

# AGENTS ON THE WEB

## AGENT JURISPRUDENCE

**Michael N. Huhns •**

University of South Carolina • huhns@sc.edu

**Munindar P. Singh •**

North Carolina State University • singh@ncsu.edu

The agent metaphor comes packaged with a number of powerful abstractions. Some of these are psychological, such as beliefs, knowledge, and intentions—abstractions that were traditionally studied in AI. However, there are a number of other abstractions that the agent metaphor brings to the fore. Of these, we have been emphasizing the social abstractions. Close cousins of the social abstractions are the ethical and legal abstractions. These too are being recognized as increasingly important in developing agents that are not only sociable, but also well behaved.

### AN UPRIGHT AGENT

Traditional computing approaches to actions focus on their causes and effects. But with agents, we also need to distinguish between right and wrong, legal and illegal. We need to make this distinction as agent developers, and we might also want the agents to make the distinction. This is so they can be trusted to act according to a set of proscribed ethics and laws, thereby properly representing humans in contractual settings. With emerging applications in mind, we review some of the essential concepts of agent jurisprudence.

Let's begin with the simpler aspects of legal reasoning and leave the greater problems of ethics to a later column.

### AGENT CONTRACTS

A contract represents a legal relation among parties. Contracts can also exist among agents, as representatives of human actors. For simplicity, we consider contracts that involve no more than two agents, although some recent work treats more general settings.

Some of the most interesting legal ideas for agents originate from the work of the American jurist, Wesley Newcomb Hohfeld (1879–1918).<sup>1</sup> After analyzing the use of legal terms such as “right,” Hohfeld concluded that the legal meanings of the terms were not clear and proposed a number of specific definitions. Agent researchers, as well as philosophers, have recently begun to study Hohfeld's definitions.

An interesting characteristic of the now carefully defined legal terms is that they can be used to describe (legal) relations among agents. As a consequence, they provide inherently *multiagent* abstractions.

### TERMS TO CONTRACT BY

Each of Hohfeld's terms has an associated correlate term, which applies when the same relation is viewed from the perspective of the other agent. Some correlate terms are *claim* and *duty*, *privilege* and *exposure*, *power* and *liability*, and *immunity* and *disability*.

- A claim—what one agent can demand from another—is the most common kind of right. For example, an agent Alice who has rendered services to an agent Bob has a claim to be paid by Bob. Bob, in turn, has a duty to pay Alice.
- A privilege exists when one agent is free from the claims of another. In other words, it is the absence of a duty to refrain from a given act. For example, Alice has a privilege to read Bob's files if Alice has no duty not to do so. In this case, Bob has an exposure to Alice's reading his files.
- A power is the ability of an agent to force (if it so desires) the alteration of a legal relation between itself and another agent. For example, Alice's privilege to read Bob's files may have arisen because of an explicit assignment by Bob. That is, if Bob owns the files, he has the power to grant anyone a privilege to read them, but may or may not have the additional power to take away that privilege once granted.
 

The correlate of power is liability. Let's assume Bob has the power to take away the privilege to read his files. Then Alice is liable to Bob for losing that privilege. Notice that Alice is also liable for gaining a privilege, which only goes to show that the technical meaning of liability need not have the connotations of the informal meaning.
- An immunity is a freedom from the power of another agent. For example, if Bob owns some files, then Alice lacks the power to take away his privilege of reading them. Thus, by fact of ownership, Bob is immune to Alice's taking away his privilege. Correlatively, Alice has a disability to take away the privilege from Bob.

Hohfeld argued that the above selection of terms covers the legal concepts related to contracts and the rights and duties of individuals. We can use these concepts to establish the norms of agent societies, where the agents are aware of the different shades of each other's rights.

### **CONCEPTS IN ACTION**

Hohfeld's concepts can be used wherever the relationship among agents represents a contract. One major arena for applying these concepts is in defining and testing for the compliance requirements of the interactions among different agents. For example, we can say that an agent who offers to buy a product must pay the amount it originally offered unless the seller releases the offering agent from this duty.

If you're interested in reading more about research in this area, see Castelfranchi<sup>2</sup> and Krogh and Herrestad.<sup>3,4</sup> The articles further elaborate the above and related concepts in multiagent systems. In other work, Singh<sup>5</sup> has begun relating formalizations of the legal concepts to the more standard social concepts.

### **SYSTEMS OF THE BIMONTH**

Although we are not aware of any implemented system based on Hohfeld's concepts that is available over the web, there are some interesting expert systems and knowledge

bases that readers may try out. These are specialized to different domains.

Branting and Aha have developed a case-based reasoning system for legal reasoning, a demo of which can be viewed at <<http://meru.cs.uwyo.edu/~cable/>>

Wysh <<http://www.austlii.edu.au/austlii/wysh/>>, an experimental web-based shell available from the Australasian Legal Information Institute, helps a user create a legal knowledge base. Although not directly relevant to our discussion, it gives instances, e.g., <<http://www.austlii.edu.au/austlii/wysh/carers.html>>, of the kinds of legal rules agents would have to deal with.

If you discover any Web agents that perform legal reasoning, please let us know and we will check them out!

## REFERENCES

1. W.N. Hohfeld, *Fundamental Legal Conceptions as Applied in Judicial Reasoning and Other Legal Essays*, Yale Univ. Press, New Haven, Conn., 1919.
2. C. Castelfranchi, "Commitments: From Individual Intentions to Groups and Organizations," *Proc. Int'l Conf. on Multiagent Systems*, AAAI Press, 1995, pp. 41–48.
3. C. Krogh and H. Herrestad, "Getting Personal—Some Notes on the Relationship Between Personal and Impersonal Obligation," *Proc. Third Int'l Workshop on Deontic Logic in Computer Science (DEON)*, Springer-Verlag, Sesimbra, Portugal, 1996.
4. C. Krogh, "The Rights of Agents," in *Intelligent Agents II: Agent Theories, Architectures, and Languages*, M. Wooldridge et al., eds., Springer-Verlag, 1996, pp. 1–16.
5. M.P. Singh, "An Ontology for Commitments in Multiagent Systems: Toward a Unification of Normative Concepts," *Artificial Intelligence and Law J.*, 1998, in press. Draft available at <http://www.csc.ncsu.edu/faculty/mpsingh/papers/mas/ai+law-final.ps>.