An Overview of Robotics

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Precursor To The Science

* In the early 19th century, people already began to think about the relationship between machine and man.

* Writers, for instance, envisioned the creation of technology that could be used to fashion robots.

* For instance, Mary Shelley concocted the story of *Frankenstein* in 1818, a novel about the misguided ambition of Dr. Frankenstein to create life.

- Mary Shelley's *Frankenstein*

- Notice the emphasis on the lack of human qualities that Dr. Frankenstein places on his monster.
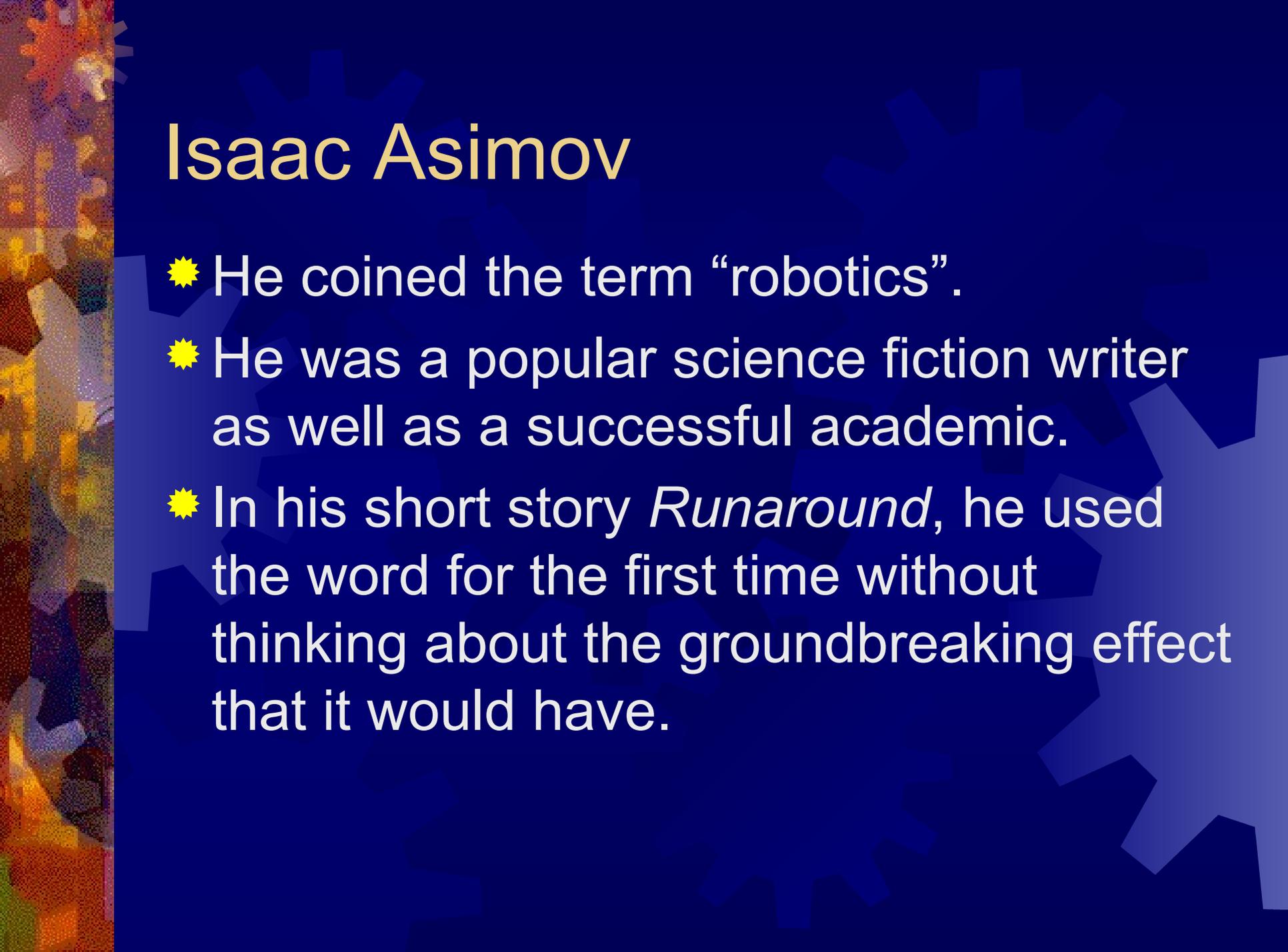
Isaac Asimov

* He coined the term "robotics".

* He was a popular science fiction writer as well as a successful academic.

* In his short story *Runaround*, he used the word for the first time without thinking about the groundbreaking effect that it would have.

Asimov's Three Laws of Robotics

* In his science fiction world, Asimov had three rules that all his robots would follow:

* A robot may not injure a human being, or, through inaction, allow a human being to come to harm.

* A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

* A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

* In essence, it is obvious that Asimov places robots strictly below humans.

So, what exactly is a robot?...

- ☀ There is no precise definition, but it is generally believed that robots are programmable machines that imitate human behavior.

- ☀ It needs to be able to sense and understand its environment as well as be able to perform physical tasks.

- ☀ They are generally acknowledged to do dangerous and trite work. It is not surprising that the origin of the word "robot" goes back to its root meaning of "slave."
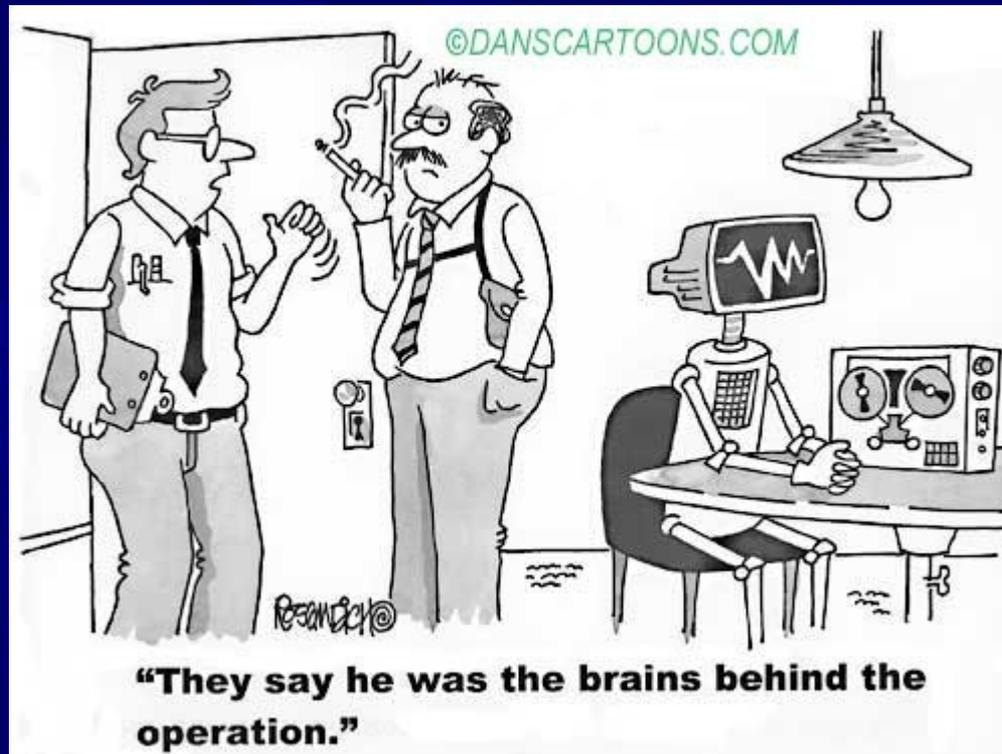
www.danscartoons.com/robot-cartoons.htm

The Anatomy of a Robot

* Although the physical appearances of robots vary, there are general names for their structures.

* A kinematic chain is what their "skeleton" is called. Its "bones" are called actuators and create joints that allow the robot to move.

* The actuators create motion from electricity by the electromagnetic effect.

* As it was mentioned, robots are built to perform physical tasks so they need some kind of end effector (something like a human arm) to control their surroundings.

Robotic Paradigm

- This just describes the way that a robot senses and processes its surroundings.
- There are 3 phases of this paradigm: [1] perception [2] processing [3] action.
- In the hierarchical paradigm, the robot first senses its environment, plans on a course of action, and then executes it.

What do they do?

* Like I said before, slave labor!!
* 90% of robots work in factories.
* And over half of that number work in making cars. It is a heavily automated industry.
* Humans mostly just supervise these robots.
* They also do mundane tasks that are repetitive like filling up a candy box with chocolate.
* In addition, robots are made to do dangerous jobs like disposing of bombs and working in unsafe, heavily polluted environments.

Don't Robots Get To Have A Good Time, Too??!!

* Robots are not just constructed to do work all the time. There are roboticists who create robots for fun competitions.
* *Robot Wars* is a game in which robots fight each other until the death while spectators look on.
* In the Tech Challenge, students design creative robotic solutions to problems—a new challenge is issued each year.
* *RoboCup*—A soccer tournament composed of robots!!
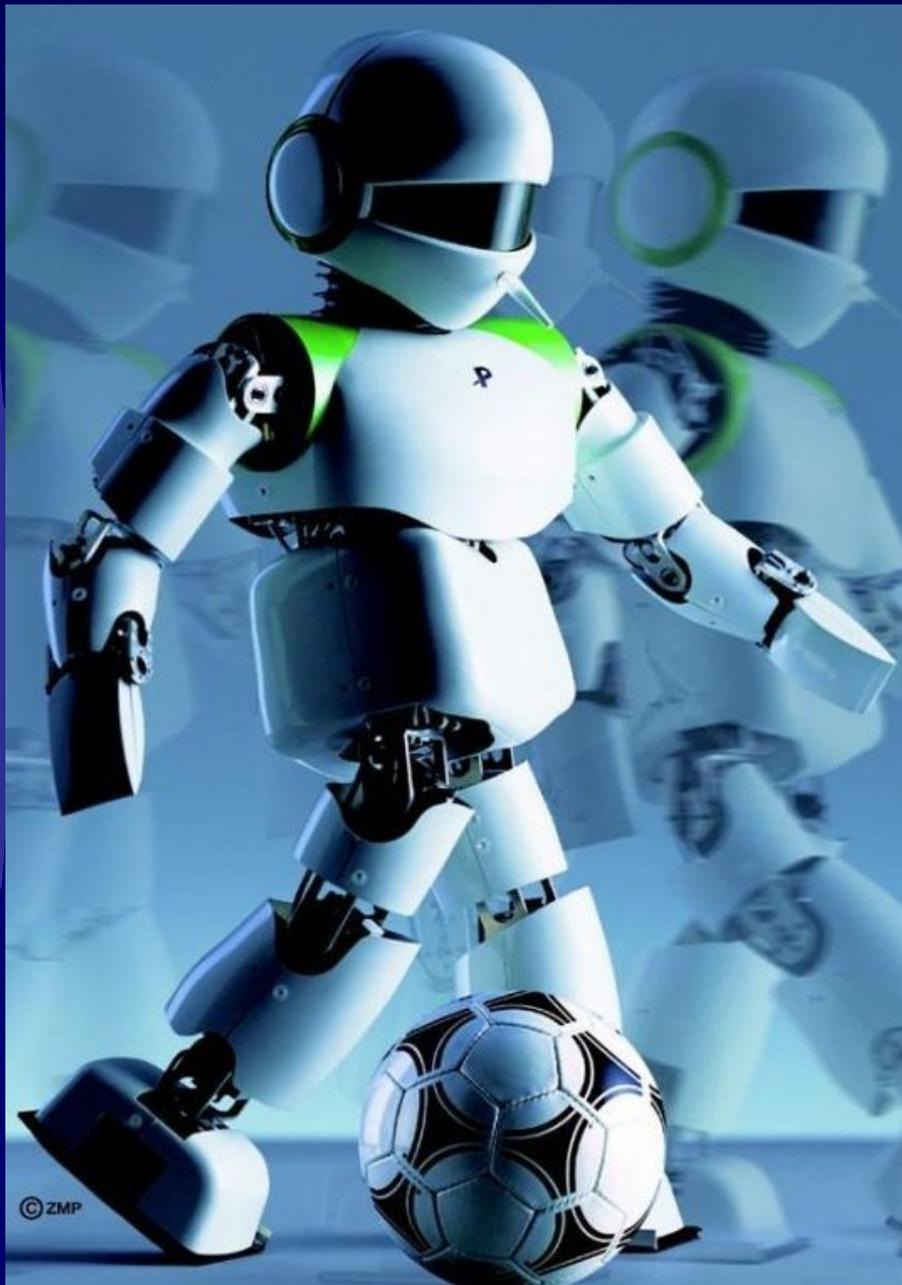
RobotatPlay.
Robocup.

Do Robots See, hear, smell?

- ✸ Robots have to understand their environment in order to do their jobs, so how do they sense it?

- ✸ They basically "mimic" our senses, using sensors.

- ✸ In general, a sensor measures an aspect of the environment and produces a proportional electric signal.

- ✸ Roboticists have had trouble giving robots "vision" because of the complexity of the operations, but for those "blind robots", touch sensors are used.

Artificial Intelligence in Robots

* Robots are programmed to do their jobs. The AI in their systems is rule-based.

* Vast amounts of information can be programmed into the robotic "brain".

* But, they're not that useful because they can't learn. Everything that they know has to be preprogrammed.

* But, another method besides the rule-based programming has been developed:neural networks.

* Neural networks are based on the human brain and allow the robot to "learn" by associating inputs with the corresponding output.

AI (cont'd)

* But, neural networks don't exactly give definite answers. This is sometimes called "fuzzy logic".

* A newer form of AI in robots is the stimulus-response mechanism. A robot with this type of AI does not have memory nor does it have a logical decision making process.

* It only has hard-wired responses to stimulation. This type of AI can lead to fairly complex behavior in robots.

The Blurring of Lines?

✺ It seems that robots are becoming more and more refined in terms of their intellectual capabilities, yet it is evident that there has not been a robot produced that has the human range of emotions, personality, and thought processes.

✺ Should this happen, then what would define humans as humans and robots as robots?

✺ At the beginning, robots were obviously below humans and made to perform programmed tasks. Now, it appears that there is a growing curiosity about the limits and possibilities of AI.

Sources

- http://en.wikipedia.org/wiki/Robotics
- http://www.thetech.org/robotics/index.htr
- http://en.wikipedia.org/wiki/Isaac_Asimo\