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RESEARCH ARTICLE

EXPLORING THE UNCANNY VALLEY: HOW HUMANOID ROBOTS ARE REDEFINING REALISM

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Abstract

Humanoid robots, or human-like robots are designed to resemble humans in appearance and behaviour. The concept of the uncanny valley describes the reaction humans have to humanoid robots that resemble humans. Humanoid robots have the potential to revolutionize various industries and redefine realism. This article explores the history and development of humanoid robots and their psychological impact. From their humble beginnings to the remarkable machines we see today, humanoid robots have come a long way with their lifelike appearance, behaviour, and potential applications, these robots have the power to revolutionize various industries and enhance our lives in unprecedented ways. However, the concept of the uncanny valley and the psychological impact it has on humans cannot be ignored. The challenges and limitations that humanoid robots face, along with the ethical considerations surrounding their use, require careful thought and consideration. As we navigate the future of humanoid robots, it is essential to strike a balance between technological advancements and the preservation of human values. By harnessing the potential of these remarkable machines responsibly, we can create a future where humans and humanoid robots coexist harmoniously, benefiting from each other's strengths and capabilities.

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Introduction:-

The “uncanny valley” is a term that originated in the field of robot-human interaction. It describes the unease or discomfort people experience when they interact with a humanoid or a robot which looks like a human. The concept of the uncanny valley was first introduced by Japanese roboticist Masahiro Mori in a paper titled “Bukimi no Tani” (The Uncanny valley), published in 1970.

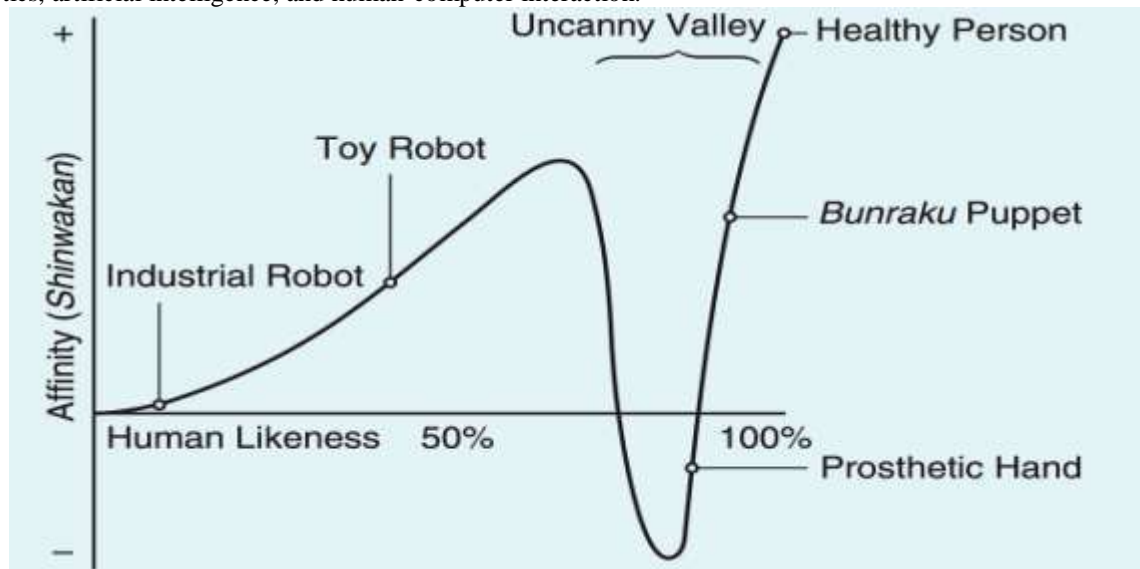
As the appearance and behavior of a robot become more human-like, our emotional response to it tends to become increasingly positive and empathetic. However, there is a critical threshold at which the entity's likeness to a real human is very close, but still not perfect people often experience a strong negative reaction such as discomfort, revulsion, or fear, which creates a valley in the emotional response graph. This dip in the graph is referred to as the “uncanny valley”.

Humanoids are the best possible substitute of human. They look like us, they communicate like us, they walk like us; all these simple actions can be performed by a humanoid with almost perfection. The communication between the human and the Robot is termed as human-robot interaction.

Human-robot interaction are being carried out in various ways such as teaching method where the robot follows gestures and motion of a human. The humanoid robots can be used in various fields such as in medical support and educational purpose.

Abstract

The concept of the uncanny valley has been scholars and artists alike, delving into the discomfort and unease experienced when confronted with something that is both familiar and foreign. This research paper aims to examine the phenomenon of the uncanny in the context of humanoids, exploring the psychological and aesthetic implications of creating robots and artificial entities that closely resemble humans. The Uncanny Valley hypothesis, proposed by Masahiro Mori, suggests that as a robot's appearance becomes increasingly human-like, the emotional response from observers shifts from empathy to discomfort, creating a valley in the graph of familiarity. Through a multidisciplinary approach, we analyse the historical, psychological, and technological aspects of the uncanny valley, providing insights into the challenges and opportunities posed by humanoids in various fields, including robotics, artificial intelligence, and human-computer interaction.



Literature Review:-

Social acceptance and impact of AI

The following cases were looked upon by the authors:

1. Current status of social acceptance of Robots and Artificial Intelligence
2. Differences in attitudes toward and acceptance of robots in Japan, U.S and Germany
3. Needs and potential of nursing care robots
4. Senses of values related to science and technology in Japan, U.S and Germany
5. Future challenges

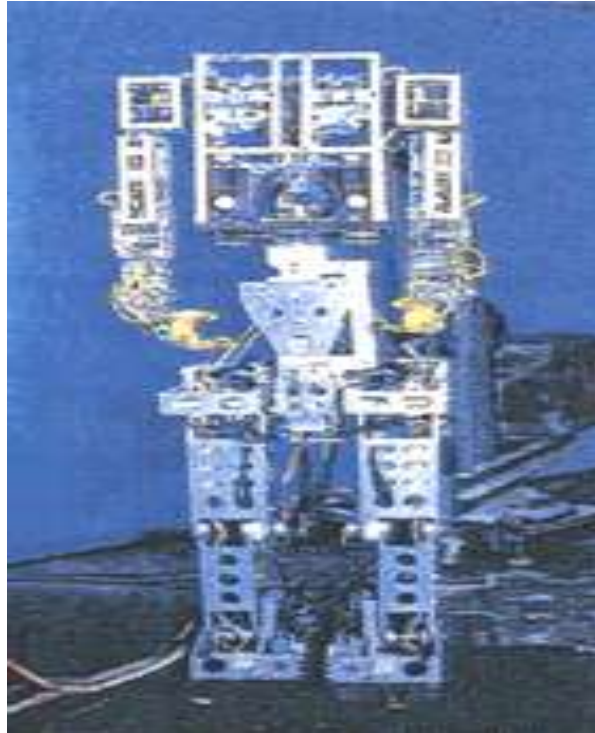
Current status of social acceptance

In 2015, Nomura Research Institute had conducted a survey regarding the people's perception of robots in Japan, U.S and Germany. In recent years, Advancements in robotics and AI have drawn everyone's attention. There have been multiple research projects in Japan which shows 49% of all jobs performed by human can be replaced AI and robots by what timeline. In the US they already have replaced humans in jobs such as, ones that help consumers find item in stores, room service in hotels, delivering telemedicine service to patients. Robots can be differentiated according to their appearance and usage.

In 5 years from now, it will become for robots to coexist with humans but what stands in the way is an emotional wall, known as the "Uncanny Valley" in which robots will reach a certain point where they look too human-like, but there comes a sense of revulsion in most human being. This is also one of the reasons behind people currently are not that comfortable with robots, according to them robots don't have feeling and senses. They work on the

programs and commands they are given which is in fact the truth. The advancements such as self-driving or robot driven cars fascinate humans, but they still don't completely trust them.

The timeline of humanoid robots can be divided into 3 aspects such as its past, its present and its possible future. The past, the term 'robot' was first used by a play writer, Karel Capek in his play. The character was a servant robot, which resembled the structure of a human being.



In 1973, Wabot-1 the first humanoid robot which could walk on two legs, communicates with human and transport objects were created by Waseda university its movement was based on biped locomotion but if we talk about the present the humanoid robots their movement is almost similar to human. Motion detection and motion generation Is one of the latest methods of learning. Human motion is detected by the robot it adapts itself to the human motion and teaches itself to follow the trajectory of the motion. Motion like human does not only define a robot as humanoid its ability to sense also comes into picture. Vision sensor are widely used in sensing system for a robot, but the factors of lighting and the appearance of the object have led to flaws. Factors such as payload limit the robot from carrying heavy sensing system along with it. For a robot to be called a humanoid it should appear like a human and should be able to communicate to a human. The communication between the human and the robot is termed as Human-Robot interaction. Interaction are being carried out in various ways such as teaching method where the robot follows the gestures and motion of a human. There are multiple possibilities that in future this practice reverses and humans will start learning from robots.

The Uncanny Valley

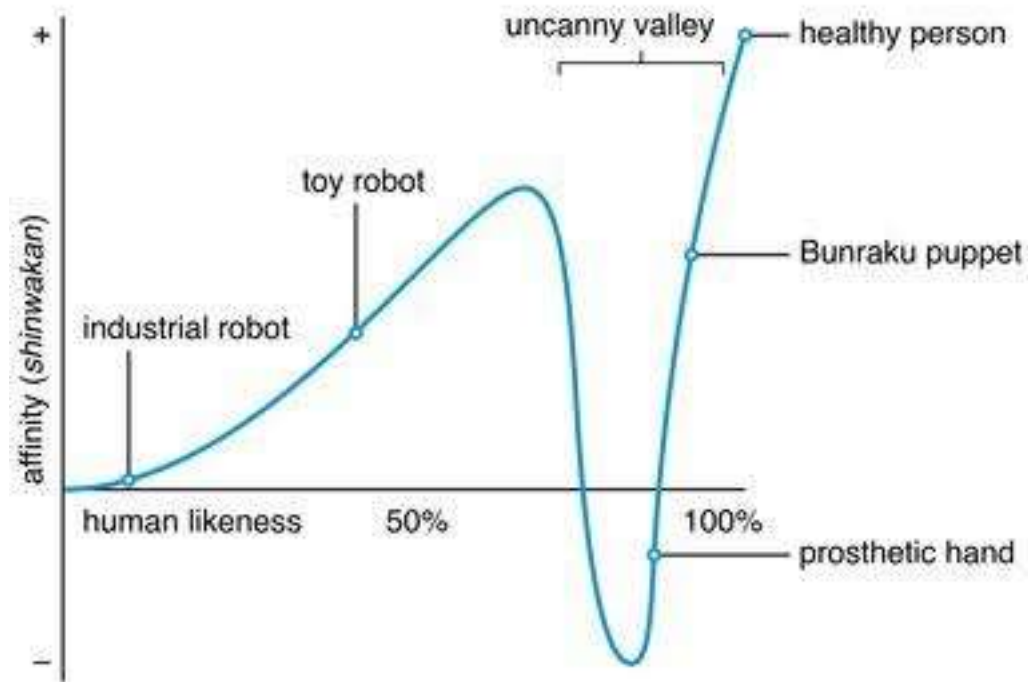
The long-seen dream of humanoid robots in science fiction has influenced generations of researchers, as well as the general public, and serves as evidence that people are drawn to the idea of humanoid robots. Human generally like to interact with such scientific wonders but are scared of completely trusting a machine but by mimicking human characteristics, humanoid robots can engage with human easily. Throughout history, the humans have been carrying out repetitive jobs in factories and industries but now they can be replaced by humanoids, they also reduce the chances of error.



Humanoid robots can be used to assist and communicate with us in our homes, offices, public spaces, hospitals, and disaster areas. The introduction and deployment of humanoid robots has a number of significant implications on our society ranging from economy to the working force and robot safety and dependability. Besides the physical interaction, cognitive human–robot interaction is a major research area. Humanoid robots can potentially take advantage of the communication channels that already exist between people. A challenge faced by humanoid robots is to convey and interpret human intent through subtle natural movement and gestures such as eye gaze ,facial expression and body language. In future they might be able to understand humans completely.

Overview of Humanoid Robot technologies

Nowadays, industrial robots are increasingly recognized as the driving force behind reductions in factory personnel. However, these robots just extend, contract, and rotate their arms; without faces or legs, they do not look human. Whereas humanoids are robot structured exactly like human and move almost similar to them . Human-robot interaction is the communication between human and robot but what makes the human uncomfortable interacting with robots, they have a feeling of revulsion and can not trust them completely This decent into eeriness is known the uncanny valley effect. A research show that people like a horror doll which is made to scare people more than a robot which is made help them.



Source: Masahiro Mori, "The Uncanny Valley," *IEEE Robotics & Automation Magazine*, 2(2):98–100 (June 6, 2012).

The humanoid are capable of doing things which human can't such as manoeuvring in various terrains, in hazards environments and in climbing objects. However there are few issues with humanoids too, that are, they generally suffer from backlashes and frictions in joints, have walking instability and have very limited payloads during motion execution. So in past years there have been multiple advancement such as They increase degree of freedom of the robot's hand in addition to flexibility results in complexity in control. To receive response of humanoid hand control to perform various manipulative tasks and complex grasping intentions has become very cumbersome. One day we might see a robot which has the same movement ability as human.

Conclusions:-

In conclusion, the uncanny valley remains a critical consideration in the development and integration of humanoids into society. As technology continues to advance, understanding and addressing the uncanny valley phenomenon becomes crucial for creating seamless and acceptable human-robot interactions. This research provides a comprehensive exploration of the uncanny valley, offering insights into its historical context, psychological foundations, and practical implications. As humanoids become more prevalent, the ability to navigate the uncanny valley will be pivotal for fostering acceptance and ethical use in various domains

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