Tutorial for November 10/14

Look at the two pages that follow, "Intelligence" and "Uncommon Sense".

These pages are taken from Marvin Minsky's book "The Society of Mind", [Minsky, 1985, pp 71,72]. The book is made up of many small essays like the two here. Minsky claims that the ideas he presents are "only common sense, yet when we join enough of *them* we can explain the strangest mysteries of the mind."

For both of the pages, do the following.

1. Pick out the important points made in the essay, and arrange them to show the shape of the argument; that is, classify the points as:

   (a) Questions;

   (b) Assertions without support;

   (c) Assertions with supporting argument (saying where).

   You should also show where assertions are given as possible answers to questions or problems set, and where they argue against previous assertions. The first page uses the idea of a dialogue presenting two sides of an argument, and you analysis should reflect this.

2. Pick out any words whose meaning is at issue in the essay. That is, for which words does Minsky want to fix a meaning or use that might be in dispute, compared to those for which he assumes we have an agreed understanding?

   Why can we not simply use the definition of the words that we find in a dictionary?

3. Evaluate the argument:

   (a) How clear is it?

   (b) How convincing is it?

Intelligence

Many people insist on having some definition of "intelligence".

> *CRITIC: How can we be sure that things like plants and stones, or storms and streams, are not intelligent in ways that we have not yet conceived?*

It doesn't seem a good idea to use the same word for different things, unless one has in mind important ways in which they are the same. Plants and streams don't seem very good at solving the kinds of problems we regard as needing intelligence.

> *CRITIC: What's so special about solving problems? And why don't you define "intelligence" precisely, so that we can agree on what we're discussing?*

That isn't a good idea, either. An author's job is using words the ways other people do, not telling others how to use them. In the few places the word "intelligence" appears in this book, it merely means what people usually mean—the ability to solve hard problems.

> *CRITIC: Then you should define what you mean by a "hard" problem. We know it took a lot of human intelligence to build the pyramids—yet little coral reef animals build impressive structures on even larger scales. So don't you have to consider them intelligent? Isn't it hard to build gigantic coral reefs?*

Yes, but it is only an illusion that animals can "solve" those problems! No individual bird *discovers* a way to fly. Instead, each bird exploits a solution that evolved from countless reptile years of evolution. Similarly, though a person might find it very hard to design an oriole's nest, or a beaver's dam, no oriole or beaver ever figures out such things at all. Those animals don't "solve" such problems themselves; they only exploit procedures available within their complicated gene-built brains.

> *CRITIC: Then wouldn't you be forced to say that evolution itself must be intelligent, since it solved those problems of flying and building reefs and nests?*

No, because people also use the word "intelligence" to emphasize swiftness and efficiency. Evolution's time rate is so slow that we don't see it as intelligent, even though it finally produces wonderful things that we ourselves cannot yet make. Anyway, it isn't wise to treat an old, vague word like "intelligence" as though it must define any definite thing. Instead of trying to say what such a word "means," it is better simply to try to explain how we use it.

> *Our minds contain processes that enable us to solve problems we consider difficult. "Intelligence" is our name for whichever of these processes we don't yet understand.*

Some people dislike this "definition" because its meaning is doomed to keep changing as we learn more about psychology. But in my view that's exactly how it ought to be, because the very concept of intelligence is like a stage magician's trick. Like the concept of "the unexplored regions of Africa," it disappears as soon as we discover it.

Uncommon Sense

We've all heard jokes about how stupid present-day computers are. They send us bills and checks for zero dollars and zero cents. They don't mind working in endless loops, repeating the same thing a billion times. Their total lack of common sense is another reason people think that no machine could have a mind.

It is interesting to note that some of the earliest computer programs excelled at what people consider to be "expert" skills. A 1956 program solved hard problems in mathematical logic, and a 1961 program solved college-level problems in calculus. Yet not until the 1970s could we construct robot programs that could see and move well enough to arrange children's building blocks into simple towers and playhouses. Why could we make programs do grown-up things before we could make them do childish things? The answer may seem paradoxical: much of "expert" thinking is actually simpler than what is involved when ordinary children play! Why is it easier to program what experts do than what children do?

What people vaguely call common sense is actually more intricate than most of the technical expertise we admire. Neither that "expert" program for logic nor the one for calculus embodied more than a hundred or so "facts"—and most of them were rather similar to one another. Yet these were enough to solve college-level problems. In contrast, think of all the different *kinds* of things a child must know merely to build a house of blocks—a process that involves knowledge of shape and colors, space and time, support and balance, and an ability to keep track of what one is doing.

> *To be considered an "expert", one needs a large amount of knowledge of only a relatively few varieties. In contrast, an ordinary person's "common sense" involves a much larger variety of* ***types*** *of knowledge—and this requires more complicated management systems.*

There is a simple reason why it is easier to acquire specialized knowledge than commonsense knowledge. Each type of knowledge needs some form of "representation" and a body of skills adapted to using that style of representation. Once that investment has been made, it is relatively easy for a specialist to accumulate further knowledge, provided the additional expertise is uniform enough to suit the same style of representation. A lawyer, doctor, architect, or composer who has learned to deal with a range of cases in some particular field finds it relatively easy to acquire more knowledge of a similar character. Think how much longer it would take a single person to learn to deal competently with a few diseases *and* several kinds of law cases *and* a small variety of architectural blueprints *and* a few orchestral scores. The greater variety of representations would make it much harder to acquire the "same amount" of knowledge. For each new domain, our novice would have to learn another type of representation and new skills for using it. It would be like learning many languages, each with its own grammar, lexicon and idioms. When seen this way, what children do seems all the more remarkable, since so many of their actions are based upon their own inventions and discoveries.

References

[Minsky, 1985] M. Minsky. *The Society of Mind.* Simon and Schuster, NY, 1985.