

# Humanoid robots: will they ever be able to become like us, and if so, do we want this to happen?

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## Abstract

This essay will shortly discuss the question whether there will be humanoid robots in the next few years, and the ethical consequences.

## 1 Introduction

To be able to satisfyingly answer the title question, this introductory chapter will define the terms “humanoid robots” and “be like us”.

### 1.1 Humanoid robots, a definition

Humanoid robots designs physically resemble the human torso, [13] that means, they have at least arms, legs and a head. Additional human likeness can be achieved through approximate human size and proportions or by mimicking a face by placing input sensors into the head, resembling eyes and ears. Constructing such a robot faces, at today’s level of robotics, certain technical problems. Among these problems are battery weight and their short life, noisy sensory input data and nonlinear actuator responses <sup>1</sup>.

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<sup>1</sup>Rechargeable batteries are the most common method to power autonomous robots (that is, except for space probes), but are heavy and currently have a short life span. Humanoid robots will probably need power for at least one day. Huge amounts of input data and noise asks for high performance processors, which use up high amounts of energy. Electric motors for actuators are easiest to control, but also consume great amounts of energy, even for simply relaxing a muscle. Advanced technologies for energy storage, materials for creating artificial muscles with a nearly linear response and refined techniques like passive dynamics can overcome these problems, but require further research.

## 1.2 Definition of “being like us”

To "become like us", a robot should be indistinguishable from humans by non-experts. Like in a Turing Test, an average human should not be able to find out if his opponent is a robot or not by usual interaction. <sup>2</sup> Experts in the field of robotics or artificial intelligence might, however, find out that a certain humanoid is in fact a robot by the means of well-formulated questions or upon deeper investigation of the robots movement. <sup>3</sup>

## 2 Motivation of constructing humanoid robots

Before one elaborates on the moral question whether we want humanoid robots among humans, and the ethical implications which would arise from this, one should investigate on the motivation needed to design humanlike robots, posing the question: "Why should we want to construct humanoid robots?"

### 2.1 Industrial use

Many industries so far have shown a tendency towards production automation [1] - using machines to replace human workers - but the decision to prefer robots over humans is made either on commercial reasoning (robots are cheaper to maintain) or on an ability basis - robots are used for tasks that exceed human possibilities. Both arguments do not support humanoid robots. Humans are multi-purpose workers, and a humanoid robot would have to be able to perform a variety of tasks, like humans can. When money is the issue, there is no reason to invest millions in a product that has a multitude of features that are not needed to perform the tasks considered. <sup>4</sup> Designing humanoid robots to outperform humans in general, so that they can perform a larger variety of tasks, is, in theory, possible. But the newly designed humanoid also has to compete the highly specialized robots that are already available. It is highly unlikely that a robot in humanoid shape will be able to perform both coal excavations and micro-surgery better than its already existing and viability-proven competitors.

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<sup>2</sup>For example, a cashier-robot should be able to act like a normal cashier, that is, scan item's prices, handle the payment and perform small talk. It should not be possible to distinguish it from a human cashier when shopping. However, there is no need for a cashier-bot to be able to dance in the ballet.

<sup>3</sup>Cutting a humanoid open and see what is inside does not count as usual, non-expert interaction.

<sup>4</sup>Most industrial robots won't need hair or even a realistic skin, and certainly not emotions.

Industries switched to robots that are specialized on one task, replacing multifunctional human workers. There is no evidence that suggests that this trend will change. Thus, it seems unlikely that industrial robots will ever become more human.

## 2.2 Human-machine interface

Some industries specially design humanoid robots for eased human-machine-interaction. The resulting robots should be able to assist or replace humans in certain cases. In contrast to the industrial robot, here, the performance of the robot only needs to be equal to the human performance. Robots like this can be used for assistance of elderly or disabled people [11][9] and for therapeutic purposes, like robot assisted therapy. [8][15] The goal is to create a user interface that acts like a human, reducing human-machine-interaction to human interaction. <sup>5</sup>

Designing humanoid interfaces faces one major problem: the uncanny valley. When robot design approaches human likeness, the uncanny valley effect produces a sudden drop in emotional acceptance towards a robot [10][4][5], until the robot is so lifelike that one can barely distinguish it from a human.

Usually, imperfect or simply different <sup>6</sup> visual appearance and motion cause an entity to be placed in the uncanny valley.[7][2] But any system that can be regarded as having humanlike qualities can provoke a negative emotional response, when the user is confronted with its inhuman side. <sup>7</sup>

Much research has been made on this topic, and recently, companies adapt their strategies towards designing emotionally acceptable interfaces in such a way that they clearly do not attempt to resemble a human. [12] Usually, cartoonish features and enhanced cuteness are used to alter the human look. Such robots neither require human-machine interaction expertise, and solve the uncanny valley problem in an elegant way. [3][6]

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<sup>5</sup>In the example of our cashier-bot, the robot replaces a human cashier. As human-machine-interaction should not be needed to go shopping, the robot has to be able to perform human interaction, handing over the change, understanding sentences etc.

<sup>6</sup>Compared to the cultural standard. Even humans can fall into the uncanny valley [2].

<sup>7</sup>Some people get angry over being told by their GPS navigation system to turn on the motorway, or turn in a direction that is not available. This is a typical reaction if a human relies on someone's (i.e., the GPS system's) responsibility, but are disappointed. This can only be the case if the human saw some humanlike abilities in the navigation system (e.g. it is able to "talk"). The sudden failure of the system causes a kind of uncanny valley effect, as a human would apologize or react emotionally as well, which the system clearly is incapable of.

It seems that, although humans can pretty well communicate with each other, using a humanoid robot as a humanlike interface for machines is not desired, if the uncanny valley is hit, or needed, if alternative looks are chosen.

### **2.3 Other uses of humanoid robots**

There is, however, at least one industry focussing on modelling humanlike robots: The sex doll industry. Here, the desire clearly is to cross the uncanny valley. But these robots certainly only look human, for there is no need for a sex doll to have the whole spectrum of human emotions, intelligence and knowledge. <sup>8</sup> Humanoid sex dolls can be seen as a particular version of specialized industrial robots.

### **2.4 Questionable use of humanoid robots**

In conclusion, one can say that, at least currently, there is no economic striving for robotic copies of humans, leaving only one way for humanoid robots to become like us: The pure technical challenge of creating it, and ambitious engineers to develop it for scientific reasons only, without expecting great business profit. While there are many technological hurdles, humans themselves are nothing more than complicated machines, so the theoretic proof of feasibility has already been made. <sup>9</sup>

## **3 The ethical question: Do we want humanoid robots among us?**

From the previous section, one can not expect to have a large number of humanoid robots among us in the next decades. If this was the case, it is still to be assumed that humans will simply adapt to the fact that some people around are human, some are not. In the internet, chat bots have become quite common, and so did fake or troll-users, pretending a different identity. The exposure to possibly fake peers has become quite common. Although meeting a fake human identity in the internet is, by definition, not physical, humans will also adapt to

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<sup>8</sup>In a way, this is exactly why sex dolls are bought. If they resemble humans too close, there is no benefit in the robot. A sex doll with headache or menstrual cycle would be an economical failure.

<sup>9</sup>While some believe in a metaphysical mind, no scientific evidence could be found that supports this claim so far.

the fact that machines are or may be physically among them all the time. They already did. 125 years ago, automobiles were a new technology, seen as noisy and primitive: "Public reaction to the strange new vehicle was initially one of skepticism. Benz noted that 'astonishment and admiration has turned to pity, insult and scorn. The vehicle's detractors asked why anyone should want to ride in this noisy, primitive and unreliable contraption [...]' " [14], whereas today one is surrounded by cars all day. Humans have proven their ability to adapt to technologies quite often and well, and so one can safely assume that humans will integrate humanoid robots into their world - at least as open-minded as other strangers.

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