

# How to measure personality traits of characters?

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## **Abstract**

*Personality of robots has played an important role in human-robot interaction. The current study selected and rated 24 popular characters for the Big Five personality traits. 8 participants were recruited to rate the personality traits of each character. We have selected the most attracted characters based on the TIPI scores as good examples of personalities that apply to service robots. The findings created opportunities for designers to design attractive robot personality traits based on the selected characters.*

**Keywords:** *Robots personality, Big Five personality, attractive characters*

## **1 INTRODUCTION**

Service robots are increasingly common in our everyday lives. They are also designed to fulfill professional tasks such as health and care [1]. A good example will be ASIMO designed by Sakagami et al. [2], which is able to assist with in-door receptionist work. As service robots would work closely to human, an overarching goal in robotics is to design robots with appealing personalities to users.

Fong et al. [3] have defined robots having social characteristics with 1) expressing and perceiving emotions, 2) communicating in higher order dialog, 3) being able to recognize other agents, 4) creating and maintaining social relationships, 5) using natural cues like gaze and gestures, 6) depicting personalities, and 7) developing social competencies. A study by Reich and Eyssel [4] reported that personality traits that relate to psychological anthropomorphism can predict positive attitudes towards service robots. Other studies have discussed taking personality into account when designing service robots [5, 6]. In other words, personality is an important factor to service robots that should display social characteristics.

Hence, the aim of our current study was to identify attractive characters from popular movie/TV series that can be good examples for service robots. Furthermore, the main novelty of the current study is that we also measured the personality of each character to identify the appropriate personality traits for service robots.

In this paper, we explained how we selected characters in Section 2. Section 3 shows the result of personality measurement for each character. Section 4 discusses some limitations of the study, and Section 5 concludes this paper and provides suggestions on future work.

## **2 SELECTING ATTRACTIVE CHARACTERS**

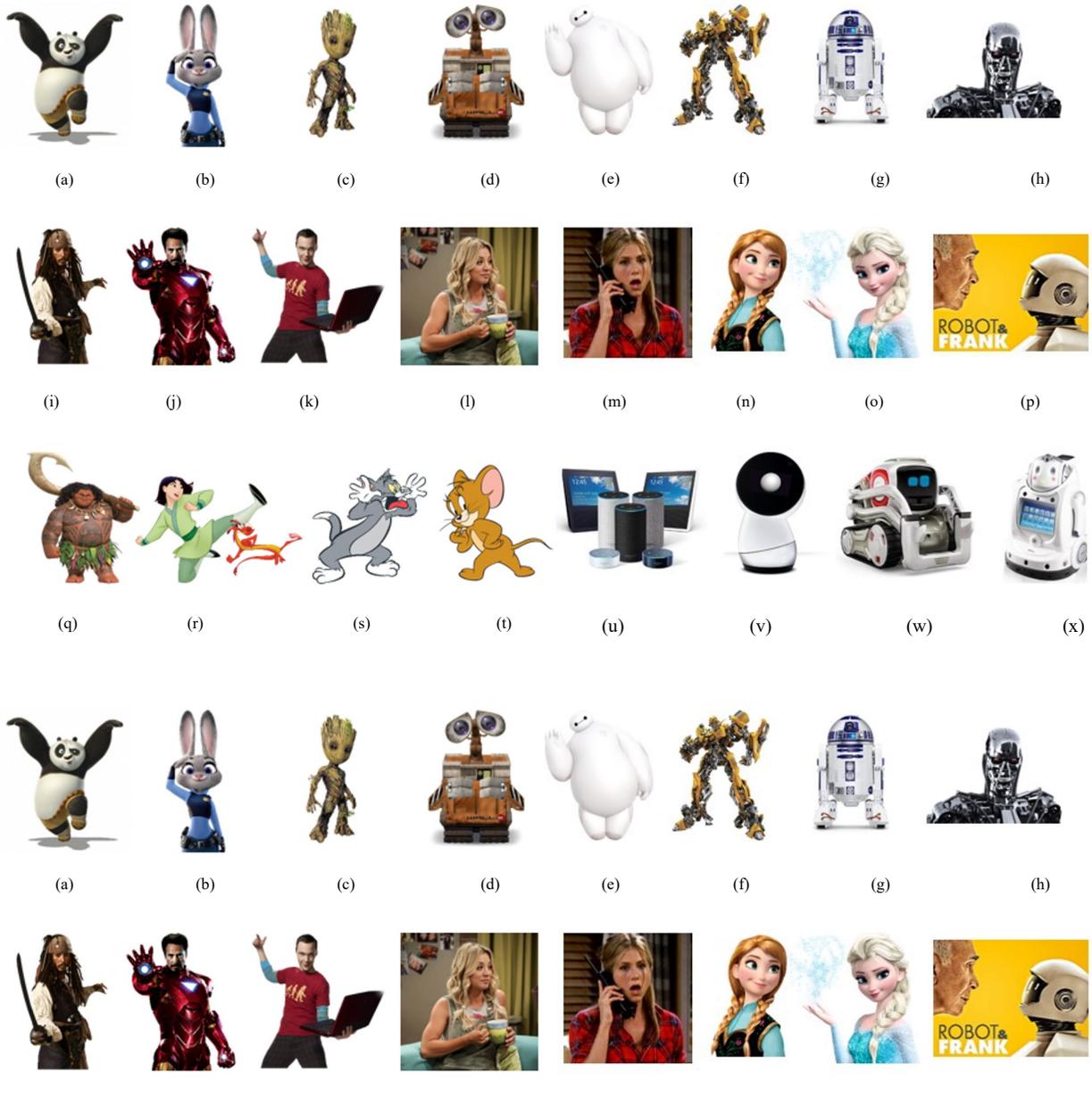
### **2.1 The Big Five Model**

The Big Five is probably one of the most commonly used personality tests for both human and robot. The framework describes personality with five broad dimensions, with each representing a bipolar factor (e.g., extraversion vs. introversion). The five factors are often described as the OCEAN, which are the acronym of openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Each broad factor can further be described by a number of descriptors [7].

Openness to experience reflects an individual’s degree of preferring novelty. Those who score high on openness can be described as imaginative, curious, and individualistic. Conscientiousness measures people’s preferences of organization, or flexibility. Descriptors like self-discipline, attending to details, and organized are often associated with a higher conscientiousness. Extraversion reflects to what extent people are being sociable, and seeking excitement. Agreeableness describes individuals’ tendency to be cooperative. People with a lower score on agreeableness appear to be more stubborn, competitive, or aggressive. Neuroticism shows individuals’ tendency to express negative emotions, and lack of emotional stability [8, 9].

## 2.2 Character Selection

Despite that the Big Five in robot personality is much studied in the human-robot interaction field, how robot designers can design a robot with attractive personality to users remains an important but understudied topic. Indeed, literature of human-human interaction, and human personality shows different approaches or combinations of the Big Five factors for designing an attractive personality of robots. Following this, we argued that referring



personalities from popular movie/TV series characters may open up new opportunities for robots' personality design. The reasons for this approach are two-folded. Firstly, popular characters are demonstrated to be favored by the general public. Some characters were created decades ago (e.g., Tom, and Jerry), and still present in the list of popular or most liked characters. Secondly, rating personality factors on popular characters enables researchers to obtain systematic scores for the OCEAN traits, and applies a similar combination of the traits when designing robots personality. To select attractive characters, 8 researchers selected a number of popular characters from TV, movies, animation, and robots in the real world based on their individual preference, knowledge and understanding of the characters. These characters were selected based on different lists of popular movie characters online, such as Empire [29], and MSN [30]. The list of each researcher was further refined and narrowed down if a) more than half of the researchers do not know the character, b) the characters that are difficult to describe using the Big Five, and c) the characters that are controversial. 24 characters were selected in the final list, including 20 characters, and 4 characters from real robots. Our selection covers both human, and robots' characters. More specifically, in the 20 characters, there are 5 humans, 10 animated humans, and 5 robots' characters. In addition to that, the characters are culture diverse. For instance, Mulan comes from the Asian culture, whereas Maui can represent pacific islands culture. The 4 real robots are Alexa, JIBO, Cozmo and iRobi, which are currently available in the market. Figure 1 shows 24 characters we have selected.

### **3 MEASURING PERSONALITY TRAITS**

#### **3.1 Participants**

8 participants (4 males and 4 females) were recruited for the study and their ages ranged from 20 to 60 years old. They were asked to rate the personality traits for the selected characters from movie or TV dramas.

#### **3.2 TIPI**

There are different instruments for measuring the Big Five, such as NEO-PI-R [31], the BFI-10 [32], and Goldberg's 100 trait adjective rating scales [33]. One disadvantage of the older personality instruments like NEO-PI-R is being time-consuming to complete. For instance, NEO-PI-R contains 240 items, and takes about 45 minutes to complete. Therefore, the ten-item personality inventory (TIPI) was developed by Gosling et al. [34] as a short substitute of long personality instruments, which will only take a minute to complete. Furthermore, the TIPI was tested for reliability and validity, which suggests more accurate and reliable test for the Big Five. We therefore employed the TIPI to test the OCEAN personality traits. The TIPI has selected descriptors from the Big Five using a 7-point Likert scale with 1 "Disagree strongly" to 7 "Agree strongly". There are 2 descriptors in each item (e.g., extraverted, and enthusiastic). Each 2 items test each dimension from the Big Five. For factors with "R", it denotes reverse-scored items. For the normal item, the scoring was 1 for "disagree strongly", and 7 for "agree strongly", while for the reverse-scored items, the scoring was then 7 for "agree strongly", and 1 for "disagree strongly". The score of each trait is the average of scores in both the item and reversed item (e.g., item O, and item OR).

#### **3.3 Procedure**

Each participant was provided with a brief introduction, and one to three YouTube videos of each character. Each YouTube video takes between 30 seconds and 3 minutes. This allows participants to familiarize the characters if they have never encountered them before. After the introduction and the videos, they would complete the TIPI personality test [34] for each character. The total experiment took approximately 1 hour to complete.

#### **3.4 The Big Five Traits of Characters**

We analyzed the TIPI results by collapsing across participants and obtained an average score of each trait of the Big Five for each character. Each trait was graded with a score between 1 and 7, according to the average

score. Figure 2 has shown the OCEAN trait scores for 24 selected characters. We then screened characters in each group, and applied criteria of low neuroticism, and high agreeableness, conscientiousness and openness. As a result, Judy Hopps, and Baymax were selected in extravert and introvert groups.

## 4 DISCUSSION

Our study aimed at identifying attractive characters using the Big Five. We firstly selected popular or famous movie/TV characters with the criteria that they should appear low neuroticism, and high agreeableness, openness and conscientiousness. With the 24 selected characters rated with the TIPI score, we selected Judy Hopps, and Baymax as the most attractive character that represents extravert and introvert personalities, respectively.

### 4.1 Implications

The current approach of using popular characters will provide extra dimensions that are important to consider in robot personality design. We have incorporated all dimensions of the Big Five in determining attractive personality of a robot. In previous literature, studies on robots' personality largely emphasized on the extraversion/introversion dimension [23]. To our knowledge, how the remaining four dimensions of the Big Five can be incorporated in robots' personality is rarely discussed. Therefore, this study can, at least, lay the foundation of future hypothesis generation in designing robots' personality with different combinations of the Big Five.

### 4.2 Limitations and Future Directions

One limitation of the study would be that more introverted characters can be selected. Based on the TIPI score, our result suggested only two characters in the introvert group. Hence, more introverted characters can be included for a better representation of the introvert group in future studies.

Another limitation could be that participants rated the TIPI scores based on introduction and YouTube video clips provided. If some participants were not familiar with the character or the movie, the score may not be

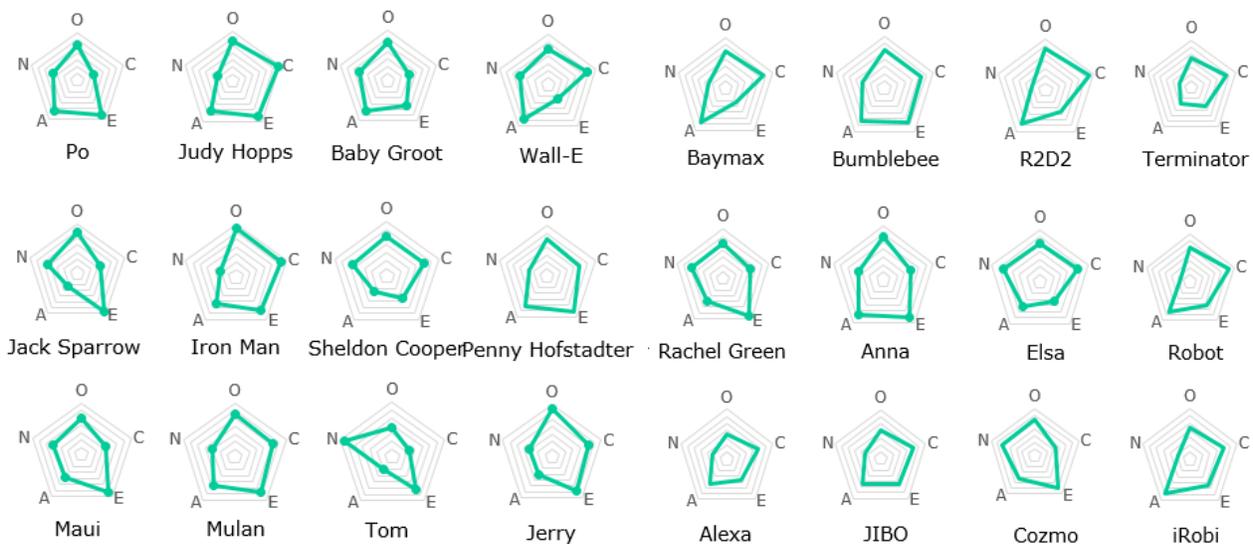


Figure 2 TIPI score of 24 selected characters.

accurate. The future study can include a familiarity score to act as a cross reference for a more accurate scoring for the characters.

## 5 CONCLUSION

In conclusion, the novelty of the study is the use of attractive characters to map on desired personality traits service robots should have. The current study has identified four popular movie/TV series characters as a reference in designing attractive service robots' personality. We have incorporated the TIPI in obtaining the Big Five score for each character, which allows us to quantitatively compare the characters. We have further selected Judy Hopps, and Baymax as representatives of attractive personalities.

Future studies can investigate characters with different combinations of the Big Five personality traits, and have participants rated for the personality attractiveness level. In this way, researchers can obtain more systematic characters' selection criteria. In addition, further studies can explore the dynamics of personality change in time when service robots are interacting with human.

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