

SoRo Project Report: Verifying Uncanny Valley Effect for Robots meant for Teaching

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1 Abstract

The lack of presence of quality teaching faculty in govt. schools in developing countries like India, is a root cause of concern that have led to weakening of the education system of the country and has had an terrible adverse effect on various our sectors. Social robots - a means of utilization of advancement of technology for the betterment of the society has certainly aided us in numerous domains and may as well come to the rescue in this problem of deteriorating quality of education in remote parts of the country. Social robots can certainly aid as well as substitute in some cases teachers in govt. schools in order to solve the worry of lack of teachers. Here, we intend to study various design traits and characteristics desirable in a social robot that is especially designed to teach school-going students. We would like to survey this target audience and study various traits that are desirable (like friendly and approachable) or undesirable (like creepy and repulsive), in order to best decide the ideal design for such a robot. By maximising the likability, we intend to maximise the acceptance and interaction with students and hence, maximising the learning in them.

2 Introduction

Through the medium of this project, we aspire to work towards one of the most serious and prevalent issues in the country: “The lack of quality teaching faculty in rural areas and government schools of urban cities”. We aim to create better and more efficient socially aware robots with competent communication skills, that can help us impart vital knowledge and expertise in the school going students. Robots could attend classes in schools could learn to teach the same concepts taught to them in government schools with poor quality of teachers. Such an initiative would really boost the education system in some remote regions of the country and give these underprivileged students access to education which they never would have got otherwise.

Recent studies suggest that social robots that are able to communicate effectively, interpret human emotions, and mimic certain human behaviours are generally more likeable in tasks involving human-robot interaction. Robots that look similar to humans and possess various human social characteristics like gestures, communication style etc. are often successful in achieving our acceptance and interact with us in a better manner. Robots with anthropomorphic design i.e. physical appearance familiar to humans are capable of gaining trust more easily that compared to robots that look too mechanical.

But like everything that is beneficial is acceptable only up to a certain threshold, the familiarity with humans is too a characteristic that when exceeded above the prescribed limit decreases the likeability as the robot moves from being acceptable to being creepy or too familiar. Sofia is an example of a robot that has received criticism due to the fact that it is too human-like in its characteristics.

It is right to comment that although robots that possess human-like properties are socially more accepted than ones that do not, it might become unpleasant if increased beyond a certain limit. Hence, we would want to ensure that robots have human-like clues along side object-like simplicity. The purpose of our study is to be able to identify what kind of robots (in terms of mechanical and human-like characteristics) would be most accepted and admired by school-going children. If we are successful in ensuring that the students are able to communicate with our robots effectively and the robot is able to impart knowledge to the students that he is supposed to, we might be able to revolutionize the education system in parts of the country where there is a dire need for a transformation.

3 Methodology

The following steps were performed by us in order to achieve the desired outcomes:

Step 1. Study the relevant literature in this domain of Uncanny Valley Effect in order to best decide the type of robots, target audience, qualities on the basis of which survey is made, sample size of research and analysis metrics/plots used for conclusion.

Target Audience: Underprivileged school going children of ages from 6 to 16 years of age.

Sample Size: 25 entries

Analysis Plots: Bar graphs for each quality for each set of robot images

Type of robots: 3 sets of different types of robots with varying levels of mechanical and human characteristics.

Qualities used: Scary, Repulsive, Trustworthy, Disgusting, Nice, Pleasant, Creepy, Approachable, Friendly.

Step 2. Created a list of social robots with varying level of human and machine characteristics beginning from a robot that is completely mechanical to the one which is indistinguishable from a human.

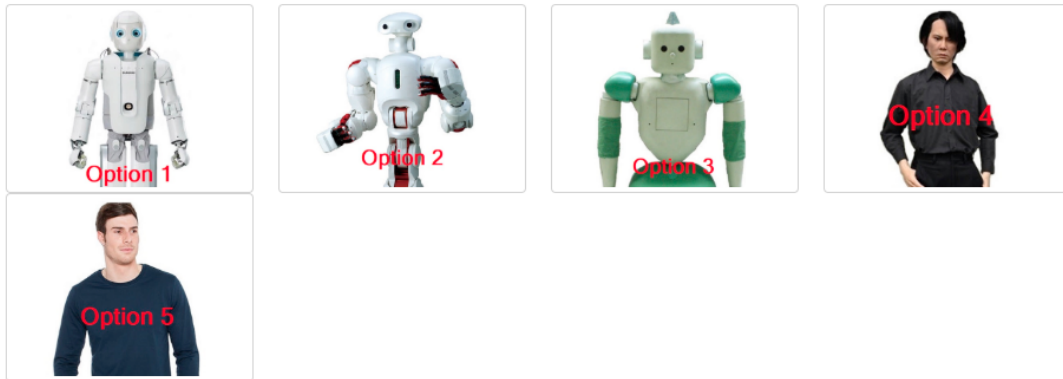


(a) Robot Types from Human to Machine

NOTE: To keep it realistic, we will only choose images of robots that are practically possible.

Step 3. Earlier, we decided to ask the students to rate the robots on basis of their likability but later based on the responses of students, we decided to keep simple multiple choice questions in order to make the survey less time-consuming. [Link to Survey Form](#)

11 . Images



12 . According to you, which of the given images are 'disgusting'?

- ☐ Option 1
- ☐ Option 2
- ☐ Option 3
- ☐ Option 4
- ☐ Option 5

(a) Images of different robots with varying levels of mechanical and human-like appearance, with a set of questions about some desirable as well as undesirable characteristics about each.

Step 4. We created a consent form for Parent/Guardians to request their permission for involving minors in our research. [Link to Consent Form](#)

Consent Form for Social Robotics Project

This is a consent form to ask for Parental or Guardian permission for Research involving a Minor. The survey involves the Minor to answer some multiple answer correct questions based on his/her likeness of various social robots meant for the purpose of teaching school-going students. This survey doesn't ask for any personal information regarding Name, Address, Phone Number, DOB or anything else. The identity of the child as well as parent/guardian will be kept confidential.

* Required

I, a Parent/Guardian of the Minor, "permit" his/her participation in a program of research named above and being conducted by Sarthak Bhagat and Vaasu Gupta. *

☐ I accept.

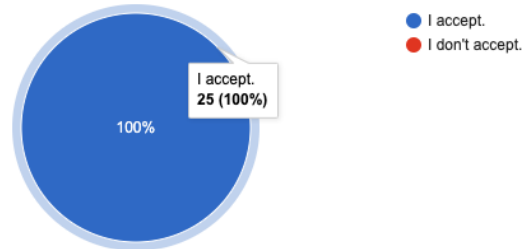
☐ I don't accept.

SUBMIT

(a) Consent Form

I, a Parent/Guardian of the Minor, "permit" his/her participation in a program of research named above and being conducted by Sarthak Bhagat and Vaasu Gupta.

25 responses



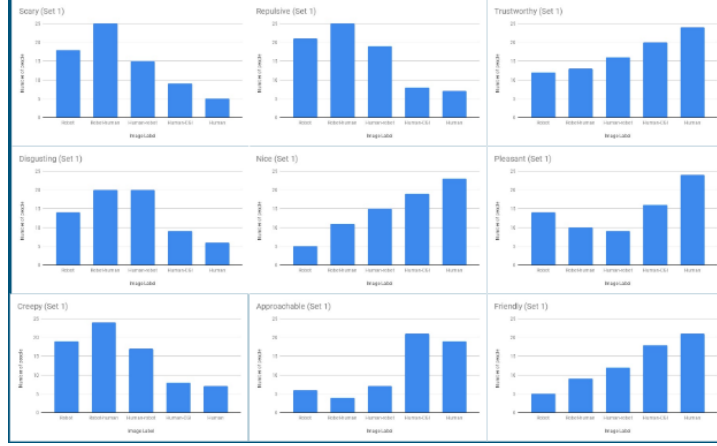
(b) Consent Form Responses (25 in number)

Step 5. The robot faces will be shown randomly and not in order of their mechano-humanness score so as to reduce any bias that may be generated due to the gradual change.

Step 6. Later, after successfully collecting sufficient amount of entries for our research, we tried to analyse the trend for various characteristics for these robots based on the responses.

These plots were used to conclude the best possible design characteristics of a social robot that is meant for teaching students in mainly government schools.

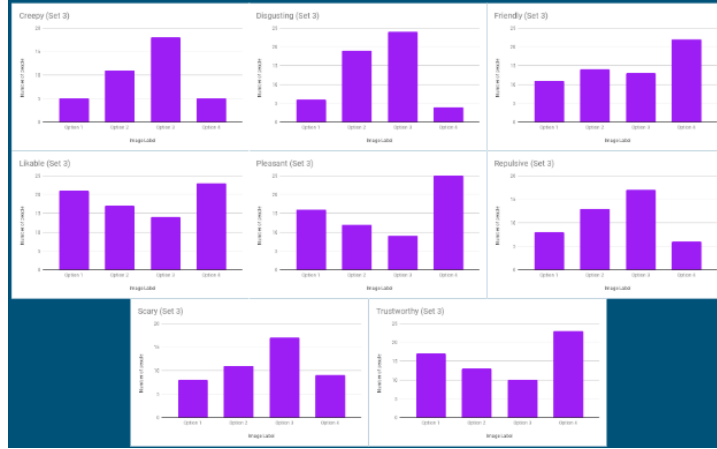
4 Results



(a) Bar Plots for Robot Set 1.



(b) Bar Plots for Robot Set 2.



(c) Bar Plots for Robot Set 3.

5 Conclusion

On the basis of certain vital characteristics (like trustworthy, friendly and approachable) for a robot meant for teaching, we conclude the following:

- There is a clear increase in likeness when we make the design of robot more and more anthropomorphic.
- Once the human-like appearance of the robot increases beyond a point, the likeness starts to decrease.
- The peak of likeness of robot is observed when the robot becomes indistinguishable from a human.