

The web as a culture broth for agents and people to grow knowledge

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April 14, 2021

The worldwide web is, in particular, a fantastic medium through which people and organisations share knowledge. This initial ambition of the web has not faded, though the web is used for many other purposes and efforts are deployed to privatise part of it.

Agents on the web There are plenty of agents on the Web already, they behave like tiny machines: as consumers, harvesting knowledge through crawling the web, as builders, developing the web through connecting and adding knowledge, as repairers, finding dangling links, contradicting statements, and fixing them. These are some basic tasks by which such agents can contribute to the web. And they do it, for instance as wikipedia bots.

As long as agents are autonomous, some of them will unweave what others woven. This is also what people do. But the web will be more solid as agents were to share a weaving culture. How can this be when they are autonomous? Agents have to better communicate with each others. They can do this in various ways: direct communication, cooperation or taking the web as a transportation layer, but also as a medium. Thanks to the web, agents can be autonomous and social, not autonomous and lonely.

Agents as knowledge producers Like yeast refines sugar into alcohol, agents may refine web data into knowledge and beliefs. They may perform such tasks at a relatively basic level based on syntactic or statistical hints. They may do it as well by developing a deeper understanding of the web content and the knowledge that underlies it.

The semantic web effort [1] was one step in this direction. The ability to express formal knowledge, as ontologies, and to understand data through this knowledge is a stepping stone on which agents could build. It has led to proposals such as a data washing machine built on web knowledge itself [2].

Knowledge as culture Knowledge and beliefs are socially elaborated as part of the culture of a society. Sharing knowledge is building cultures, different cultures. We should study how agents can elaborate knowledge socially and

culturally [3]. This falls into the topic of cultural evolution, in which evolution theory is applied to such phenomena [4]. We should study how they can evolve their knowledge through wandering, learning, building or repairing the web.

There may be many ways to study this: analysing how human societies do it, developing logical theories of knowledge evolution, or experimenting with cultural knowledge evolution. We are currently running a program [5, 6], building on the work on cultural language evolution [7], to deepen our understanding of how agents may evolve their knowledge.

But, like people, it would be nice that agents have a life beyond the web.

Agents and people Human beings are in the web like fishes in the sea. The web, as a mediation architecture, has been massively adopted, in various modalities by human beings. Yet, it is a fully artificial environment, so eventually prone to be adopted by agents.

As discussed in previous sections, the building of a culture is only achieved through interaction, either implicit or explicit, and adapting behaviour with respect to interaction. Because the web could be an environment natural to both agents and human beings, it is a perfect playground for studying further cultural evolution in agents driven by human-compatibility [8]. Actually, it may also be a good playground to study as well how human-compatible are some human behaviour.

References

- Tim Berners-Lee, James Hendler, Ora Lassila, The Semantic Web, *Scientific american* 284(5):34–43, 2001.
- Sören Auer, Jens Lehmann, Creating knowledge out of interlinked data, *Semantic web journal* 1(1–2):97–104, 2010.
- Jérôme Euzenat, A map without a legend: the semantic web and knowledge evolution, *Semantic web journal* 11(1):63–68, 2020.
- Alex Mesoudi, Alan White, Kevin Laland, Towards a unified science of cultural evolution, *Behavioral and brain sciences* 29(4):329–383, 2006.
- Jérôme Euzenat, Interaction-based ontology alignment repair with expansion and relaxation, Proc. 26th International Joint Conference on Artificial Intelligence (IJCAI), Melbourne (AU), pp185–191, 2017.
- Yasser Bourahla, Manuel Atencia, Jérôme Euzenat, Knowledge improvement and diversity under interaction-driven adaptation of learned ontologies, Proc. 20th International conference on autonomous agents and multiagent systems (AAMAS), Online, 2021, to appear.
- Luc Steels (ed.), Experiments in cultural language evolution, John Benjamins, Amsterdam (NL), 2012.
- Stuart Russell, Human compatible: artificial intelligence and the problem of control, Viking New-York (NY US), 2019.