1-1-1998

Anthropoid Agents

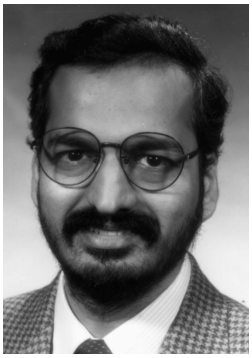
Michael N. Huhns
University of South Carolina - Columbia, huhns@sc.edu

Munindar P. Singh

Publication Info

Published in *IEEE Internet Computing*, Volume 2, Issue 1, 1998, pages 94-95.
http://ieeexplore.ieee.org/servlet/opac?punumber=4236

AGENTS ON THE WEB



ANTHROPOID AGENTS

Michael N. Huhns • *University of South Carolina* • *huhns@sc.edu*
Munindar P. Singh • *North Carolina State University* • *singh@ncsu.edu*

Until now, this column has focused on the suitability of agents for information applications. We have argued that communication and sociability are crucial facets of agents as they help find and manage information over networks. But another facet to agents is emerging—their ability to exhibit emotion.

In the study of agents, we often ascribe to them human qualities, such as beliefs and intentions. These qualities are best understood as metaphors that give developers a way to talk about and design the capabilities and applications of agents.

GETTING EMOTIONAL

Although beliefs and intentions are the main metaphors used by agent researchers, they are by no means the only human characteristics we can apply to agents. Emotion is another. Judging from its fundamental role in human interactions, emotion has powerful implications for agent technologies.

Emotional agents are also called "believable" agents—not to imply sincerity, but because they suggest a lifelike persona. We use the term "anthropoid" to refer to this class of agents.[1] Anthropoid agents can act whimsically, but that only makes them richer in character, somewhat like the interesting characters you might encounter in a Dickens novel. Agents can be nice, but they can also be unfriendly or just plain annoying (like the animated characters so many Microsoft customers turned off in their copies of Office 97).

Emotion often gets short shrift in our society, and is thought to have no place at all in science. Cognition (the act of thinking) is placed at odds with emotion. In fact, calling someone "emotional" usually has pejorative connotations. In computer science, rational agents are cognitive; emotional ones may be irrational.

SERVICE WITH A SMILE

So who needs emotion? Well . . . people do.

Despite all the progress in computing, users have been slow to accept the technology. They have often accepted what was thrown at them, but only under economic duress. Bringing the technology closer to their emotional needs might ease this resistance.

So how can we put a human face on computing? Maybe by putting an animated face on it! Thus, an interface may consist of an agent, which has an explicit presence (for example, as an on-screen animated figure) and appears to have a personality. In computer-human interfaces, especially for education and commerce where a large variety of people must deal with computers, an anthropoid agent might be more inviting. Depending on the situation, the agent might appear shy, friendly, stern, or knowledgeable. For example, people might better accept advice offered politely by a shy agent, or heed warnings uttered seriously by a stern agent. And they might be more likely to purchase goods or services offered by a friendly, knowledgeable agent that could appear empathetic to their needs.

A CAT WITH ATTITUDE

There are also applications of anthropoids enabled by the Web itself. One such application involved the agent *Julia*, who participated in chat rooms, providing directions to users and taking part in online discussions. Another is interactive theater, where the agents assume different roles in a play or story, guided by users at remote sites. Hayes-Roth and colleagues have developed such agents.[2] Humans give the agents general directions, and the agents improvise according to their own personal styles.

One of the earliest projects involving computational emotion was by Bates and associates, who added emotion as an explicit component of an agent architecture.[3] Their anthropoid cat illustrates the sophisticated behaviors possible. The cat has goals, such as to eat and to explore. It exhibits happiness and sadness when a goal succeeds or fails, with the degree of happiness or sadness depending on the importance of the goal. When it appears that a goal might succeed or fail imminently, the cat will begin to show hope or fear. Pride, shame, reproach, and admiration arise when an action is approved or disapproved by another agent. If another agent shoves the cat from a chair, sadness results from the failure of a relaxation goal, and reproach arises toward the miscreant. The combination of sadness and reproach leads to anger. Similarly, gratitude is a composite of happiness and admiration.

AGENTS IN TRAINING

Anthropoids are important in simulation environments. Simulators now constitute the primary training ground for airline pilots, harbor pilots, nuclear power-plant controllers, and some soldiers. These virtual environments are typically safer and less expensive than

real-world environments, and enable a wider range of training scenarios. However, many scenarios involve other people, such as in traffic simulations, and the training is much more effective if the agents adopting the roles of those people are believable.[4]

Cassell and associates show how an agent can combine a number of interaction modalities, such as speech, facial expressions, and gestures.[5] The challenge they address is how to synchronize these modalities both temporally and conceptually. Stone and Lester report on another implementation, *Herman the Bug*, an animated insect for teaching plant biology to students in grade school.[6] Their work combines ideas from knowledge-based tutoring with agent technology.

ANTHROPOIDS IN THE "REAL" VIRTUAL WORLD

Most current anthropoid agents have been implemented via creative but ad hoc approaches. A major challenge is the development of toolkits and methodologies through which anthropoid agents can be engineered in large, practical applications.

Other challenges include proving that these anthropoid agents are in fact useful, and identifying the types of applications that can most benefit from their use. Among other criticisms, Shneiderman[7] notes that once their novelty has worn off, the animated characters may not be any more appealing than other user interfaces.

SYSTEMS OF THE BIMONTH

Some implemented prototypes for the above projects are available via the Web and for use over the Web. These include Extempo's Web-situated virtual bar, based on the work by Hayes-Roth et al.,[2] available at http://www.extempo.com/webBar/. Another is Virtual Personalities by Michael Mauldin, available at http://www.vperson.com/.

The German Research Center for Artificial Intelligence (DFKI) has developed the Personalized Plan-Based Presenter (PPP) Persona, which is prototyped for various kinds of training and marketing purposes. This is available at http://www.dfki.unisb.de/~jmueller/ppp/persona/index.html.

Check them out! ■

REFERENCES

1. M.N. Huhns and M.P. Singh, eds., *Readings in Agents*, Morgan Kaufmann, San Francisco, 1997.
2. B. Hayes-Roth, L. Brownston, and R. van Gent, "Multiagent Collaboration in Directed Improvisation," In *Readings in Agents*, M.N. Huhns and M.P. Singh, eds., Morgan Kaufmann, San Francisco, 1997, pp. 141–147. Reprinted from *Proc. Int'l Conf. on Multiagent Systems*, 1995.
3. J. Bates, A.B. Loyall, and W.S. Reilly, "An Architecture for Action, Emotion, and Social Behavior," In *Readings in Agents*, M.N. Huhns and M.P. Singh, eds., Morgan Kaufmann, San Francisco, 1997, pp. 225–231. Reprinted from *Artificial Social Systems: Proc. Fourth European Workshop on Modeling Autonomous Agents in a Multi-Agent World*, 1994.
4. M. Tambe et al., "Intelligent Agents for Interactive Simulation Environments," *AI Magazine*, Vol. 16, No. 1, Spring 1995, pp. 15–39.
5. J. Cassell et al., "Animated Conversation: Rule-Based Generation of Facial Expressions, Gesture, and Spoken Intonation for Multiple Conversational Agents," In *Readings in Agents*, M.N. Huhns and M.P. Singh, eds., Morgan Kaufmann, San Francisco, 1997, pp. 148–155. Reprinted from *Proc. ACM SIGGRAPH Conf.*, 1994.
6. B.A. Stone and J.C. Lester, "Dynamically Sequencing an Animated Pedagogical Agent," In *Readings in Agents*, M.N. Huhns and M.P. Singh, eds., Morgan Kaufmann, San Francisco, 1997, pp. 156–163. Reprinted from *Proc. Nat'l Conf. on Artificial Intelligence*, 1996.
7. B. Shneiderman, "Looking for the Bright Side of User Interface Agents," *ACM Interactions*, Vol. 2, No. 1, Jan. 1995, pp. 13–15.

IEEE INTERNET COMPUTING

Editorial: ***IEEE Internet Computing*** **targets the technical and scientific Internet user communities as well as designers and developers of Internet-based applications and enabling technologies. Instructions to authors are online at http://computer.org/internet/. Articles are peer-reviewed for technical merit and copyedited for clarity, style, and space. Unless otherwise stated, bylined articles and departments, as well as product and service descriptions, reflect the author's or firm's opinion; inclusion in this publication does not necessarily constitute endorsement by the IEEE or the IEEE Computer Society.**

Circulation: ***IEEE Internet Computing*** **(ISSN 1089-7801) is published bimonthly by the IEEE Computer Society. IEEE headquarters: 345 East 47th St., New York, NY 10017-2394. IEEE Computer Society headquarters: 1730 Massachusetts Ave., Washington, DC 20036-1903. IEEE Computer Society Publications Office: 10662 Los Vaqueros Circle, PO Box 3014, Los Alamitos, CA 90720; (714) 821-8380; fax (714) 821-4010. Annual subscription: $28 in addition to any IEEE Computer Society dues, $33 in addition to any IEEE dues; $58 for members of other technical organizations. Nonmember subscription rates are available on request. Back issues: $10 for members, $20 for nonmembers. This magazine is also available on microfiche.**

Postmaster: **Send undelivered copies and address changes to *IEEE Internet Computing*, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08855. Periodicals postage paid at New York, NY, and at additional mailing offices. Canadian GST #125634188. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement #1008870. Printed in USA.**