# Intelligent Software Agents vs. User-Controlled Direct Manipulation: A Debate

**Pattie Maes**
MIT Media Laboratory
20 Ames Street
Cambridge, MA 02139 U.S.A.
+1-617-253-7442
pattie@media.mit.edu

**Ben Shneiderman**
Human Computer Interaction Laboratory
Department of Computer Science
University of Maryland
College Park, MD 20742
+1-301-405-2680
ben@cs.umd.edu

**Jim Miller,** Moderator
Apple Research Laboratories
Apple Computer
1 Infinite Loop, MS 301-3S
Cupertino, CA 95014 USA
+1-408-862-5546
jmiller@apple.com

**ABSTRACT**
Critical issues in human-computer interaction – in particular, the advantages and disadvantages of intelligent agents and direct manipulation – will be discussed, debated, and hotly contested. The intent of the participants is to strike an appropriate balance between a serious discussion of the issues and an entertaining debate.

**Keywords**
agents, direct manipulation, intelligent interfaces, graphical representation

## INTRODUCTION

We all could use a little help. In the last ten years we have undeniably made progress in understanding the sort of capabilities necessary to provide intelligent assistance to computer users, but questions remain whether we are "climbing a ladder to get to the moon" or on the brink of bringing together all the components of a breakthrough in intelligent software agents.

At the same time, advocates of direct manipulation and information visualization promise to bring greater comprehensibility, predictability, and control to advanced interfaces. Is direct manipulation already stretched to its limits or can users be served best with direct manipulation programming, control panels, dynamic queries, and other visual tools?

So what will it be? In this debate, different views of our progress and prospects are presented by a leading cast of characters:

- **Pattie Maes**, MIT Media Laboratory
- **Ben Shneiderman**, University of Maryland

---



## THE POSITIONS:

### FOR INTELLIGENT AGENTS: PATTIE MAES, MIT MEDIA LABORATORY

Computers are as ubiquitous as automobiles and toasters, but exploiting their capabilities still seems to require the training of a supersonic test pilot. VCR displays blinking a constant 12 noon around the world testify to this conundrum. As interactive television, palmtop diaries and "smart" credit cards proliferate, the gap between millions of untrained users and an equal number of sophisticated microprocessors will become even more sharply apparent. With people spending a growing proportion of their lives in front of computer screens--informing and entertaining one another, exchanging correspondence, working, shopping and falling in love--some accommodation must be found between limited human attention spans and increasingly complex collections of software and data.

Computers currently respond only to what interface designers call direct manipulation. Nothing happens unless a person gives commands from a keyboard, mouse or touch screen. The computer is merely a passive entity waiting to execute specific, highly detailed instructions; it provides little help for complex tasks or for carrying out actions (such as searches for information) that may take an indefinite time.

If untrained consumers are to employ future computers and networks effectively, direct manipulation will have to give way to some form of delegation. Researchers and software companies have set high hopes on so-called software agents, which "know" users' interests and can act autonomously on their behalf. Instead of exercising complete control (and taking responsibility for every move the computer makes), people will be engaged in a cooperative process in which both human and computer agents initiate communication, monitor events and perform tasks to meet a user's goals.

The widespread dissemination of agents will have enormous social, economic and political impact. Agents will bring about a social revolution: almost anyone will have access to the kind of support staff that today is the mark of a few privileged people. As a result, they will be able to digest large amounts of information and engage in

several different activities at once. The ultimate ramifications of this change are impossible to predict.

### FOR USER-CONTROLLED DIRECT MANIPULATION: BEN SHNIDERMAN, UNIVERSITY OF MARYLAND

Direct manipulation user interfaces have proven their worth over two decades, but they are still in their youth. Dramatic opportunities exist to develop direct manipulation programming to create end-user programming tools, dynamic queries to perform information search in large databases, and information visualization to support network database browsing. Direct manipulation depends on visual representation of the objects and actions of interest, physical actions or pointing instead of complex syntax, and rapid incremental reversible operations whose effect on the object of interest is immediately visible. This strategy can lead to user interfaces that are comprehensible, predictable and controllable.

Direct manipulation programming is an alternative to the agent scenarios. Agent promoters believe that the computer can automatically ascertain the users' intentions or take action based on a vague statements of goals. I am skeptical that user intentions are so easily determined or that vague statements are usually effective. However, if users can specify what they want with comprehensible actions selected from a visual display, then they can more often and more rapidly accomplish their goals while preserving their sense of control and accomplishment.

The agent metaphor is based on the design philosophy that assumes users would be attracted to "autonomous, adaptive, intelligent" systems. Designers believe that they are creating something lifelike and smart, however users may feel anxious and unable to control these systems. Success stories for advocates of adaptive systems include a few training and help systems that have been extensively studied and carefully refined to give users appropriate feedback for the errors that they make. Generalizing from these systems has proven to be more difficult than advocates hoped.

The philosophical contrast is with "user-control, responsibility, and accomplishment" Designers who emphasize a direct manipulation style believe that users have a strong desire to be in control and to gain mastery over the system. Then users can accept responsibility for their actions and derive feelings of accomplishment.

Direct manipulation and its descendants are thriving. Visual overviews accompanied by user interfaces that permit zooming, filtering, extraction, viewing relations, history keeping, and details-on-demand can provide users with appealing and powerful environments to accomplish their tasks. I believe that most users want comprehensible, predictable and controllable interfaces that give them the feeling of accomplishment and responsibility.