

# ***On the design and beauty of robots***

***Bruno Siciliano \****

The physical shape of robots should not be indifferent to their function. This is especially true for those that interact with humans.

A robot that cooperates in an anthropic environment, in addition to presenting technical features of safety, agility, dexterity and reliability, must meet criteria of beauty in order to be socially accepted. Harmony and pleasantness of design: requirements that were underestimated in the initial design phase of the development of robots for assistance and companionship.

However, in Japan, thanks to a particularly sensitive culture to these aspects, it was taken for granted that machines had to be pleasant and also inspired by human nature. Today, in light of the results achieved in various research projects, we can say that a harmonious appearance of a robot and a smooth mode of interaction have a recognized therapeutic value.

The IT industry has focused on the creation of devices such as tablets, monitors, smartphones, cars that for their functions, in relation to the cost / benefit, have gone from niche objects to gadgets within the reach of the general public because more accessible economically and easier to use. Sometimes, the word *gadget* is used to express aspects of triviality in the technological objects of common use, with somewhat an understandable snobbery. For me *gadget* is a positive term: it means that an object of techno-scientific origin has been adopted by civil society.

## ***The robotics challenge***

At the opening event of the last Maker Faire, journalist Riccardo Luna asked me two questions. The first, "Where are the robots now?", referring to the need for robots to help operators in the CoViD pandemic, and there weren't many at the time. In fact, the Italian robotics community immediately went to work and offered various types of robots for assistance, disinfection, and so forth. The question, which had already been posed by Luna himself in an article in *La Repubblica* newspaper, "But where have the robots gone?", struck me, because it is the same question that perhaps the public has been asking.

The other question, "How do I explain to my mom, a person of a certain age, that an assistive robot could help her?" To this one, I answered that actually demonstrating the usefulness of assistive robots for elderly people, children, people with disabilities, is not difficult. There are now many projects that have confirmed and proven the benefits of assistance robots in real situations.

What is more difficult – I explained – is to convince young women and men in their age of maturity of the social utility of robots. This is the robotics challenge of the near future.



Prof. Siciliano with Riccardo Luna at the opening event of Maker Faire 2020

## ***The InterAction Technology***

With the prospect of combining Artificial Intelligence with the physical reality of robots, the neologism of *InterAction Technology* (IAT), technologies that also allow physical interaction with the user, was born. And the prelude to IAT came with the Industry 4.0 paradigm, the digitalization of industry for which we talked about cyber-physical systems.

For 20 years we have been developing information technology. All over the world, women and men routinely use various digital devices to communicate, use information and data: smart personal assistants, smartphones, apps. Today, the big research challenge is to move beyond voice – or visually-based cognitive interaction to lay the groundwork for physical interaction between a person and a learning robot, with interaction both in presence and at a distance. In this perspective, one day, we will be able to talk about *physical smart working*.

Let's think, for example, of an exoskeleton that is light, easy to wear and also beautiful, that guarantees the user, in addition to the undoubted usefulness of an overall support for loads or for assistance in case of disability, also a more youthful, elegant, graceful posture. Who wouldn't someone buy it?

Another example, from a project we're working on: collaborative robots, cobots, that help supermarket staff move weights or relocate goods, so as not to exceed the fixed hours of tiring physical labor. To date, supermarkets are full of digital technology, for data acquisition and management. In our case, it is physical interaction, action on matter, modification of the environment.



Hyundai's YL012 robotics arm

## ***Why is Hyundai getting into robotics?***

In late 2020, the Korean company Hyundai bought Boston Dynamics (BD). This famous research center has always been at a loss. Even before it had passed from Google to the Japanese financial Softbank, has always had carte blanche to do research aimed at prototypes, but certainly not consumer products: a quadruped, a humanoid that jumps and dances.

I asked myself “Why is Hyundai, primarily an automaker, buying a top robotic research center?”

My answer was inspired by two events.

Two years ago, I was invited as a Keynote Speaker at Hyundai's Italian Convention, which was held in Naples. I had the chance to talk to some Korean managers and from what they were saying I understood that they had a vision of 10 years ahead, maybe more, when not only cars will be more and more autonomous, that is robots at all effects, but houses, schools and so on will be full of intelligent machines. And they are gearing up.

The second event was seeing the new Hyundai's robotic arm. It is a kind of minimalist work of art, it is harmonious and very pleasing. It also costs less than others. I think Hyundai's purchase of Boston Dynamics was due to its intention to enter the world of consumer robotics. For the general public, to associate the walk of Atlas, BD's bipedal robot with Hyundai's products is to infer that if those robots move so well on two legs, they will be even safer on two wheels as in the case of another flagship prototype like Handle!

In conclusion, if a major car manufacturer feels the need to acquire a robotics research center of excellence, it means that they are betting on research and, as a consumer industry, on transferring the possible results of research into widely available products and services.

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