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Defining Patentable Subject Matter -
Software and Silicon Life Forms

by Robert Gunderman, PE and John Hammond, PE

What is Patentable?

Inventions come in all shapes and sizes. Some can be dropped on a table and looked at, while others cannot be seen at all. These "invisible inventions" are often software programs, or are too small to see (as in the case of nanotechnology and microelectronics). With many "invisible inventions" comes the question – "is it patentable?"

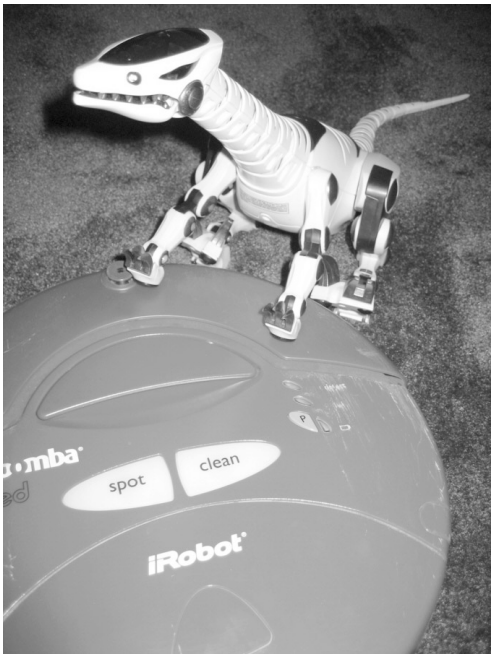
The patent statutes are contained in Title 35 of the United States Code. 35 U.S.C. 101 defines what is patentable by stating that, "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." It sounds simple enough… but this leading statute has been the subject of many arguments and lawsuits.

Key requirements for patentability are "newness", referred to in the law as novelty (35 U.S.C. 102), unobviousness (35 U.S.C. 103), and the applicant's detailed written description of the invention (35 U.S.C. 112). These topics, especially the subjective topic of obviousness, have been the substance of many recent high visibility lawsuits. But what about the most fundamental of questions- what is patentable?

For an invention to be patentable, it has to be useful, and it must fall within at least one of the four categories of patentable subject matter (process, machine, manufacture, or composition of matter). Historically, patentable subject matter has been the topic of much controversy.

Software Patents

Consider software patents as an example. Is software patentable subject matter in the U.S. or abroad? Let's look at the U.S. first. If an invention contains patentable subject matter, it is considered "statutory". In the United States, non-statutory subject matter, things that are NOT patentable, include abstract ideas, laws of nature,



and natural phenomena. In addition, mathematical operations without some claimed practical application, or a manipulation of an abstract idea without some claimed practical application are NOT patentable. So mathematical algorithms (possibly expressed in a software program) without utility are not patentable. However, when the invention results in a physical transformation outside the computer and has a practical application, it becomes patentable subject matter under 35 U.S.C. 101. So a useful machine or manufacture that is a combination of hardware and software is considered patentable subject matter.

To be patentable in the U.S, the software must produce a useful, concrete and tangible result. What about descriptive material such as data structures? The data structure itself is non-statutory, but when it is recorded on a computer readable medium and becomes structurally and functionally interrelated to the medium, it becomes functional, and hence statutory. If an invention meets certain "safe harbors" as defined by the U.S. Patent Office, it is statutory. If a process requires physical acts to be performed outside the computer independent of and following the steps to be performed by the programmed computer, or the process requires the measurements of physical objects or activities to be transformed outside the computer into computer data, it meets the safe harbor requirements.

In Europe, the European Patent Convention (EPC) does not regard methods for doing business, mathematical methods, presentations of information and programs for computers as inventions. It does, however, consider inventions of a technical character that relate to a technical field that are concerned with a technical problem and have technical features to be patentable subject matter. This includes products or methods of a technical character even if the claimed subject matter defines or at least involves a business method

or computer program. In Japan, computer programs and business methods are patentable provided that they are considered to be technical instead of merely abstract ideas. In a number of other countries, computer programs and business methods are not yet patentable.

Life Forms

As we continue to develop and advance in the 21st century, things that may not have been useful yesterday may have tremendous utility today. An example of this is silicon. Silicon was first identified by Antoine Lavoisier in 1787. Subsequently, in 1824, Jöns Jakob Berzelius prepared amorphous silicon and later purified it. Was this useful at the time? Could Lavoisier or Berzelius have dreamt of what tremendous utility silicon would have in the future? And what if, like some science fiction novels, silicon-based life exists or can be created in a lab? What if computational wizardry evolves into a life form? Would it be patentable?

Thomas Jefferson, author of the original Patent Act of 1793, could not have anticipated that life forms would become the subject of patent applications. An 1889 tenet helped to keep life forms out of the patent office. This tenet basically stated that you can't patent the trees of the forest or the plants of the earth.

Then, in 1930, the Plant Patent Act changed this by allowing new varieties of plants that are asexually reproduced to be patented. The distinction being that these plants were no longer products of nature, but of plant breeders.

Life forms other than plants did not surface in the patent field until 1972, in the famous case of *Diamond v. Chakrabarty,* Anand Chakrabarty, a biochemist at General Electric, developed a genetically modified bacterium in the early 1970s that could break crude oil down into harmless byproducts. The bacterium was thus developed by the action of man, not by nature. In June of 1972, Chakrabarty applied for a patent on his invention. The Patent Office rejected his application under 35 U.S.C. 101, on the grounds that the subject matter was non-statutory. Chakrabarty appealed and took his case all the way to the supreme court, who ultimately ruled in favor of Chakrabarty. One key point cited by the Court was that, "His claim is not to a hitherto unknown natural phenomenon, but to a nonnaturally occurring manufacture or composition of matter – a product of human ingenuity…" On March 31, 1981, U.S. patent 4,259,444 issued to Chakrabarty and his assignee, General Electric.

The first patent on a living animal came in April of 1988. Researchers at Harvard Medical school in the early 1980's produced a genetically modified mouse that was highly susceptible to cancer by introducing an oncogene that can trigger the growth of tumors. The *oncomouse* was valuable in cancer research, and Harvard sought patent protection for it. In the United States, patent 4,736,866 was granted, but during the prosecution of the case, the patenting of humans was specifically excluded. In Canada, the patent application was rejected because higher life forms were not considered patentable. The European Patent Office, after much deliberation and concern that the exploitation of an animal is contrary to morality (and thus not patentable), decided that the medical benefits outweighed moral concerns over suffering of the animal.

In the last decade, there has been a flurry of activity to patent genes without knowing what they do or produce. There have been many scientific and moral objections to these patenting efforts, but also concerns that the U.S. could lose a global competitive economic advantage if we fail to patent. As lifeforms continue to enter the field of patent law, so do ethics and morality, making patent law all the more complex as time goes on.

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So what if, at some point in the future, life forms and non-living things merge? What if machines become conscious or humans become part biological and part digital? What if the silicon identified by Lavoisier in 1787 is fabricated into a silicon humanoid in the 21st century like some bad sci-fi flick. Will any of this be patentable? Will the laws change to deal with new technical breakthroughs? The answer is certainly yes, but with morality and ethics entering the fray, you can bet the changes will be difficult and complex. ❑

Authors Robert D. Gunderman P.E. (Patent Technologies, LLC www.patentechnologies.com) and John M. Hammond P.E. (Patent Innovations, LLC www.patent-innovations.com) are both registered patent agents and licensed professional engineers. They offer several courses that qualify for PDH credits. More information can be found at www.patenteducation.com.

We would also like to thank our RoboReptile for posing with the Roomba robotic vacuum cleaner we use to clean our offices.

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