Introduction

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What is HRI?

Human-Robot Interaction (HRI) is a new and emerging field drawing inspirations from different areas such as: AI, Cognitive Psychology, HCI, Robotics etc.

Interactions between humans and robots are inherently present in all of robotics, even for so called autonomous robots — after all, robots are still used by and are doing work for humans. As a result, evaluating the capabilities of humans and robots, and designing the technologies and training that produce desirable interactions are essential components of HRI

HRI can also be defined as a field of study dedicated to understanding, designing, and evaluating robotic systems for use by or with humans.

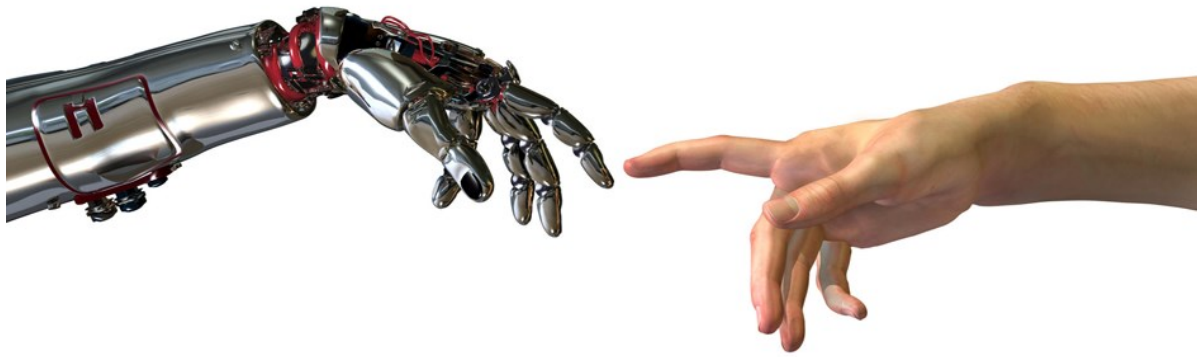
What is HRI?

HRI is the field dedicated to understanding, evaluating, and designing robotics for use with humans

Interaction – Refers to communication between robots and humans

This can be separated into two distinct categories:

1) Remote – Human and robot are not co-located
2) Proximate – Human and robot are co-located



Example Applications of Categories

Remote + Mobility = teleoperation or supervisory control

Remote + Manipulation = telemanipulation

Proximate + Mobile = Mobile assistant

Proximate + Manipulation = collaborative robot

Proximate + Social = Social, emotive, or cognitive

Social interactions are never or rarely ever Remote

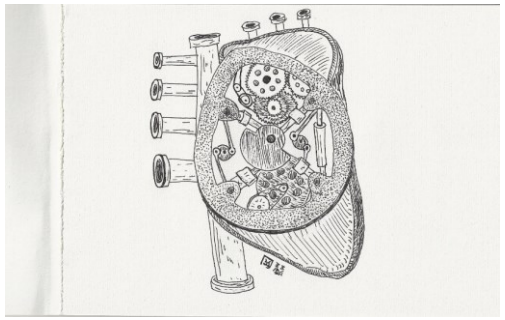
HCI vs HRI?

- Human computer interaction(HCI) is focused on interface design between computers and humans.
- HRI is dedicated to understand or define interactions between robots and humans.
- Due to lot of similarities between the two fields HRI can also be argued to be a subset of HCI as robots are also computing systems.
- At the same time, robots involve complex control systems which set them apart from HCI.
  - Due to physical embodiment to interact and move in the real-world robots raise significantly greater safety concerns.
  - Another important challenge with HRI is the relative expectation from robotics.
  - Uncertainty and environmental noise

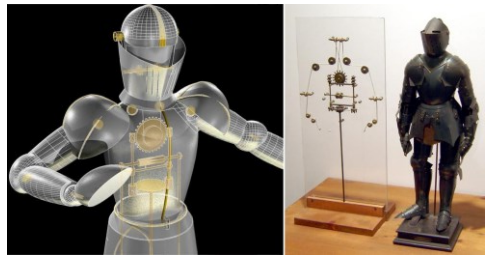
History: Robotics & HRI

Hebrew folklore has discussed “artificial” beings called golems

Ancient legends about West Zhou Dynasty (1006BC – 771BC) described a humanoid. When it winked at the concubines it had to be dismantled to prove that it was just a machine.

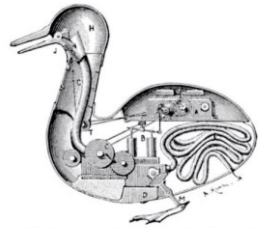


Leonardo da Vinci sketched his first mechanical man in 1495. These are often differentiated as “automata”



History: Robotics & HRI

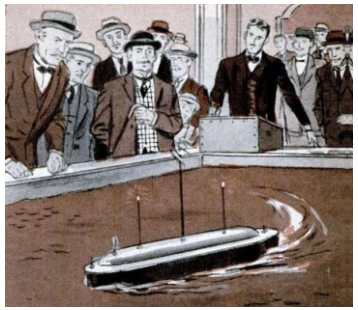
Vaucanson's mechanical duck was revealed 1739.



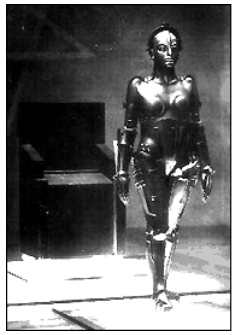
INTERIOR OF VAUCANSON'S AUTOMATIC DUCK.

A, clockwork; *B*, pump; *C*, mill for grinding grain; *F*, intestinal tube; *J*, bill; *H*, head; *M*, feet.

1898 Nicola Tesla showed a remotely operated (RC) boat. He envisioned robots doing work of the human race.

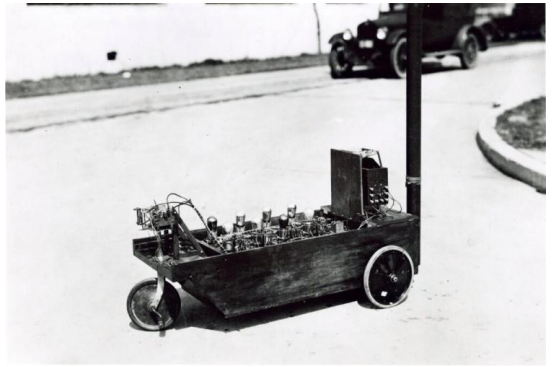


Word 'Robot' originates from Czechoslovakian word robota meaning work. It was first used in the 1920 play "Rossum's Universal Robots" by Karel Chapek



History: Robotics & HRI

1923 Naval research lab created the ‘Electric Dog’ to remotely pilot bombers during World War II



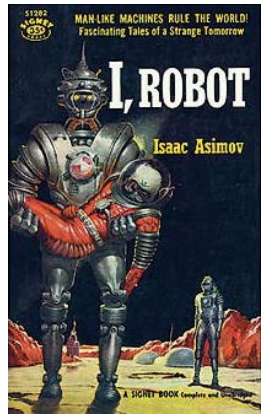
Unmanned underwater vehicles have been successful in finding lost ships, explore underwater life and assist in underwater construction and geothermal activity.

Isaac Asimov's Three Laws of Robotics introduced in 1950 “I, Robot”

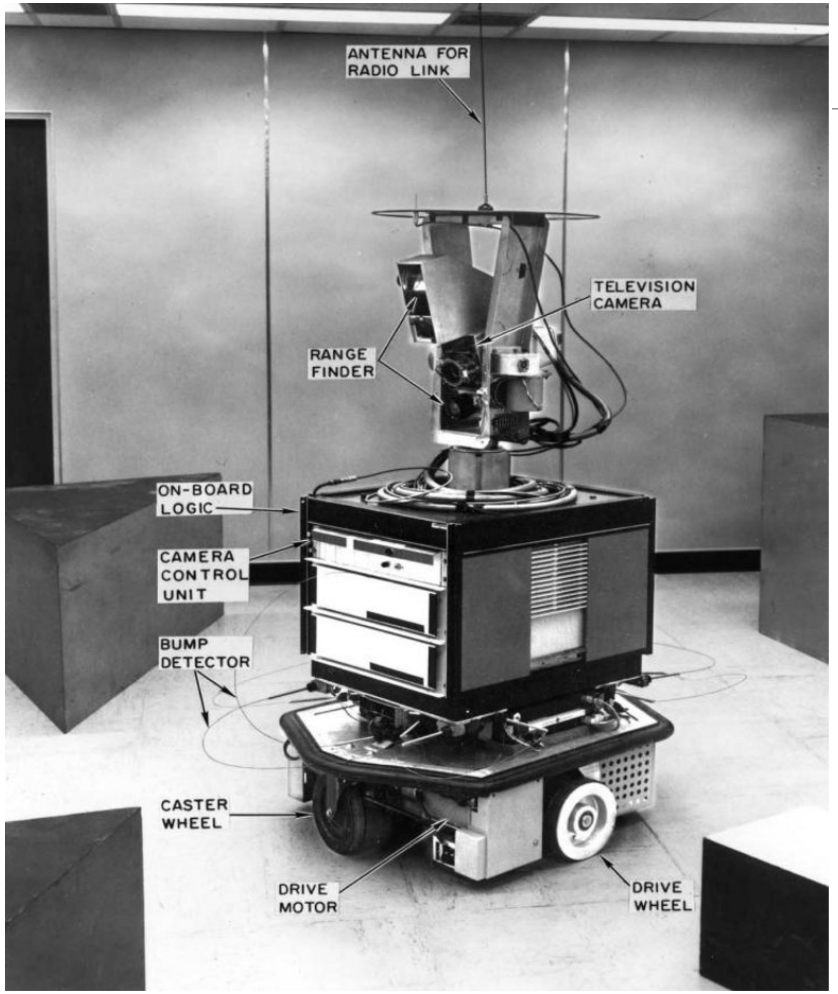
1) A robot may not injure a human being or, through inaction, allow a human being to come to harm.

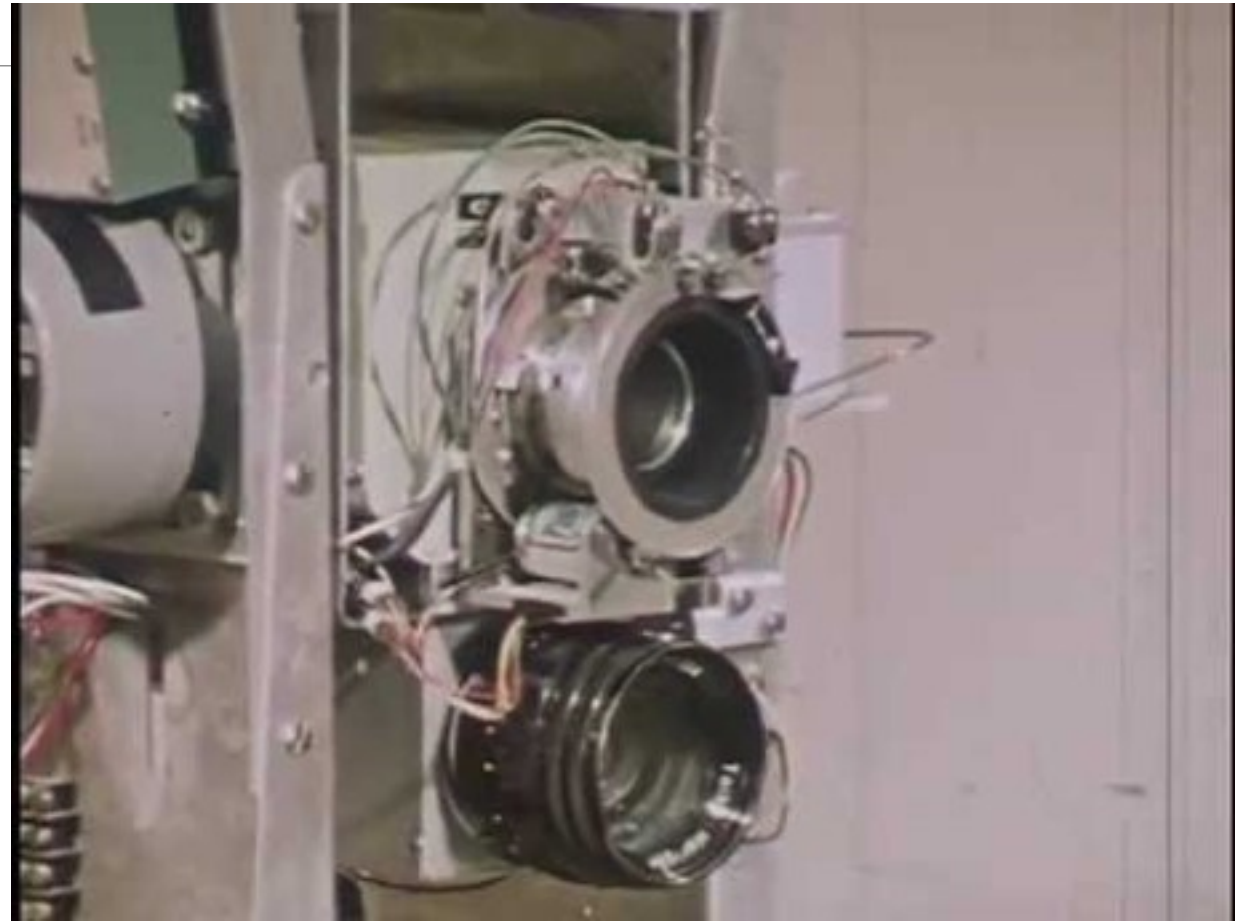
2) A robot must obey orders given it by human beings except where such orders would conflict with the First Law.

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

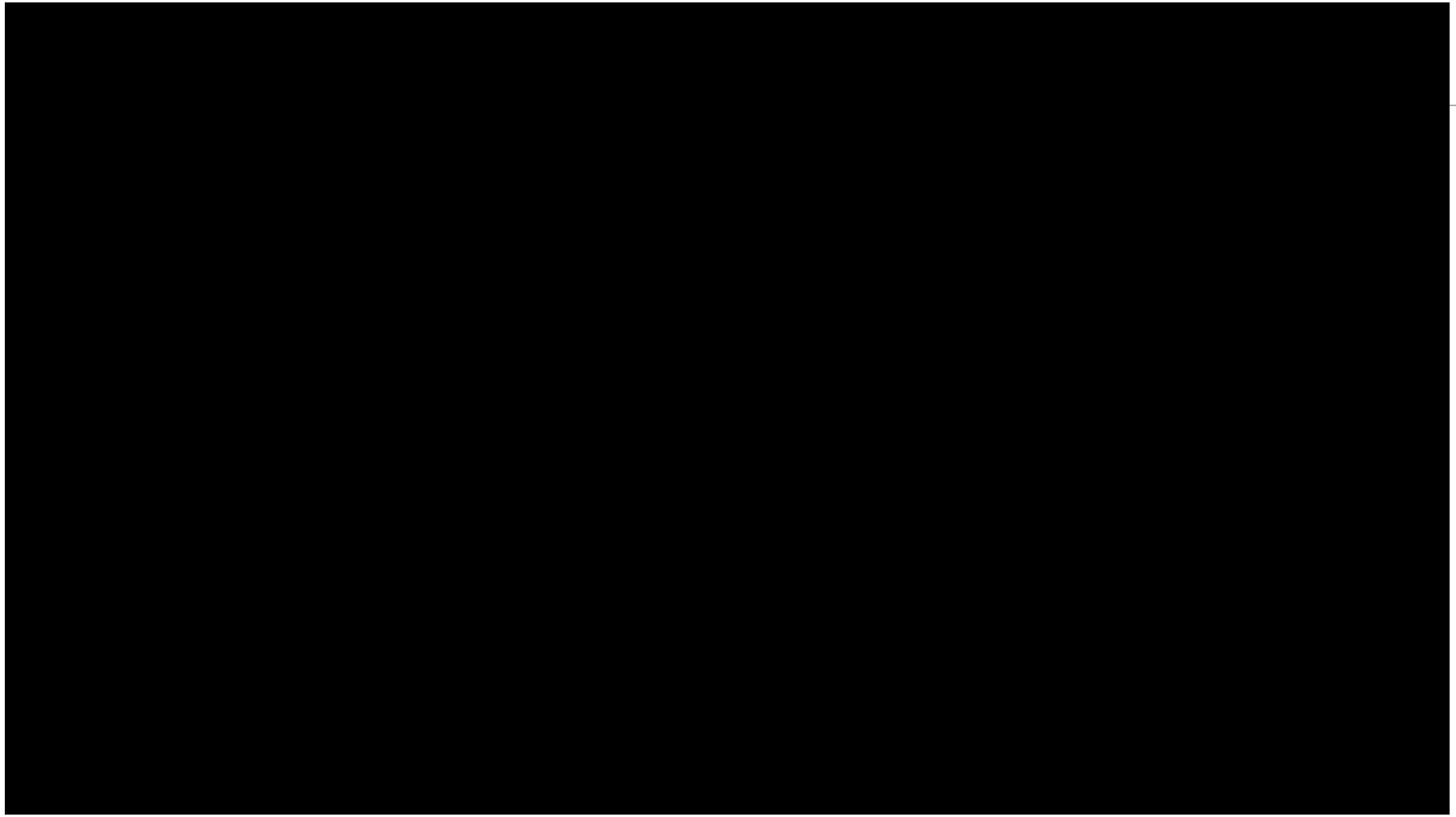


Shakey: the Robot



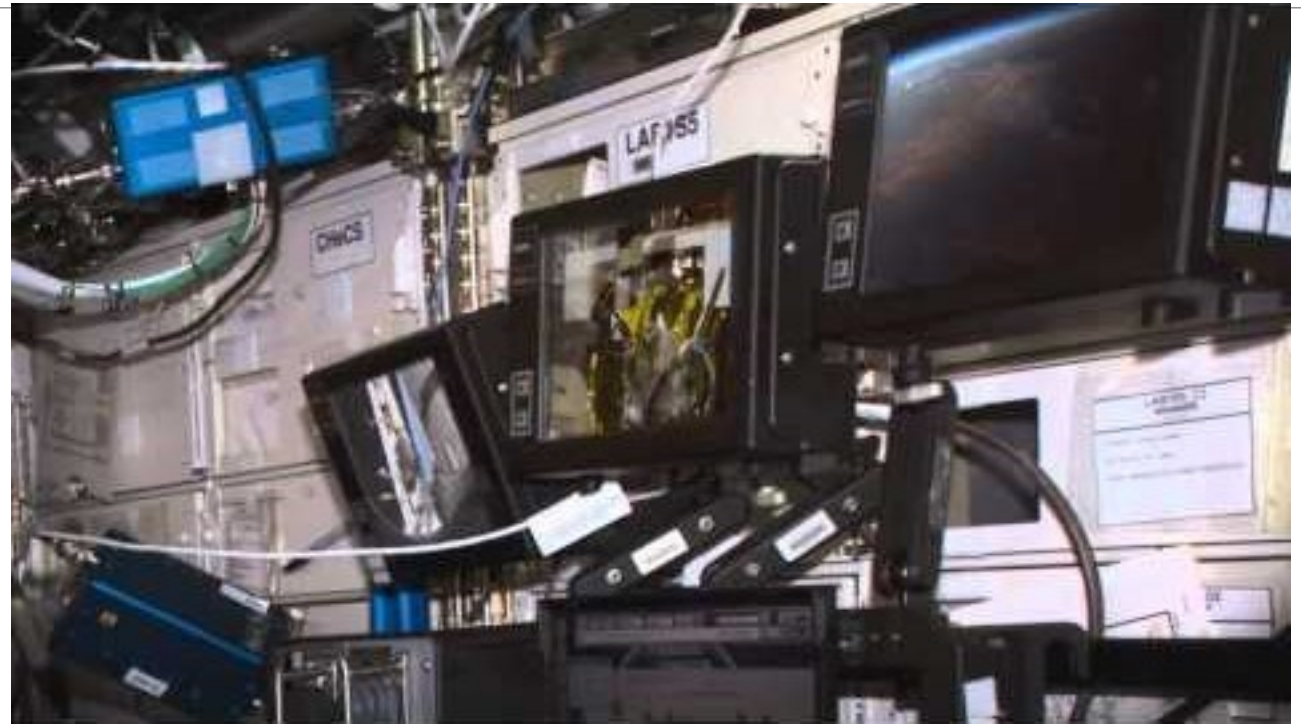


Telemanipulation



Reference: https://corporatenews.pressroom.toyota.com/releases/toyota+unveils+third+generation+humanoid+robot+thr3.htm

Space Robotics



Space Robotics

Collaborative Robots

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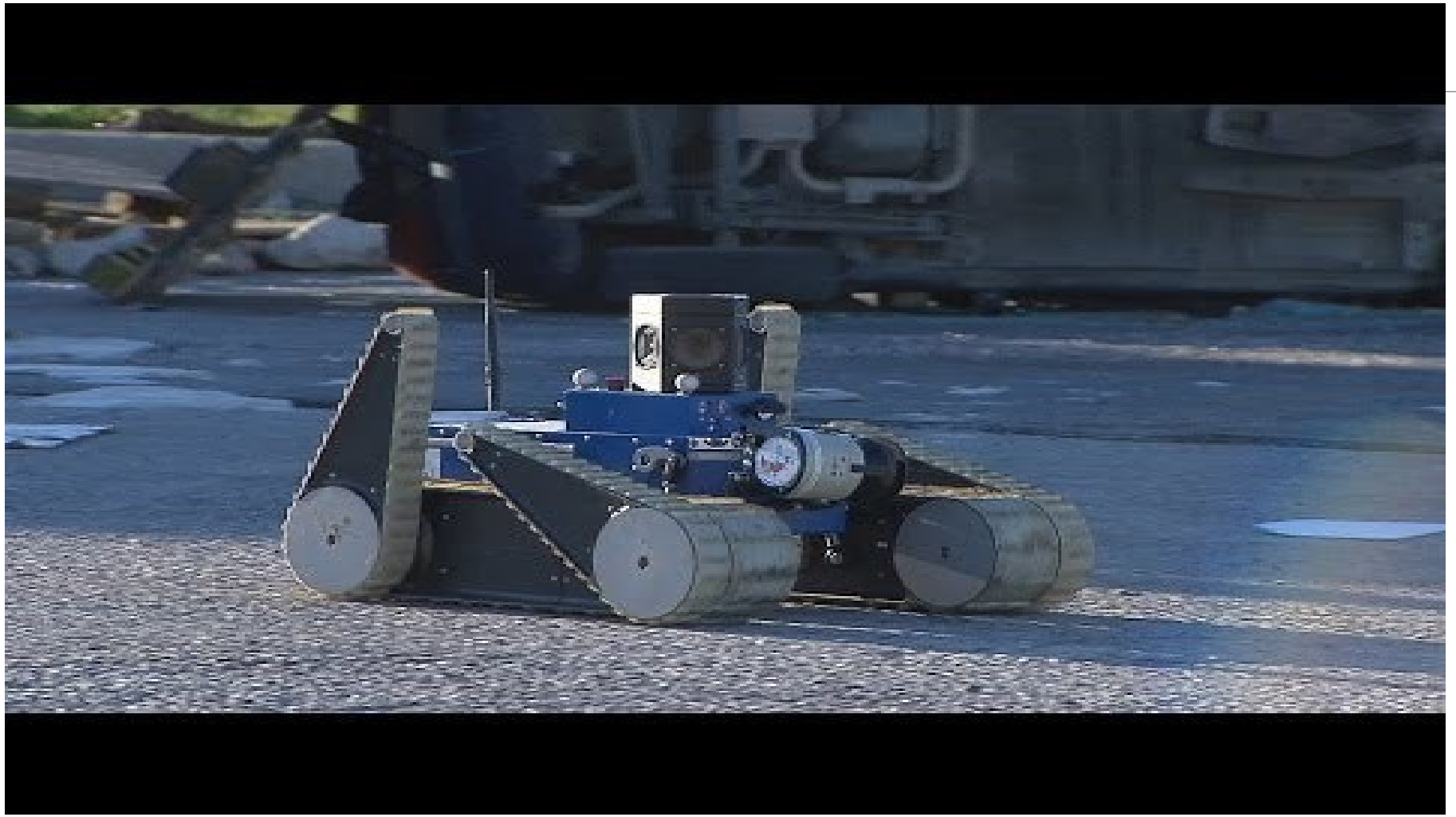
DARPA Grand Challenges

Fukushima Clean-up

Urban Search and Rescue - UAVs

Urban Search and Rescue – Mobile Robots



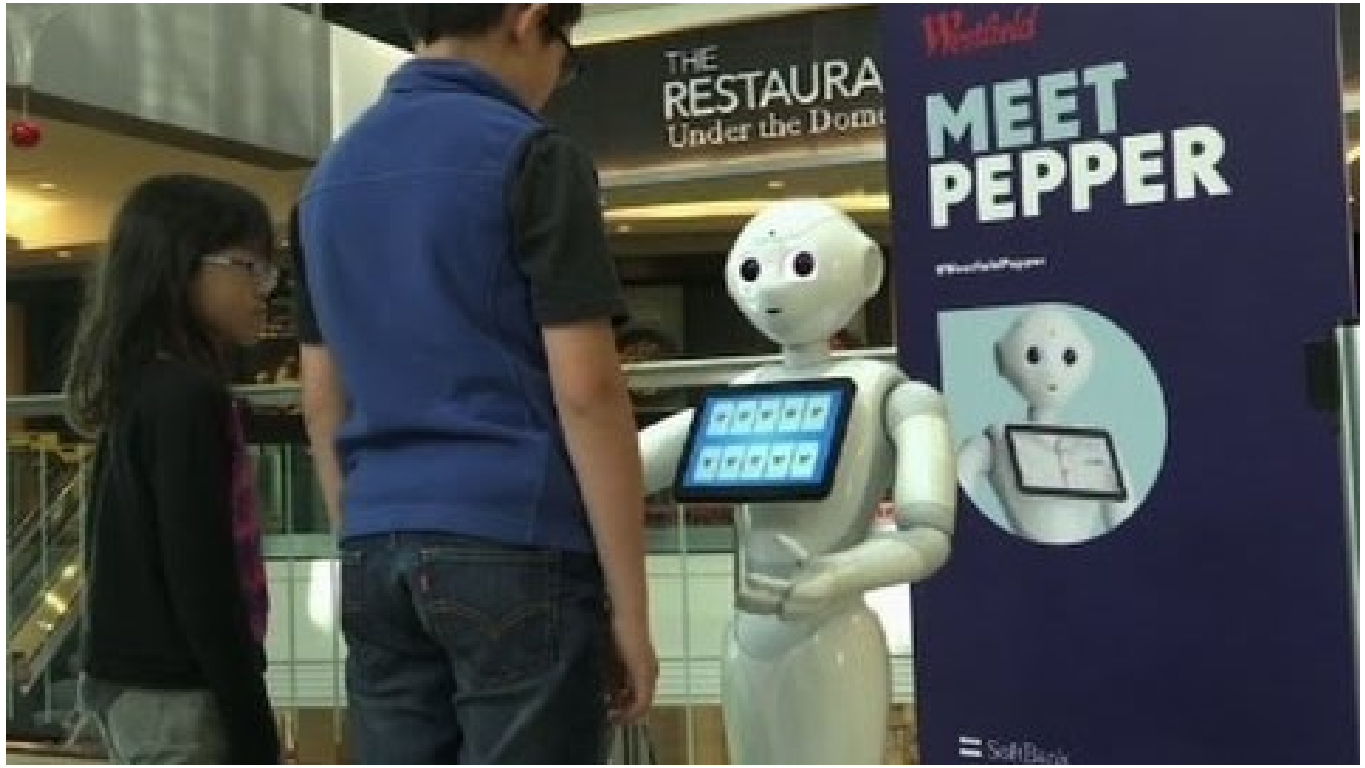
Military

Socially Assistive Robot - Paro

Reference: http://www.parorobots.com/

Socially Assistive Robot - Milo

Service Robots



Turtlebot