has also been used to study the evolution of short audio loops (MacCallum et al. 2012), of risk perception (Moussaïd, Brighton, and Gaissmaier 2015), and of abstract visual patterns transmitted by apes (Claidière et al. 2014). Another approach is the meta-analysis of large numbers of anthropological or historical works on a given subject to rebuild the evolution of a representation as it happened. This technique has been used by Morin (2013) in his study of how painted portraits change over the centuries, and by Miton, Claidière, and Mercier (2015) in their examination of the practice of bloodletting. A third approach crawls online content and communities in order to study the spread and propagation of representations in human networks. While earlier works were based on atomic propagation and exposure models where simple entities such as URLs and innovations were the

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central object (see Cointet and Roth 2007 for a discussion), this stream of research is increasingly modelling linguistic representations as deep objects with complexity of their own, improving on simpler virus-like models. Several works have now studied large quantities of meaningful sentences, showing that their propagation can depend heavily on social context (Bakshy, Karrer, and Adamic 2009), semantic content and grammatical style (Danescu-Niculescu-Mizil et al. 2012), as well as on competition between items (Weng et al. 2012).

The wide array of disciplines studying these complimentary questions, and the variety of techniques used in the process, testify to a major obstacle: collecting relevant data in usable amounts to analyse cultural evolution is challenging. The works cited above develop several strategies to face the problem, yet must invariably leave aspects of the question aside: transmission chains usually operate on very simple representations; recompiling historical and anthropological works uncovers trends with many explanations competing for causality; models of online content propagation overlook cognitive levels of explanation by and large.

The guiding rationale for my thesis is the following: by taking advantage of current computing and web technology, and increasing interdisciplinarity, one can recombine the advantages of these different techniques into approaches that expand the range of questions available to empirical studies of cultural evolution. In the process, matters which had until then remained at the theoretical level become concrete problems that can be challenged or must be faced to make progress. In my work I focused on one particular type of linguistic representations: short written utterances, up to a few sentences long. These are both widely available for empirical study — as they are widespread in online social network data and relatively straightforward to collect in controlled experiments —, while at the same time extremely varied and versatile. Using them as my main material, I aim to contribute to the empirical testing of one of the core hypotheses in CAT: the existence of cultural attractors, and their relevance to the study of cultural evolution.

A first detailed case-study examines transformations that quotations, that is a particular case of short utterances found online, undergo as they are propagated from blog to blog or media website. By coding words with a number of lexical features that are well-studied in psycholinguistics, I show that the way words are substituted in quotations is consistent (1) with the hypothesis of cultural attractors, and (2) with known effects of the word features. In particular, words known to be harder to recall in lists have a higher tendency to be substituted, and words easier to recall are produced instead. Furthermore the particular pattern of substitutions observed shows that, on average, these transformations produce words that are closer to a feature-specific attractor value. These results support the hypothesis that cultural attractors can result from the combination of individual cognitive biases in the interpretation and reproduction of representations (Lerique and Roth 2017).

A second case-study aims to improve on the limitations of the first, by transposing the situation to a controlled transmission chain experiment. Indeed, inferring missing information in the above dataset led to constraining the analysis to only word substitutions in order to keep the results reliable. While transmission chain experiments are an obvious next step to counter that caveat, they present an additional challenge: the space of initial utterances that deserve to be studied is extremely large, and analysing the actual evolution of linguistic content (vs., for instance, contrasting the evolution trends of different categories of initial utterances) is an open question that depends on the utterances studied. In order to accelerate the exploration of that space I developed a full transmission chain web application that can rapidly gather enough transmission data for a given utterance type (Lerique 2016). Using a corpus of memorable and non-memorable quotes from movie scripts, and a set of short literary stories, I reproduce my previous results in this controlled setting, detail the evolution of utterances in terms of divergence speed, instability and time to stability, and assess those results in light of the cultural attraction hypothesis.

The final chapter connects these works to a broader debate in the philosophy of language and the study of language evolution. Building on the challenges of semantic analysis and variability that surfaced in the second case-study, I argue that the next step in explaining the short-term evolution of such utterances is to

concentrate on the mechanisms that determine their actual meaning in a given situation (as Scott-Phillips 2017 has argued for the study of long-term evolution of language itself). I present the current approaches for facing that challenge, and replace them in the ongoing debate between representational and enactive approaches to cognition and language.

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