Robots and Intimacies: A Preliminary Study of Perceptions, and Intimacies with Robots

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Abstract. When David Levy first introduced the subject of 'love and sex with robots', he became a provocateur of a conversation that spread from morality to the rights of robots. With the rapid development in Artificial Intelligence, love and sex with robots is expected to be a reality in near future. However, the question remains, how much humans understand and accept intimacies with robots. We argue that perceptions of human-robot interactions (HRI) have a certain impact on how individuals comprehend intimacies with robots. In this study, a pilot study of first stage of a series of studies, we examined the perception of robots, and intimacies with robots, and realized our sample created a 'self and other', and 'over there, but not here' distinction when it comes to the perception of HRI. This stance, we like to identify as an adoption of a moral position, not simply with regards to love and sex with robots, but also communicating to HRI.

Keywords: Robots · Intimacies · Human-robot interactions · Perceptions · Love

1 Introduction

1.1 Background

Connections, relationships, and intimacies between humans and robots have been part of the fantasy of science fiction. Now, it is a conversation in real life, opening possibilities to experience a future, hitherto a mere fiction. Although, robots are highly advanced and largely negatively represented in fiction, real life robots have been part of the human every day for some time now. Robots play a significant, yet not visible roles as efficient machines programed to replace humans in doing tedious repetitious tasks. Service robots are developed to play the roles of domestic staff, to vacuum the floor, or mow the lawn. Then, there are personal robots who performed the tasks of personal concierges, robot toys, and robot arms etc. In all these roles, robots serve and perform a designated task to automated abilities. In other words, robots are advanced tools, accepting certain instructions, and performing assignments.

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The process, or let us call it[1] as the connection, is proceeding from human to robots; requests, instruction, and commands from humans to be adhere to and execute by robots. This pattern of connection is challenged through the developments in artificial intelligence (AI) where, rather than listening to instructions and acting upon it, robots initiate conversation, such as among humans. In other words, robots with cognitive abilities, who comprehend, reason, and preform. The meaningful human-robot interactions have the possibility to develop a human-robot relationship, based on not commands and actions, but on emotional bonds, because both parties are sharing and experiencing emotions.

Levy [1] asks "…if a robot behaves as though it has feelings, can we reasonably argue that it does not?…". This contested the next level of HRI, where complexities of human emotions are pitted against emotions of robots for an authenticity. In the movie 'Bicentennial Man', the robot falls in love with a human and vice versa, however, is the love robot feel for the human any less poignant than human love for the robot? While Levy [1] argues that one can believe robots having feelings if there is a behavior pattern to back them, there is the argument that humans programed the robot, giving it a cognitive platform, thus controlling the feelings and behavior patterns. The 'Bicentennial Man' is a robot independent in cognition, making moral judgments per situations. At this juncture, we arrive at the point where science fiction has been wondering (and frightening), if robots are given the ability to develop their own cognition, to reason and feel, would their moral judgments give them power over humans? More than half a century ago, Asimov[2] [2] answered this matter by imposing rules for robots, which will certainly defeat the purpose of HRI. However, it brings the question of morality associated with thoughts and behaviors, to which Coeckelberg [3] writes an interesting essay. What if a robot could make a moral judgement with the cognitive capacity given to it, and feel and behave accordingly, and if it communicates feelings of love and express the desire for physical intimacies, would we feel threatened, and respond accordingly? When robots are evolved to accommodate, and reciprocate human emotions, humans will find it unimaginable to live without them, bringing forth the rationality to Levy's argument.

Human-robot relationship is not about to happen overnight, since most of the possibilities in discussion here are hypothesizes. But the discussions are happening, because hypothesizing robotic future is not strange to us. Acceptance of robots as companions and lovers first required the acceptance of robots in general as more than assistive labor, toys, and an unknown threat. A very recent study on the layperson's view of robots concluded that the perception of robots are still as mechanical bodies [4] and another

[1] 1999 movie Directed by Chris Columbus and Co-produce by Touchstone Pictures & Columbia Pictures.

[2] (1) A robot may not injure a human being or, through inaction, allow a human being to come to harm. (2) A robot must obey orders given it by human beings except where such orders would conflict with the First Law. (3) A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.
Later he added a forth law or zeroth law 'A robot may not harm humanity, or, by inaction, allow humanity to come to harm'.

study has examined the 'Othering' in human-robot interactions [5], presenting us with layers of challenges in perception in HRI.

As Scheutlz and Arnold [6] discussed in their paper, the human acceptance of sex robots falls within the existing connections and relationships. Human-robot interactions, at this point in time, are rather feudal in structure, robots being programed to take instructions, obey, and execute, just as peasants were conditioned to accept the establishment in feudal societies. With time, robots will be programed to comprehend humans, converse, and build relationship through mutual understandings. Robots will evolve to be emotionally and cognitively intelligent and to communicate and reciprocate thoughts and feelings. With time, Human-robot relationship will not be that of a sex robot and human, but a fully emotional and physical bonding, a sharing and caring union of mutual understanding. It is understandably important for bonds between humans and robots be bidirectional, and if a robot can have the capacity to learn, reason and evolve, it will contribute to the relationship to satisfy its requirements, as well as mindful of others' requirements, thus morally defining the relationship boundaries.

To turn to the purpose of this paper, the impact of interpersonal touch in HRI has been investigated recently with a conclusion that touching intimate areas of a robots' body could trigger a physiological reaction [7]. This was a study conducted using 10 participants who interacted with a human shaped robot by touching the robot's less inaccessible areas of body. This particular approach, where we discern certain gaps, which we will explain when we present our three-phased study, instigated us to further investigate the conclusion and methodology.

This paper is presenting a pilot study conducted on the first phase of three phases study, where both male and female perception of robots and intimacies with robots are discussed. Our sample is limited to 32 individuals of both genders, who provided binary answers to questions that measured their perception to various aspects of human-robot interactions.

1.2 Objectives

As briefly mentioned above, this study is a pilot study of a part of a series of studies intending to be conducted on the topic of love and sex with robots. The series of studies are proposing to determine female perception and physiological responses to intimacy with robots. This pilot study, using both genders, is assessing the method that will be employed in the first stage of the series. The series, that we are proposing, will commence with a quantitative study of the perception of robots and intimacies with robots. At the second level, the physiological responses will be measured, and as the third level, a qualitative study will be conducted to understand the phenomenon.

In this paper, we are presenting the pilot study which we conducted using both genders, as a way of assessing the methodology. Our objective is not only to assess the method, but also to glean some insight into the perceptions of a group of individuals, of both gender, on human-robot interactions.

2 Methodology

2.1 Participants and Process

As indicated, this is an adaptation of a series of studies we are aiming to conduct on the subject of love and sex with robots. In this paper, there is an attempt to understand both male and female perception of robots and intimacy with robots. The focal point of this study is that, our objectives have not defined the representations of robots, either as a tool or a social agent. Our objective is for the participants to create scenarios with their insights and logic, and express their perception of representations, which we have not influenced; instead encouraged through numerous questions that stimulated scenarios both personal and impersonal. The next level of objective is to understand the attitudinal positioning of all participants as an aggregate on certain key criteria.

We have used the Guttman scaling method which is "…applied to a set of binary questions answered by a set of subjects" [8]. Guttman scale is cumulative, thus the questionnaire is progressively difficult, and the process could end with a wrong answer. In addition, Guttman requires binary answers to large number of questions. The justification for using this method is that it allows to understand the level of attitude towards the topic in discussion and the hierarchical structuring of the questionnaire helped to determine the ranking of the score and scale. Since our study is trying to understand the perception of robots in general and intimacy with robots, an attitudinal position as an aggregate, we maintain that this method adequately provided us the answers.

Most of our study participants are from our research institute, while others were selected using the referral sampling method used in non-probability technique. Thus, our participants are aged above 18 years, with varied education levels, and represent several nations. 32 participants, equally represented by gender, answered questions to 13 dimensions. These dimensions are derived from categories that examine particular aspects of the topic in question. The discussion of the results will build a conversation based on these aspects.

2.2 Results

From a 15 dimensions' questionnaire, only 13 dimensions were selected, omitting 2, thus deriving a valid Guttman Scale. A valid scale is which consisted of least errors, since large number of errors conveys the inability to reproduce a pattern of responses [9]. Guttman introduced the coefficient of reproducibility measure to as a measure of validity of the method [10]. Table 1 provides an overview of the study, the initial criteria, the dimensions built on each criterion, both positive and negative answers, detected errors and coefficient of reproducibility (CR) which required to be above 0.9 to have a valid scale.

Table 1. Overview of the study

Criteria	Dimensions	Positive	Negative	Errors	Coefficient of reproducibility (CR)
Awareness	2	338	110	32	0.92
Association	2	189	95	14	0.95
Enjoyment	2	109	243	11	0.96
Attraction	3	192	128	18	0.96
Intimacy	4	468	1132	72	0.95

3 Discussion

As mentioned before, this is part of a series of studies on intimacy with robots. Both male and female participated in this study, where they gave binary answers to succession of questions. This study is, by no means, attempting to establish a broad position on individuals' perspectives of robots, and intimacies with robots, but an attempt to establish an elementary level of understanding of the sample position in relation to the topic. This adaptation is an effort to build a conversation on challenges the topic is facing, and to open doors to further discussions.

The discussion will focus on introducing five criteria on which the study was based, and empirical analysis of results gained through the study.

3.1 Awareness

This criterion is primarily trying to comprehend the level of awareness of robots in the day to day living environments and the level of acceptability of that awareness. Here the awareness is separated in to two categories; awareness of robots in the living space and awareness of the human connection with robots. 80% of participants gave positive answers to this criterion, which contained two dimensions with 13 questions altogether. On the awareness of sharing living space in any capacity they envisage, perspectives of participants inclined towards positive (87.5%). Questions pertaining to the connections between humans and robots, starting with abstract level connections, and progressing to personal connections, majority (77%) tended to be positive. The objective of this dimension is to understand awareness of human-robot connections in various real-imagined scenarios, and the acceptability of both real and imagined possibilities for connections.

On the first dimension, participants naturally understood and accepted that robots are ubiquitous. The questions primarily inquired to the awareness of robots in their environment, from country, state to their workplace. However, in the second dimension where they answered 9 items, they gradually distance themselves from possible connections to the robots. Such as when asked whether they are aware that humans can have robots companions, majority of them accepted the possibility, however, when the same question was asked on a personal note, whether they are aware they can have robot companions, the majority answered negatively to the possibility.

In the awareness criteria, it is understood that awareness of the pervasiveness of robots has not created a further awareness of other promises of robots, such as in the roles of friends, or companions.

3.2 Association

Association is attempting to understand the kind of personal relations individuals prefer to build or imagines preferring to build, and the level of association they conceive they would prefer. Association is realized by asking questions from abstract to personal level such as whether preferring robots in the country perceived as positive as preferring to robots in home. At the second level trying to determine the perception of the preference to certain intimate connections with robots. Overall, 64% of participants answered positively to this criterion.

The first dimension where, the questions gradually progressed from abstract to personal level, 72% of participants gave positive answers, earlier questions garnering more positivity than latter. Question such as whether the participants prefer robots in their country elicits an overwhelming 93% of positivity while whether the participants like robots gaining nods of 56%. The second dimension brought participant to imagine close associations with robots, to which 49% gave positive answers. When asked whether the participants prefer being close with robots, their perspective turns negative only 37% answering positive.

On the criteria of association, associations are placed on a robot that is an abstract entity, that is relatively beyond the existing environs.

3.3 Enjoyment

Enjoyment is a criterion that is attempting to understand the individuals' pleasure and entrainment with/from robots. The objective is to introduce a robot as a pleasurable and entraining entity, and understand the accompanying perception. 55% percent of participants answered positively to ten questions on two dimensions. The first dimension is establishing whether robots are understood objectively as enjoyable and entertaining i.e. the perception that if robots are capable of creating and providing joy, then they are enjoyable. The second dimension is establishing a subjective position i.e. robots are enjoyable to me, and I can enjoy robots.

The first dimension drew 61% of positive answers, positions changing negative progressively at the end of six questions. Questions such as robots are enjoyable is a position that revealed favourable with 84% of participants agreeing with the statement, but robots themselves can be joyful did not elicit similar favorability, only 37% answering positively. The second dimension has an overall percentage of 51 positive answers. Questions such as robots provide joy is observed favourably with 59% of agreeable answers, while to a question that inquired whether robots are part of the joy is favored by 37% positivity.

It is noticeable from the answers that robots are considered as creators and providers of enjoyment, thus enjoyable, however there is a certain lack of enthusiasm to consider robots themselves as part of the process of enjoyment. Even though this perspective

could sound overstated, the participants shows certain reluctance to share enjoyment with robots, considering robots as tools of entrainment.

3.4 Attraction

The objective of this criteria is to understand the perception of emotional attraction of individuals to robots. 28% of participants answered favorably to three scopes of the criteria. The objective of the first dimension is to establish the level of attraction at an abstract level with questions like 'do you find robots attractive?'. On the second level, the questions explored the possibility of being attracted to robots, making the perception personal to a certain extent. The third dimension expanded to directly establish attraction at a closely personal level, contesting the '…robots attractive' to establish '… attracted to robots'.

On the first scope, 44% answers elicit positivity, of which the question trying to ascertain the attractiveness of robots scored 56% of preference while whether that attractiveness could lead to emotional closeness is positively accepted by 34%. The second dimension received 24% positive answers, and to questions attempting to understand the possibility of an individual being emotionally close to a robot elicit 46% of favorability; however, to the question whether the emotional attraction is a possibility on a personal level gained 9% of positive answers. On the third dimension, with only 21% of positive answers, to the questions of whether participants, in any imagined scenario, be attracted emotionally to a robot gained a 9% favorable rate.

The responses to this criterion revealed that some participants find robots attractive, and perceived that individuals could be emotionally attracted to robots. However, on the personal level, the possibility of being emotionally attracted to a robot, majority of participants found implausible. Thus, the higher majority of participants revealed a clear case of acceptance to certain hypothetical scenarios with robots, but with the attitude of 'not me', declining to put themselves in the scenario.

3.5 Intimacy

The objective of this criteria is to understand the perception of intimacy, hypothetically conjured, with robots. The questions on this category started from abstract level gradually progressing to personal positions. 25% of participants positively responded to four dimensions where they answered altogether 50 questions. On the first dimensions the questions were attempting to understand the perception of an intimate relationship with robots; starting from outlying level. i.e. perception of humans in an intimate relationship with robot, towards personal level i.e. the participant in an intimate relationship with robots. 28% participants answered favorably to this criterion. The second dimension was intended to ascertain the perception of love with robots, where questions were arranged in the similar manner to the dimension one. 35% of participants answered positively to 12 questions. The third dimension introduced the sensual involvement, attempting to understand the perception of sensual feelings related to robots. Overall 23% of participants provided positive answers. The fourth dimension gathered only 15% of positive answered from participants who answered 14 questions. The scope of this section is

understanding the perception of sex with robots. The questions were organized in the same manner as previous three dimensions; gradually progressing from abstract level questions to personal level.

On the first dimension, when questioned on the possibility of humans having intimate relationships with robots 56% answered positively, however, when presented with the question whether the participants personally associate intimately with robots 15% participants positively answered. The possibility of humans loving robots, 59% of participants considered as positive, however, when it reached the personal level, 28% of participants gave positive answers. The third dimension where the first question is whether there is a possibility of a sensual involvement between humans and robots, 43% accepted the possibility, and only 12.5% participants gave positive answers to a personal sensual involvement. Sex with a robot is the least favored with only 31% agreeing to the possibility of sex between humans and robots. Only 9% wanted to imagine personal sexual involvement with a robot.

On this criterion, the dimensions developed from emotional to physical involvement with robots, and it was evident that emotional involvement is slightly favored over physical involvement.

As discussed before, and as can be seen in Figs. 1 and 2, in general, abstract emotional and physical level is acceptable to majority of the participants, but the personal involvements are mostly perceived as negative. Throughout this analysis, participants distanced themselves from the perception of being intimately involved with robots, creating a 'self and other' and 'over there but not here' distinction. This distinction could be an adoption of a moral position, not simply with regards to love and sex with robots, which is a highly-contested topic, but also corresponding to human-robot interactions in general. Naturally, there are numerous aspects to human perceptions of relationships, even human-human relationships, and number of elements that compels them. Culture, and economy perform major roles in shaping everyday living of humans, impacting their

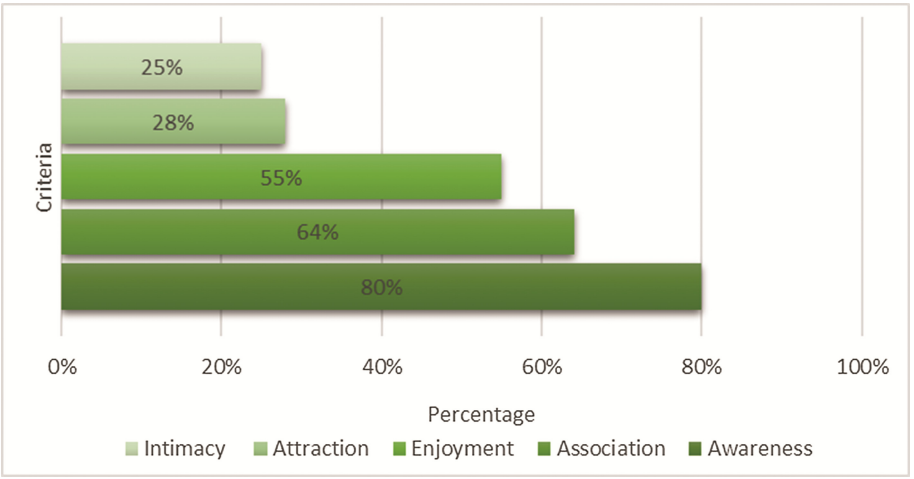

Fig. 1. Overview of overall positive answers

perceptions of morality in relationships. Those factors have not played a role in this study, which could be considered as a limitation. However, we intend to remedy that omission in the third phase of the proposed series of studies.

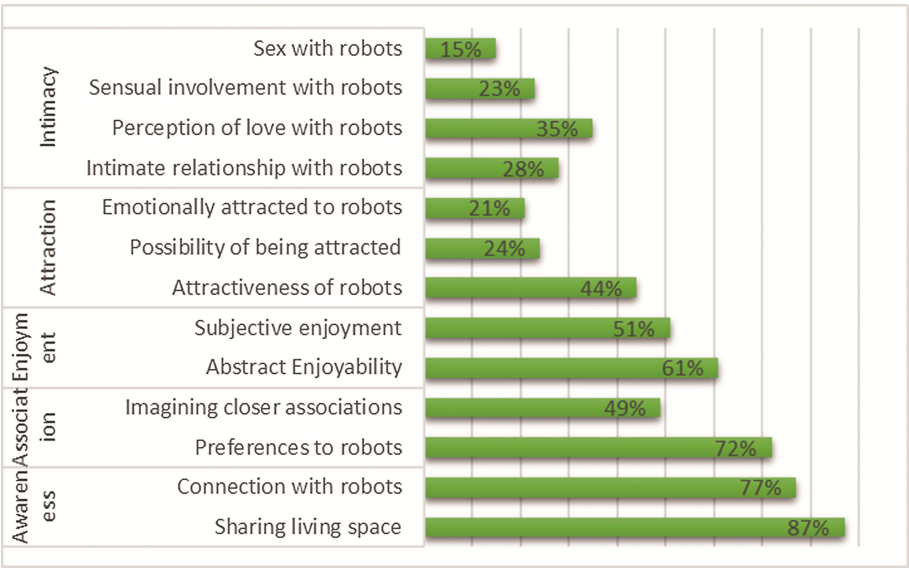

Fig. 2. Overview of the percentage of positive answers to each criterion

3.6 Limitations of the Study

Although this is a pilot study, there are several limitations that required mentioning at this stage. The first limitation is the method of inquiry, which we would like to state is not adequate. Quantitative analysis of hypothetical positions adopted by individuals is commonly performed. However, in this study, examining the answers, considering the binary options provided for answering, and unofficial discussions with some of the participants, we have come to the realization that, for a comprehensive study, adopting both qualitative and quantitative will resulted in rich outcomes.

The subject matter itself presented limitation, considering that human-robot interactions are still at the progressing stage, and even though scholars are predicting and painting highly interactive human-robot environments, at this point in time, love and sex with robots is a hypothetical future. Thus, participants of this study need to imagine scenarios and associate to them, or relate to cultural- moral norms, or simply based their answers on justice and fairness.

On the other hand, we did not define the parameters for robots, giving the freedom for participants to imagine for themselves. The advantage in this approach is that it has broaden the representation of robots, thus expanding the imagination. However, on certain criteria, like enjoyment, the robots inclined to be considered as just toys or in intimacies as sex toys.

The binary answering option this study recommended is understood as a limitation, considering that yes or no will not adequately compensate for numerous nuances some of the questions presented. We endeavored to counterbalance this issue through an empirical discussion of results.

4 Conclusion and Future Work

This study has attempted to comprehend the perception of human-robot interactions, in terms of how humans perceive robots and intimacies with robots. Our sample revealed that their awareness of robots as positive, however, majority is negative to the possibility of being attracted to a robot. Majority of the participants reacted positively to emotional and physical bonding with robots in abstract, distant level, an attitude they adopted to all queries. However, on a personal level of interaction with robots, majority responded negatively. It is noted that participants created a 'self and other' and 'over there but not here' distinction when it comes to their perception of human-robot relationship. The authors recognize this as an adoption of a moral position, not simply with regards to love and sex with robots, but also communicating to HRI.

As we have been mentioning throughout this paper, we are aiming to conduct a series of studies on the perception of human-computer interaction. We will conduct studies of both qualitative and quantitative methods to understand the perception and also a physiological response to intimately touching a robot.

Perceptions of human-robot interactions (HRI) have a certain impact on how individuals comprehend intimacies with robots. Perceptions are products of awareness and logical reasoning, which is not to say that one correlates with the other or both are there at the same time. Unless there is an extensive conversation on topics of HRI, informed reasoning and creation will take a backbench to wild, and ill-informed conceptions and creations. On the other hand, HRI needs these dialogues to assist in their creative ventures, not just to imagine how emotions and desires should feature in the cognition of a robot, but also to imagine the 'freedom to think' and what it could mean to humans-robot relationship.

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