An Overview of Robotics

By: Shirley Lung
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.”
“They say he was the brains behind the operation.”
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!!
Robot at Play.
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