Humanoid Robots

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Outline

- What is a robot?
- History
- Our Times
- Why Humanoid Robots?
- ASIMO
- Recognition Technology
- Conclusion

What is a Robot??

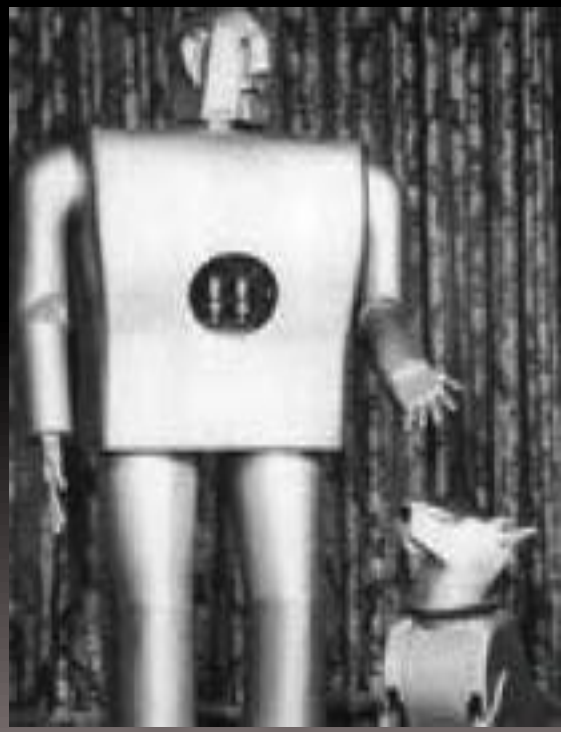
- "A reprogrammable, multifunctional **manipulator** designed to move material, parts, tools, or specialized devices through various **programmed motions for** the performance of a variety of **tasks."**

  Robot Institute of America, 1979

- "Where AI (Artificial Intelligence) meets the real world."

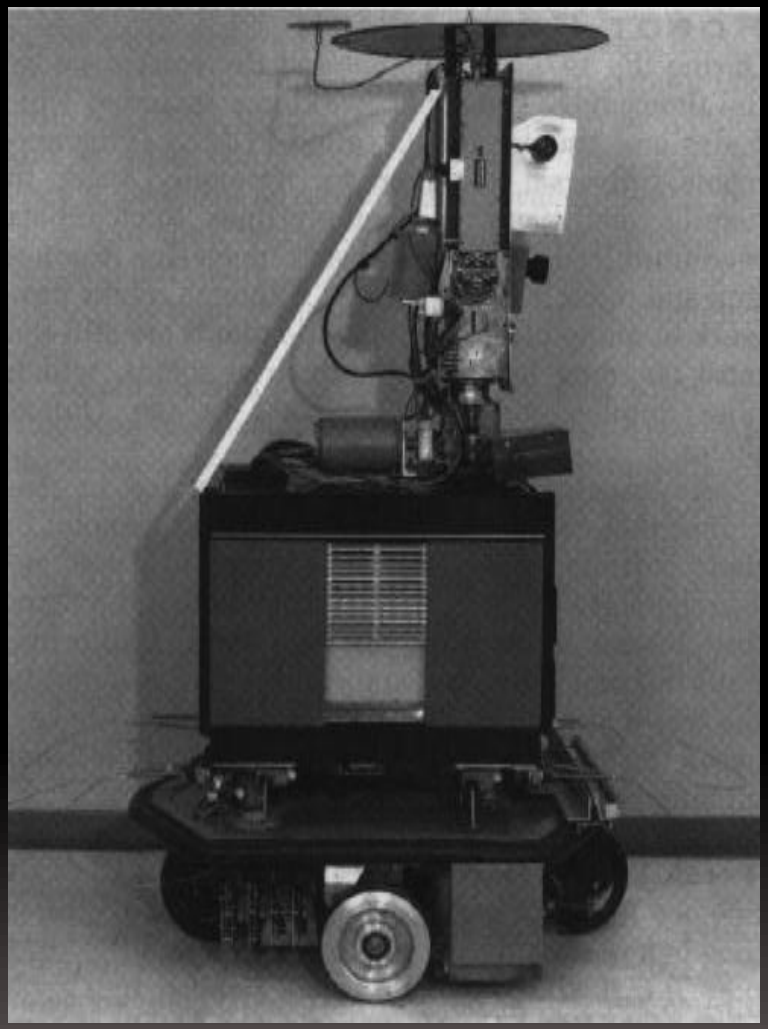
History

- Early Stages
  - The notion of **putting machines to work can be** credited to great thinkers like **Aristotle.**
- Westinghouse Electric Corp. creates two of the **first robots that use the electric motor for entire body motion.**



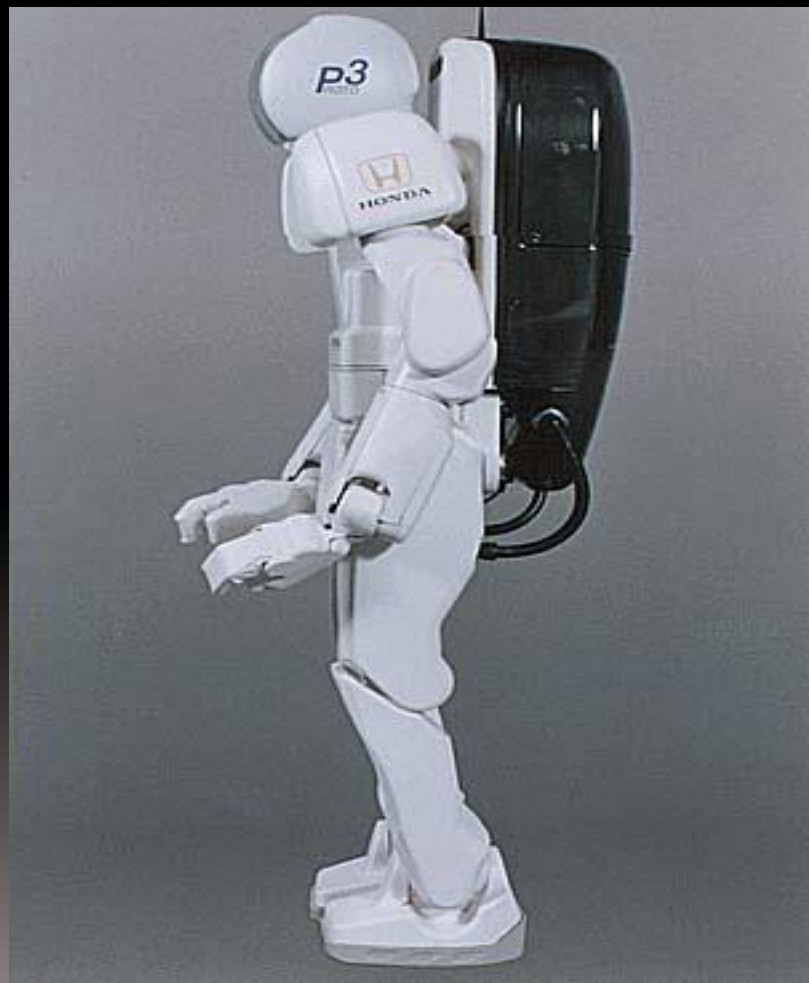
History (cont.)

- 1968…'Shaky' build at Stanford Research Institute.
- Shakey could perform tasks that required planning, route-finding, and the rearranging of simple objects.



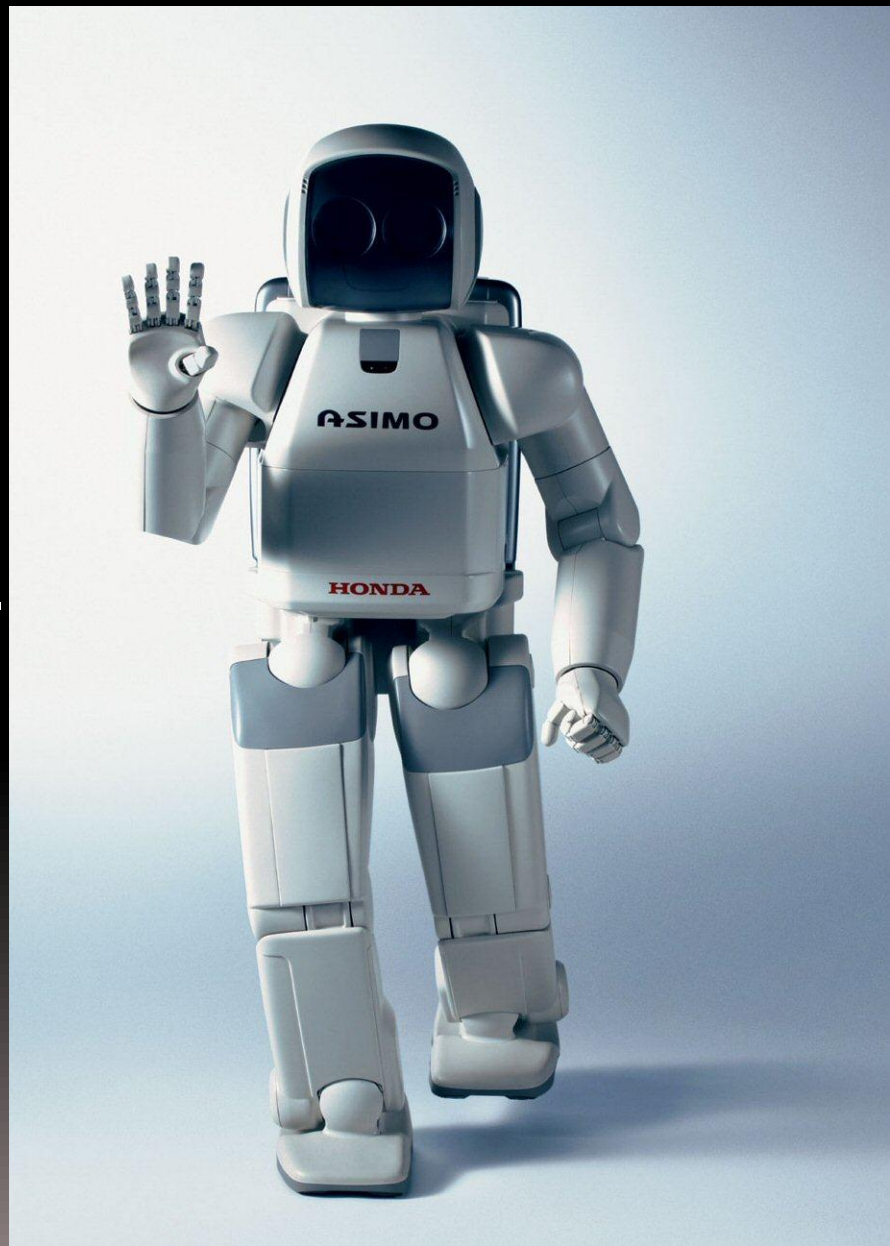
Our Times

- In 1997 the P3 robot was produced by Honda which was more human like.
- Capabalities:-
  - Walk around
  - Climb stairs
  - Carry things
  - Pick things up
  - Push things
  - Position it self accurately



Our Times (cont.)

- In 2000 Honda incorporated the P3 technology into its dancing robot ASIMO.



Why Humanoids??

- Are there any good reasons for doing research on humanoid robots?
  - Work in dangerous environments
  - Exhaustive and repetitive tasks.
  - Division of labour with humans in cooperative tasks
  - Anthropomorphism
  - Embodiment
  - Interaction and Communication

Why Humanoids??

- Anthropomorphism
  - Humans have built complex environments, tools and equipments very much adapted to our selves.
  - Robots with human-like morphology and motion capabilities have a greater potential acting in living environments created for humans, than e.g. wheeled robots.

Why Humanoids??

- Embodiment
  - The form of our *bodies is critical to the* representations that we develop and use for both our internal thought and our language.
  - If we are to build a robot with human like intelligence then it must have a human like *body in order to be able to develop similar* sorts of representations.

Why Humanoids??

- Important aspects of being human are *interaction and communication with other* humans.
  - Humanoids can *communicate in a manner that* supports the natural communication modalities of humans. Examples include: facial expression, body posture, gesture, gaze direction, and voice.
  - If a robot has humanoid form, then it will be both easy and natural for humans to *interact with it in a humanlike* way.

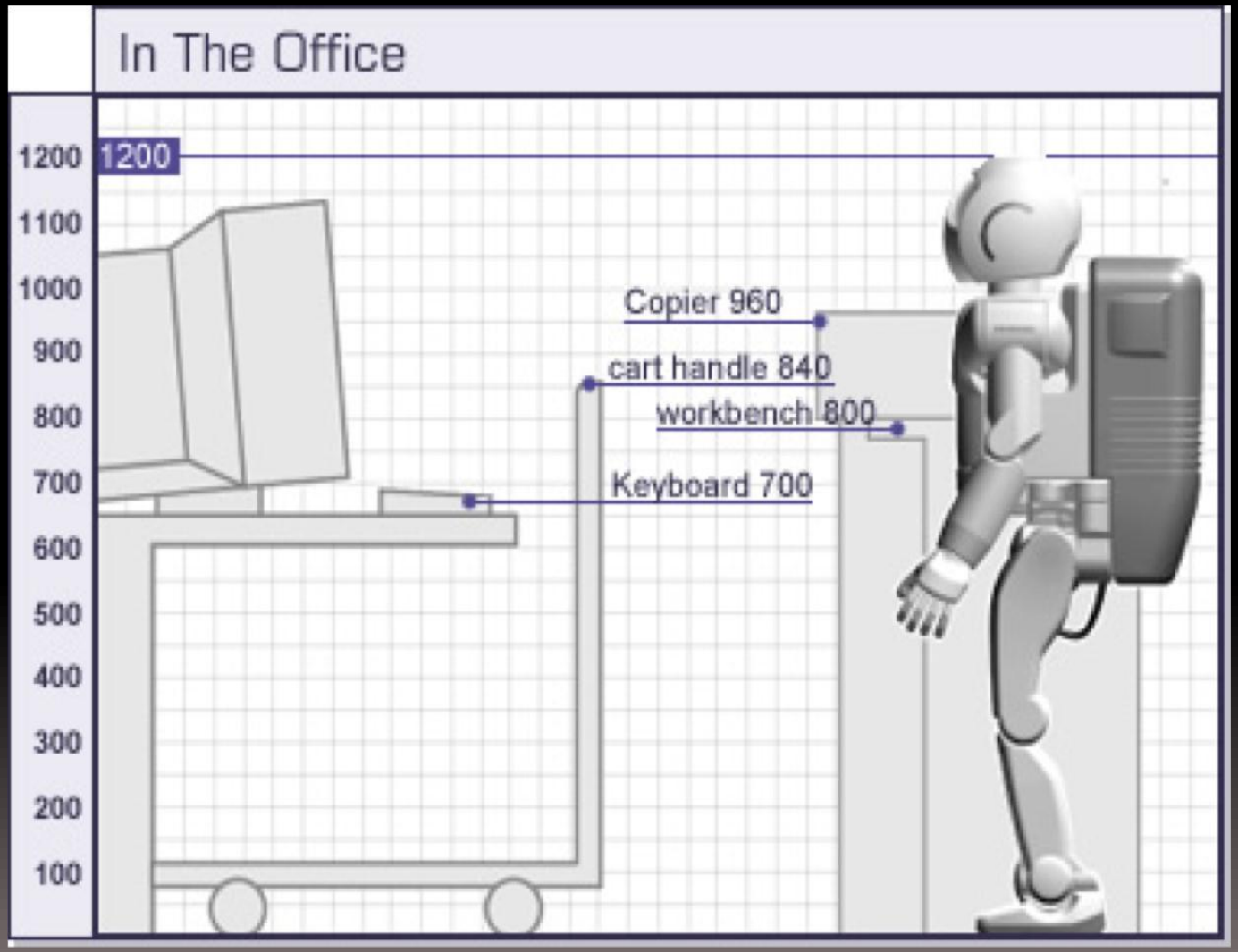
Who is ASIMO?

- ASIMO is a humanoid robot created in 2000 by Honda.
- ASIMO stands for
  - Advanced Step in Innovative MObility
- 11th in line of successive bipedal humanoid model's by Honda.
- It is the 4th man like humanoid robot.

Specifications

Weight: 52 kilograms
Running Speed: 6 km/h
Walking speed: 2.7 km/h
Walking speed while carrying objects: 1.6 km/h
Height: 130 cm
Width: 45 cm
Depth: 44 cm
Continuous operating time: 40 min – 1 hr
Degrees of Freedom: 34

Why was ASIMO created?



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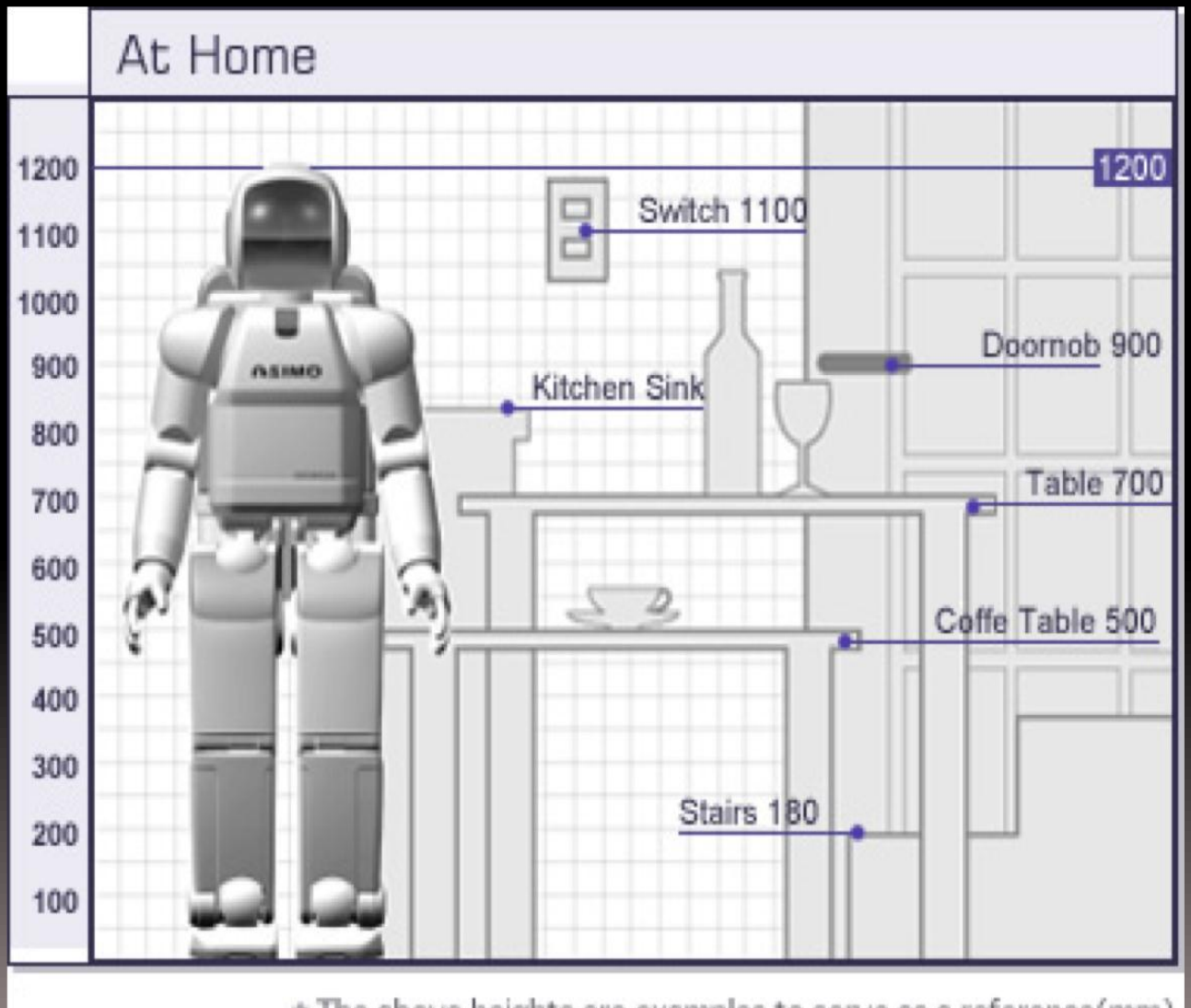

Recognition Technology

- With 2000's ASIMO model Honda added many features, labelled "Intelligence Technology", that enable ASIMO to interact better with humans. These features fall under 5 categories:

1. Recognition of moving objects
2. Posture/gesture recognition
3. Environment recognition
4. Sound recognition
5. Face recognition.

Recognition of moving objects

- ASIMO can detect movement of multiple objects, assessing distance and direction using the visual info. captured by the camera.
- Featured served by this application are
  - Follow the movements of people
  - Follow a person
  - Yield to pedestrians in its path.
  - Greet a person when he or she approaches.

Recognition of postures and gestures

- Positioning and movement of a hand, recognizing postures and gestures.
- Can react and be directed to both voice commands and natural movements of human being.
  - Recognize when a handshake is offered.
  - A person waving at it.
  - Movement directions.

Environment recognition

- ASIMO can recognize the objects and terrain of his environment and act in a way that is safe for both himself and nearby humans.
  - Recognizing potential hazards such as stairs.
  - Avoid hitting humans and other moving objects.

Distinguishing sounds

- ASIMO can distinguish between voices and other sounds.
- He can respond to his name, face people when being spoken to, and recognize sudden, unusual sounds such as that of a falling object or a collision, and face in that direction.

Facial recognition

- ASIMO has the ability to recognize faces, even when ASIMO or the human being is moving.
- It can individually recognize approximately 10 different faces. Once they are registered it can address them by name.

Demo

- ASIMO at CES 2007 in Las Vegas.
- ASIMO conducts Detroit Symphony Orchestra

Conclusion

- History of humanoid robot
- Reasons for its existence
- ASIMO
- And now The Big Question??

The Big Question

- Should the human race be worried by the rise of robots?
  - **Why do you ask?**
  - **Isn't all this just sci-fi fantasy?**
  - **What else is about to be invented?**
  - **What's all this about 'robot rights'?**
  - **But do these changes raise moral issues?**

So are these machines a threat?

- Yes…
  - The Japanese are trying to create a robot that will take over child minding and care of the elderly from human beings
  - The Koreans are working on a robot sentry that can distinguish the movement of people and shoot them on sight
  - The US military have commissioned a robot helicopter with a recoil-less rifle capable of tracking and killing a particular individual

So are these machines a threat?

- No…
  - Robots are taking over tasks which are deemed dull, dirty and dangerous
  - The idea of robots with greater intelligence than humans is at least 50 years away, and may never come
  - It's not the robots we need to worry about; it's the people who programme them

References

- Honda Asimo Website
- History of humanoid robots part 1
- History of humanoid robots part 2

Thank you!!