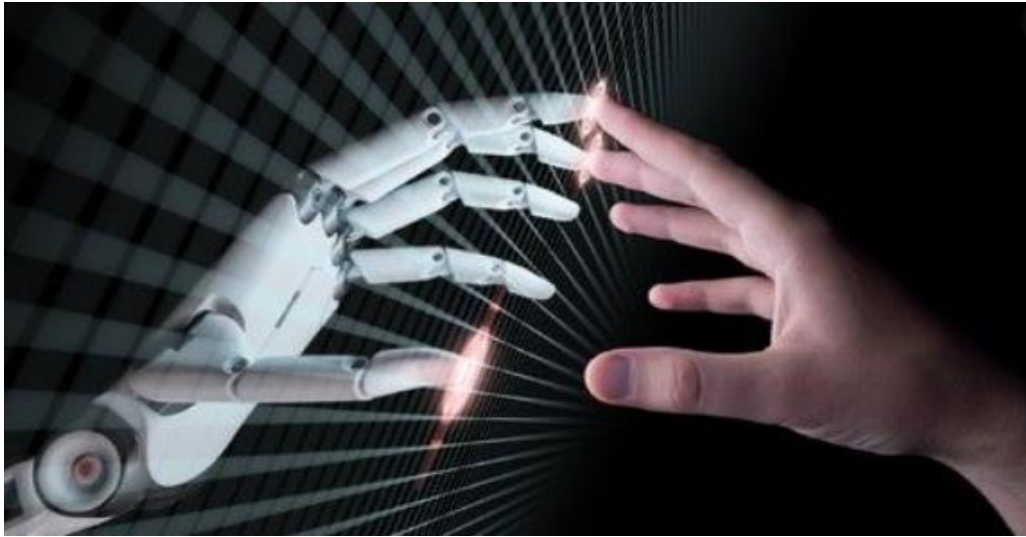


# Human-Robot Interaction

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## Abstract

As with so much else in the field of artificial intelligence, the idea that robots might one day have emotions first appeared in science fiction and now social robots are resolutely moving from fiction to reality. This paper introduces several types of robots in a physical interaction environment, which have been developed so far and also the future of Human-Robot Interaction. Digital technologies have enabled these robots with easier and faster human-like audio-visual interactions. Technologies include artificial muscles, elastic electric cables, artificial skin, artificial brain, fast moving robots, artificial noses or tactile finger devices and have the potential to bring artificial

devices one step closer to humans. However, the feelings of human cannot be felt by the robot and it cannot show the same feelings as human. Also this paper focuses more on the application of robots in a social environment.

## **1. Introduction**

Robots are programmable devices that automatically perform complicated and often repetitive tasks. These are used in different fields to perform difficult and risky tasks in highly structured environments and have only limited interactions with humans. But now the unimaginable relation of human and robot for the people who believed it came to reality and have acquired the ability to enter at our work, home and in the public sphere. These robots that are programmed to interact with humans and other robots in a friendly manner are named as social robots.

Social robots [1] exhibit social behaviors such as recognizing, following, assisting their owners and engaging in conversation. As we are living in an aging societies, several serious problems are expected in our way. These robots can be one of the solutions to this problem such as they can be expected to perform various daily tasks like helping at home, helping with the medication, helping with tasks like lifting, it can also be a friend (a companion) and simulate emotions.

There are many types of collaborations of robot and humans, in this paper I am limiting to hospitality, entertainment and a companion.

## **2. Age of social robots**

- The very first software that successfully conversed humanly is chatbot [2]. Chatbot is first to pass standard tuning test [3], there are many in production that are unable to adequately converse or

pass the industry standard Turing test. These chatbot are used to provide customer service, request routing or information gathering.

- The Geminoid F is an android robot that is meant to look identical to a Japanese woman. The robot was made in 2010 and is part of a series of Geminoids made by Professor Hiroshi Ishiguro's laboratory at Osaka University in Japan.
- Nanyang Technological University's Nadine [4], a social humanoid that can operate independently and recall conversations
- Hanson Robotics's [6] Sophia [5] is a social humanoid robot [7] appeared in numerous television shows and also participated in many high-profile interviews. Sophia became a Saudi Arabian citizen, This is first robot to receive a citizenship of any country. Sophia looks like human, can imitate human gestures and facial expressions. Sophia is a social humanoid robot that can display more than 50 facial expressions and is the first non-human to be given a United Nations title. The AI program analyses conversations and extracts data that allows it to improve responses in the future.

These robots have human like appearance, imitates human speech and actions but they does not feel like human

- the Avatar Shaman [8] the most advanced Audio-Animatronics figure is developed by Walt Disney's Imagineering Team. It stands out for its graceful, fluid motion, a characteristic never seen in any other robot. This is the most realistic one.

### 3. Social Robot

**Hospitality:** The reason why robots have emerged as a popular technology trend within the hospitality industry is because the ideas of automation and self-service are playing an increasingly vital role in the customer experience. The use of robots can lead to improvements in terms of speed, cost-effectiveness and even accuracy.

Considering the pandemic right now, why cant we take help of robots in this situation? Like give a try and see how these robots and human gonna adjust to each other and to the environment. Also they are efficient and faster than human with high accuracy. During my case study I found that there are robots already in the world of hospitality before this pandemic started. The research says that almost 60% of the people are satisfied with the robot service in the hotels. Here are the some of the hotels that are using robots as staff before the pandemic started.

Henn-na Hotel [15] Situated in Nagasaki, Japan, runs almost entirely by robots. It is kind of unique place to stay and live with robots, these are programed to be friendly and help with the needs of customer. One interesting thing about this hotel is we could get to open the room with the facial recognition.

Hilton's concierge robot, Connie is used by Hilton's which is developed by IBM. Connie interacts with the guests, responds to their questions like near by attractions, place to eat and also with the hotel information.

Aloft's butler robot is used for surprise room deliveries in the hotel.

This robot services can also be used in airports, here are some of the ideas where the robots can be used.

Airports, such as Hamad International Airport and La Guardia Airport, are using security robots to provide the next level of airport security. The robots come equipped with an in-built facial recognition system, cameras, and sensor. They can measure pulse rate remotely, and thus, detect suspicious persons, credit cards, fake currencies, abandoned objects, and explosives, without disturbing the passenger flow at the airport terminal.

near future we can expect robots as airport staff, in terms of airport operation handling such as cleaning, loading and unloading luggage, helping with guidance, information, entertaining solutions.

How about social robots in travel/ tourism industry?

When all the travel agencies are busy working, the social robots can be used to entertain customer who are waiting, help them to figure out where to travel if they are confused or not yet decided, most importantly customers will be guaranteed with fast response time even though the staff member is not around.

### **Entertainment :**

Over the last few years, we all have seen huge advancements in the field of entertainment. The idea of robots in the films, amusement parks, or even at home is fascinating.

This fascination gave a chance to robots to increase their roles in filmmaking and videography. Whether they're shooting movies or commercial spots, robots provide unprecedented precision, repeatability, and speed behind the scenes.

Robby the robot designed by members of the MGM art department and constructed by the studio's prop department. Robby is a fictional character and science fiction icon who first appeared in the 1956 film *Forbidden Planet*. He made a number of subsequent appearances in science fiction movies and television programs, usually without

specific reference to the original film character. Some of them are Invisible Boy, The Thin Man, The Twilight Zone and even in tv commercials.

Sophia the robot, a hyper-realistic humanoid robot specially designed for social interactions. She gave interviews in the same manner as humans, seems like most of the interviewers enjoyed the time with her, she also appeared in tech conferences and youtube videos. Now Sophia is going to start acting in her own short film.

These robots' response is interactive but their movements look mechanical. The Na'vi Shaman [16] is a highly expressive alien-like robot, with fluid movements and lifelike features. She welcomes guests at Na'vi River Journey found in Pandora – The World of Avatar at Disney's Animal Kingdom Theme Park in Florida.

### **Companion :**

As we grow old, people around us might not have enough time to take care of us, meeting our family once in a week or month or a year/years might be depressing at that age. During this time living alone might be lonely. How about living with Pepper? Pepper is a semi humanoid robot that is designed to read emotions, it may not replace the person but it can fill the void. It can dance with us, play songs, can tell a joke, also it will try to make us laugh. It can also help in kitchen, gardening and reading too. In future Pepper can also be used in schools to help children with their education.

How about ALPHA2 as a family?

It is a small humanoid robot “designed for practical household service and companionship.” its potential for social interaction, and its extremely low cost. It helps with the work, entertaining and educating children, Reporting the weather, searching the web, downloading applications to our phone with a voice command. It takes high quality photos too

## **5. Societal Impacts**

Impact on society due to social robots is positive, the experiment says that the group of people along with a social robot tend to discuss more among themselves. This makes them naturally bonded and in the same time with the help of robot they can improve their knowledge.

## **6. limitations**

- Social robots are expensive especially humanoid robots for their facial expression.
- Increase in this automation can lead to employment crisis
- They cannot act outside of their programmed parameters, meaning they cannot adapt to unanticipated situations.
- They cannot adjust very quickly, cannot be spontaneous , well Sophia is learning and adapting fast. May be this perspective might change in few years
- Human get attached to robots emotionally but they cannot show the same feeling.

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