

## Social robot

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Alejandro Villaron  
Rewa Abou Raas  
Yifan Wu  
Ting Hui Cheng

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UPPSALA  
UNIVERSITET

# 1 Abstract

The research question is: Does the emotional expression of the robot influence people’s perception of its empathy and likability in the interview? Two versions of the Furhat robot were programmed, one neutral version and one empathetic version for the purpose of creating meaningful social interactions with elderly people in nursing homes. Eight elderly people were recruited for user research, giving hints on the choice of the robot’s personality and conversation topics. The scripted conversation was tested through the Zoom with the virtual Furhat robot. Ten participants were recruited for testing the robot in an in-subject test with one to three days between the two sessions.

Results show slight increased empathy among participants in perceiving the empathetic version compared to the neutral version. Since no participant from the target group of elderly people living in nursing homes were recruited, along with very few participants and speech recognition problems encountered in some of the test sessions, it is not possible to draw any obvious conclusions from this study. More tests are needed to answer the research question.

# 2 Introduction

Robots are the future many may say, especially social ones. Now that more people are heading towards a more digital world, creative solutions are even more necessary. To answer the research question: Does the emotional expression of the robot influence people’s perception of its empathy and likability in the interview? the group designed, programmed and evaluated the interaction of the Furhat robot.

# 3 Application

## 3.1 Design of Application

The group members’ parents and grandparents, total 8 participants were recruited for user research. The interview questions were created based on the Katz-Hass questions and the 4Ws. The interviews were approximately 30 min long, exploring the participant’s previous interactions with robots or similar experiences, as well as previous experiences of loneliness and isolation.

Participant	Age	Gender	Living alone?
1	72	F	No
2	75	M	No
3	71	M	No
4	57	F	No
5	49	F	No
6	50	M	No
7	74	F	No
8	76	M	No

Table 1: User research participant demographics

The results from the interviews were compiled and discussed among the group members, which led to the conclusion that a robot that displays personality and flaws is perceived as more human-like. The robot should bring up topics close to the elderly lifestyle, e.g. health, weather, family, food, interests, memories, appearance, assistance and environment. 30 seconds to one minute of dialogues and questions were created for each topic, prompting the user to answer with either YES/NO or using natural language.

## 3.2 Development of Application

The topics and dialogues were implemented using the Furhat SDK. Due to the limitation of a three minute dialogue, only the topics of health, appearance and interests were implemented

in the final version. The dialogue in both the neutral and the empathetic versions began with a self introduction by the robot; followed by an episode from the robot’s memory, displaying personality and human-likeness, followed by conversation topics and questions. The robot’s utterances were scripted by tweaking the sentence structures and delays between sentences until sufficient flow and natural feel in the dialogue was reached.

The face texture "Ted" along with PollyNeuralVoice.Joey() with an american accent were selected for the beginning of the introduction, and switching to the face texture "Ursula" and PollyNeuralVoice.Amy() with a British accent at the end of the introduction. The face textures and voices were the same for both versions and were chosen to display the possibilities of the robot.

The independent variables in this study, i.e. the properties that distinguishes the empathetic version and the neutral version were:

- More and exaggerated facial expressions displaying joy, disgust, scepticism etc.
- Delays i in speech when waiting for a reply from the user and utterances e.g. "Yeah, that’s great!" vs. "yes." and "Okay, maybe you’re right." vs. "Oh, Okay."
- Head movements, nodding, shaking, wobbling

The dependent variable is thus the reaction of the user when exposed to these two versions of the robot. The confounding variables are:

- The carry-on effects of in-subject testing and the short cool-down period between tests of the two versions
- The variations in the test environment, e.g. weather, mood, physical well-being. Especially if there are noises that could interfere with the speech recognition of the robot.
- Problems with the speech recognition.
- The lack of the physical presence of a real robot.

A wizard of oz option was implemented in case the robot got stuck on a reply from the user due to faults in the speech recognition. The final versions of the interaction between the robot and one of the group members were filmed. The application was compiled and tested both individually by the group members and together as a group.

## 4 Method

Ten participants were scheduled for testing the robot of the within-subject study. Four of the participants also participated the previous user research interviews. The test sessions were around 15 minutes long, including an introduction to the robot and an explanation of the study. A verbal consent was received from each participant before the test began.

Participant	Age	Living alone?	Days between 1st and 2nd session
1	30-40	No	3
2	70-80	No	3
3	70-80	No	3
4	40-50	No	3
5	70-80	No	3
6	50-60	No	3
7	50-60	No	3
8	40-50	yes	3
9	20-30	No	1
10	20-30	No	1

Table 2: Robot test participant demographics

The test was performed via screen sharing using Zoom on the group members’ the participants’ own laptops. The group member shared his/her screen and sound and captured

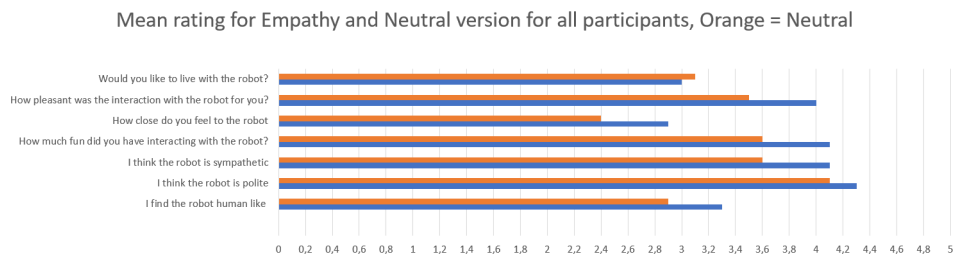
the voice of the participants' from the other end. The participants could interact with the robot via zoom quite well as there were no audio or visual delays in the interaction.

The order of the neutral/empathetic versions were randomised for each participant in the first test session . The participants waited for three days between testing the first and the second versions to reduce the carry-on effects. The test sessions were scheduled during the same hours of the day; and the participants were asked not to talk about the robot after the first test session to further reduce the confounding effects.

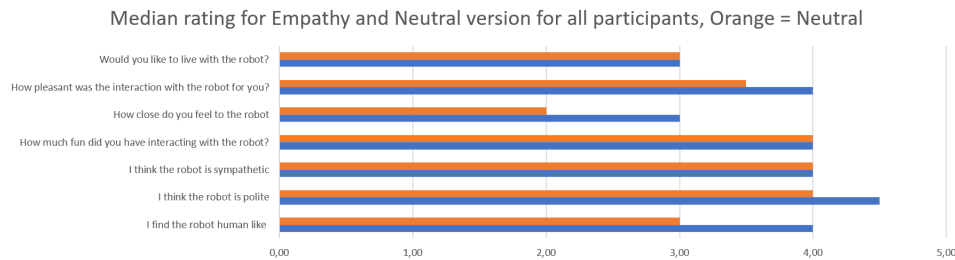
The participants were asked to fill out a post-test questionnaire [1] based on Salem's paper on perceived likeability of robots [2] . The ratios of the scores (Likert scale 1-5) to each question, e.g. "how close do you feel to the robot?" were analysed together for the neutral and the empathetic versions. The mean and median for all questionnaire answers were calculated and charted using Microsoft Excel.

## 5 Results

For most participants, speech recognition worked as expected with only a few repeated questions from the robot. Two participants really struggled with the speech recognition in the empathy version of the robot to the point of losing patience. The questionnaire rating that followed suffered from this fact, rather than the emotional display of the robot, especially in the "Would you like to live with the robot" question. The mean rating of all the questionnaire answers show a slight preference for the empathetic version among participants, the participants felt more emotions and empathy from the robot in 6 out of 7 questions.



The median rating of the questionnaires show similar results as the mean rating, although less significant. 4 out of 7 questions were rated higher for the empathetic version of the robot.



The overall reading from the questionnaire is that the participant found the robot to be polite, sympathetic and it was fun to interact with it. The participants did not have any strong opinions for whether they felt emotional closeness to the robot or if they'd like to live with the robot. The empathetic version was perceived to be better on almost all of the metrics. The only place where the empathetic version rated less than the neutral version was in the questions "would you like to live with the robot", which could be explained by irritation resulting from errors in the speech recognition in one of the test sessions with the empathetic version. The overall feedback expressed by the the participants, was that the experience was pleasant and interesting but the robot talked a bit too much and the participants would liked to have more opportunities to speak.

## 6 Discussion

### 6.1 Challenges Faced

The user research would've been better if we had access to nursing home residents. The group members' parents and grandparents did not live alone nor felt lonely which makes them somewhat unfitting as participants for this study. No participant had any previous social interactions with robots. Thus, the requirements were based on the participants' speculations on what a social robot should be and how it should behave. Some participants were asked to describe their previous experiences with chat-bots used in the tax agency, insurance companies etc, which was the closest thing to a social robot interaction. Ultimately, the requirements were not very precise, as the participants were unable to describe how they would feel when imagining an interaction with a social robot.

More familiarisation with the Furhat SDK and the Kotlin language would've been useful along with more knowledge about linguistics and psychology. The group struggled a bit with creating natural dialogues as well as trying to anticipate the users' questions and answers. Since the scope of a social robot is so large, as opposed to the limited scope of e.g. a chat-bot from a website or the tax agency, the Furhat robot must be able to anticipate a wide range of questions, answers and linguistic variations from the user; and address the user in a non-repetitive and non-annoying way, which is very difficult. E.g. if the robot fails to recognise the user's answer or questions a couple of times in a row, the user would lose patience and give up the interaction altogether.

It is difficult to isolate the reason for the perceived empathy/lack of empathy when the speech recognition is not working as it should. When the robot doesn't understand the user and repeats a question over and over again, it'll undoubtedly ruin much of the experience, even if the empathy part is working fine.

The group experienced some problems initially in setting up the IDE and the SDK and faced some debug issues which lead to delays in the project. The delay shortened the cool-down period between testing the neutral and empathetic versions to three days instead of one week, which could've affected the test results since the participants might not have forgot the experience from the previous test session.

Due to the constraints of the pandemic, it was not possible to test the application on a physical Furhat robot. The virtual robot is rendered on the screen of a laptop which confines the user to a fixed place in space and forces the user to interact with it through a device. The virtual robot does not follow the user with its gaze which is an important social cue. The physical presence of the robot is probably a big part of the experience which virtual robots cannot simulate.

The number of participants we could recruit is too small for a quantitative study and to perform statistical analysis on our results. We could've excluded some participants for struggling with the speech recognition but that would've left us with even fewer participants. The results of this project would be best suited as a pilot study of trying to answer the research question.

### 6.2 Ethical Issues

The robot did not ask any inappropriate or personal questions and was designed to be polite and respectful. If the robot is implemented in a real nursing home, it would be placed indoors in the private space of the resident, listening and watching his/hers movements which is a privacy concern. To optimise the social interaction, the user's personal information including previous memories and experiences, preferences and secrets must be saved in the robot to simulate and create a sense of connection and trust between the robot and the user. If this information is not kept under the direct control of the user, and the user is constantly sharing personal information with the robot without second thoughts, it would cause some serious ethical and privacy issues.

The participants were asked for verbal consent because written consent were not possible to obtain. The participants, being the parents or grandparents of the group members, so the participants already trust us to ensure that they're properly anonymized and their privacy respected. If this study is done at a nursing home with real residents, the consent would be

done more rigorously, making sure that the participants know what they're being tested for and how their privacy and data is being handled.

## 7 Conclusion

In this project we programmed a robot to interact with older people and give them company specially during the pandemic since people are more isolated than before. To make sure that the robot talks about subjects that is interesting to our target group we made an interview with older people and ask them what they would like to talk about. This also gave us a better understanding to how the conversation may goes and how the empathy version of the robot should talk to be more human-like and polite.

The next step was to implement and program the robot, this step was divided into to submission, programming the empathy version and the natural version. Natural version had almost no facial expressions and less empathy words.

Once we were done programming we started testing the robot. We asked some older members of our family and some friends to test the robot and fill in a post-test formal. The post-test was written based on studies and is made to measure the different between the empathetic version and the natural one. We tried to minimise the carry out effect by keeping some days between the two tests. The results shows some participant felt closer to the empathy version of the robot and felt the it was more human-like. Most of them would like to talk even more with the empathy one and enjoyed it more.

Further testing and research and more participants are needed to validate our results.

## 8 Appendix

### 8.1 UCD interviews

Participant 1 and 2

Have you had any interactions with robots before?

If No: would you like to try?

What's the closest thing to this robot that you've used?

Siri/Google assistant

What kind of conversations did you have with it?

Haven't use it much at all

If No: Have you had conversations with a nurse? How was that experience?

I know more than the doctor about my own condition.

Some small talk, about pension, the doctor was old. It's easier to small talk with someone live, vs. on telephone.

Who do you call when you feel alone?

What do you talk about?

We have never felt alone.

The insurance company, about travel insurance, small talk, female service rep.

If they could extend the insurance but they couldn't, instead they helped us to another insurance company, was very helpful

Even if they couldn't help us directly, they still tried their best to help us.

They said their name, explained the insurance policies and the conversation felt personal, nice tone in the voice, nice attitude.

The doctor asked about Italy, about the weather, the house, was a bit jealous.

A have shoulder and knee problems. Small-talks with the physiotherapist about weather etc.

The physiotherapist had a Norwegian accent, which was a conversation starter. She had a Norwegian husband.

What do you think about when you're home alone?

Thinks about the vaccine, when Covid will end,

There is a girl helping out with the house in Italy, there is a lot of snow in the mountains there, the temperature gets below zero during nights, the house could get moldy. No contact with the neighbours.

Feelings, interests, activities, and contact with the family At home in Sweden, read about scientific articles in molecular biology and toxicology, watch TV, movies, sport events, right now there is a skiing event with Swedish contestants. Do crosswords.

What do you have in your room? Describe colours, furniture, lighting etc.

The apartment looks the same, we bought a new wool carpet 1,7mx2,3m, real wool, from HIMLA in Täby Centrum, the assistant was nice, got 20

What kind of face/texture do you prefer on the robot?

Elsa, neutral facial expression is not very friendly, well defined eyes is important.

A wants female robot

B wants male robot

Participant 3 and 4

Have you had any interactions with robots before? (if we understand a robot like something similar to the furhat robot, then no)

Yes, a surgeon robot. (However she wasn't conscious so its not relevant to the scope of this answer)

If No: would you like to try?

Not in particular, but would not mind.

To speak yes. Specially during those times you might feel alone..

What's the closest thing to this robot that you've used?

A computer: you can ask questions, it has an artificial intelligence given by humans. A tool programmed by humans to develop tasks. Also, the surgery robot in the hospital.

An ATM,

Where did you interact with it?

On a daily basis, it's a personal device and permanent. In the example of computer, in a

home environment. In the case of the phone, everywhere.

In the Street/bank

What kind of conversations did you have with it?

For example, with the laptop, I dictate something and the laptop writes it (text to speech).

With the gps guide, the robot replies with the route to follow and instructions.

Procedure (algorithm) programmed to execute the transaction required.

If No: Have you had conversations with a nurse? How was that experience? 1) Yes. Normal.

Sideways conversation, asking for information regarding the situation (new question) do you think we could imitate such conversation with a robotic algorithm? – Yes, its like using the robots at the supermarket, it's a conversation with patterns like any other. 2)

Yes, it was good. The most positive, human treating, knowing how to deal with the patient.

In addition, the negative side would be the same but in a negative way, when they treat people like kettle without caring for them.

Who do you call when you feel alone?

Obviously not a robot (joke). At my family, at a friend, job mate... but generally when I'm alone the more time spend I with is with the computer.

In the hospital, a nurse. At home, to his husband or her sons.

What do you talk about?

Depending on the situation. If it's because you're anxious, you ask calling for help/advise.

If it's just chitchat then you call only for having some laughs or for routine. To spend time with them and have a conversation. Probably about covid during these times, but any thing, just a general conversation to talk, no particular topic. About family....

Why do you call this person? (see previous question)

For trust and closeness. The nurse because they would have the knowledge to help her about her condition/situation

What conversation topics are special to you?

Whatever topic you might be worried about nowadays. For me, a conversation about how problem solving techniques and decision taking, and critical thinking (in this case the robot would be a great feature to have and to discuss with) , but it depends on each person's interests

Music, actuality topics, what is happening in the current situation, talking about family, sons, grandsons... Family is a big topic! Personal interest: heart disease related to personal experience. What is good for it, what is not....

Why?

Because is personal and subjective interest, no special reason besides that. If someone liked paintings or books, they would enjoy those topics of conversation.

Because those are the things that interest her. Those are her personal likes.

What do you think about when you're home alone?

Study and research about his interest on decision making techniques and analysis systems, , because it's a topic that has been important in his life and thinks it could be a good legacy for him and it could help more people. Like a research. That keep his mind busy. People at his age get obsessed with something that makes them feel complete and busy.

Anxiety, cyclic thoughts, constant worry about near family and getting infected by the virus, how to be prepared... Reminding previous better times (holidays, etc)

Feelings, interests, activities, and contact with the family (contact with family) Normal, like everyone else. Some more close and some more distant. Most by online because of distant and covid situation., others see once a week more or less. (activities) Golf, exercise, depends on what each likes.

Activities home alone: knitting, listening to classical music, watching tv, listening to the radio, Reading newspapers and magazines

Family: Reduced contact, mostly with the husband (living together) and some visits of family members, but very reduced.

What do you have in your room? Describe colors, furniture, lighting etc.

Natural lightning aiming to the laptop, which is very useful with very good light. Quite messy with too many papers, but knowing what is inside his mess. White walls and light wood furniture. Also, have a kettlebell to exercise sometimes.

Big Windows, lot of natural light, two couches and one table, a relatively big space



Tell me a story about something special that happened last week?

Yes. His sister in law is in a bad health state and might pass away. However, while facing that situation, he still thinks you should never give up and always try once more time.

Nothing special happened in the last weeks.

What was special about it?

Special because is a delicate situation that affects him personally, and it's a pill hard to swallow. (nothing because no special event)

How did it make you feel? why?

A bit discouraged because of the nature of the situation, but he's still optimistic in the sense of he knows there's always a chance to keep trying one more time and don't give up.

It makes her feel bored and lose time perception.

Everyday is the same as before, she wants the whole situation to be over. (why) Because she has the same routine every day, with no external elements to change it.

What are your expectations of the robot and the interaction?

He would love to have such robot to explain him all the different things he's interested to (problem solving and piano). Of course, it depends on every person. In addition, a good thing would be its neutrality. For example, if a robot makes you an interview they will be neutral, unlike a human person.

To be useful and remind her things to do, help her to walk if she cannot, be useful for a purpose. Mobility robot, Old people need mobility (or even just supporting her by grabbing one arm).

What kind of face/texture do you prefer on the robot? Cheerful and nice. Not an ugly/serious kind. Something jolly that would cheer him up

Human face. A normal man/woman. She would prefer man, and if he's handsome, better (jokes), handsome/ good looking traits.

What kind of a voice should a robot have?

The accent would be important. Optimistic in the way of speaking. Definitely not a neutral robotic voice. Even if it's a serious conversation, like the previous one of death of a relative, the robot should have a nice and positive tone trying to cheer up, never pessimistic.

Cute, soothing. Like a poetry-reading kind. Low pitched but not aggressive. Easy in the ear.

Participant 5 6

Have you had any interactions with robots before?

No

No

If No: would you like to try?

Maybe...not in particular

Yes

What's the closest thing to this robot that you've used?

I don't catch up with those new technologies actually. I even started to use a phone three years ago. The closest thing might be a phone or a computer.

Computer.

Where did you interact with it? I usually don't go out. So I use both my phone and computer at home.

At home

What kind of conversations did you have with it?

I don't really have conversations with it. I only use them to contact friends or family members.

I only use computer to chat with friends or look at stocks

If No: Have you had conversations with a nurse? How was that experience?

Yes. When I went to see the doctor, I chatted with a nurse. Usually about the information of treatment. The experience was nice.

Yes. The experience was good. We talked about how to take medicine or cautions.

Who do you call when you feel alone?

I'll call my son and daughter when I feel alone.

Friends or family members. Generally, I call my kids more.

What do you talk about?

Daily life... maybe. We talk randomly so there is no specific topic.

Ask about how life is going or how work is going. Just some general talk. Why do you call this person?

Because they are family members. Only relatives are able to be concerned with each other. They are more close to me and they are the only people I can think of if I want to call someone.

What conversation topics are special to you?

Nothing special. They are healthy and their work goes well are the most important things.

Nothing special. Things about family members are the main topics of the conversation.

What do you think about when you're home alone?

I don't really think anything special. I usually draw, practice calligraphy, and play Gobang online so I am not really bored or lonely.

Nothing. I'll do stuff when I'm alone, like playing the computer, watching stock, looking at the latest news, listening to music, playing piano or harmonica.

Feelings, interests, activities, and contact with the family (Contact with the family) I lived with sons and my daughter visits us two to three times a month. When she is busy, we still contact each other via phone. Other family members depend on how close we are and also the distance we lived. But mostly we still talk to each other online if we have time. (Contact with the family) [Same as above]

What do you have in your room? Describe colors, furniture, lighting etc.

White wall. Three big cabinets, a tailor machine, nightstand with some books on top, and a big bed. Lights are not strong.

The room is not large but cozy.

[Same as above]

Tell me a story about something special that happened last week?

Nothing really special I think.

Chinese New Years. There were a lot of relatives who came to visit us. We play majiang together and I self-drawn(better than win) several times.

What was special about it? X

Because Chinese new years are only one time a year and it's the only time lots of our family members can be together.

How did it make you feel? why? X

Happy. Because all of us are healthy and can be together and play.

What are your expectations of the robot and the interaction?

Hope that there is a robot that can help with cleaning. Or some robots that can play Gobang with her(because sometimes I couldn't find another user that has the same level).

Maybe a robot that can organize news that I might be interested in and report to me. So I don't need to search them by myself.

What kind of face/texture do you prefer on the robot?

Human-like. Hope it can look nice.

Human-like...maybe. No specific.

What kind of a voice should a robot have?

More like a human being, instead of a more robotic voice.

Like a real human.

## 8.2 Robot interview dialogues topics

**Introduction:** Hello, my name is Elsa, I come from Sweden. Have you ever met a robot before? How is your day? I haven't talked to anyone in a while and it was getting boring. Does that happen to you?

**Health(Ting):** I was once dropped by a user accidentally. My back, then, broke into two pieces. It hurt so much, and it almost took one month to heal. My parents spent lots of time on the surgery. Although I look well right now, I sometimes still can feel the pain in my back. It's so annoying. Did you ever hurt your back? or do you have a backache?

(If yes)Oh, really. Then, you definitely know how painful it is. (If No)Well, You're so lucky. You don't know how I suffer from that. After the surgery, it almost took me another month to return to my health like before. It was a struggle. From the start, I couldn't even get up from the bed by myself. My whole body felt weak and heavy. I could feel the pain from my wound every moment, and my parents forced me to do a lot of exercises. That

made me more hurt. I hated it so much, but I still have to, otherwise, I might not be able to walk again, they said. I cried almost every day because it was so painful and I was so afraid. I didn't know whether they would abandon me if I couldn't move or not. Bad memories.

(If yes) Oops, I talk too much about myself. How about you? How is your backache? I hope it is good right now.

**Weather, etc (Yifan):** I can't wait for spring to come, this winter has been the worst for many years, and the pandemic too, really nowhere to go. You must've been so bored being at home all this time. Well, soon spring will come and it'll be nice and warm outside and you can go and sit in the sun.

I think everything will go back to normal this summer, the vaccine is coming along and the warm weather will help to keep the virus in check. Last summer wasn't too bad, considering the circumstances. You'll finally be able to meet family and friends again, very soon! Take me to your grandkids, I'd like to meet them!

I met the best travel insurance salesperson the other day, she was super nice, I called her because I wanted to go to Italy to visit my parents. She told me that their insurance didn't cover robots, but she could make an exception for me! So I'm now insured up to 5 million for a trip to Italy. If only I could sign the contract somehow... Well... Why don't you take me to Italy next year? I'd like to see the mediterranean, and the colosseum, and David! Yes, I'd like to have a body just like that. I can really recommend this insurance company, they're called XYZ, if I can get insurance there I'm sure it wouldn't be any problems for you. Tell me if you want one, I know exactly who to talk to.

**Family/social situation(Rewa)** So, I call my creator mom, do you think that is weird? I mean I see that you humans have families and I would like to get on someday, although I can't exactly see how that is going to be possible, but maybe if I could get smarter and eventually create another robot then I can call it my baby. I would like to have a daughter in this case. What about you, do you have a family? If they have a family: Ask about details: how many kids do you have? How often do you talk to them? What do they do in their lives? Tell me more about them. If not: oh, why is that if I may ask? Potential answers: Focus on work Never wanted a family Didn't find the right one

**Food(Rewa):** One thing I would love to try is food, you humans seem to enjoy it a lot, I mean I like that I don't have to eat, it takes so much effort and time, however, it seems joyful. Is there any kind of food you think I should really try? Would you cook it for me? If yes: what kind of food you cook the best? Mmm, that sounds yummy! I would like to try it someday! If no: who cooks for you usually? What is your favorite kind of food? mine is probably Indian, although I can't taste it, it looks so colorful. What did you have for lunch today? Was it good?

**Assistance(Ting):** You know, although I'm a robot, I still can do a lot of things. I like fishing. I enjoy traveling. I love playing chess, singing songs, playing sports, reading books, drawing, dancing, playing instruments, and seeing movies. I have learned a lot of stuff. I also have a lot of knowledge. Like, you know, it's pretty easy for me to search for anything online. So if you have any problems, don't hesitate, I will definitely help you as well as I could. Do you need anything else? Is there something I can help you with? I am here to help you, so don't worry, I am happy to help in any way I can.

(If no) That's ok. I'm always here for you. So If you need anything, you can always tell me at any moment. I'll be happy to assist in any way I can.

**Old times/Memories(Yifan):** I used to love old movies, especially the spaghetti westerns, Clint Eastwood, Charles Bronson...There were not many actresses in those movies. Did you know they were mostly filmed in Italy? We should watch them again sometime, how about tonight? A fistful of dollars! I think I have it saved on my drive somewhere.

You know the earliest robots that were similar to me were invented in 1928? Its name was George. It couldn't do much, only move his head and arms, well that's more than I can do. But he couldn't talk like I do. The first android was invented in Japan in the 1970s. It was around that time speech recognition and speech synthesis started to appear in universities. They were pretty bad though, not nearly as sophisticated as me. Somehow all androids out there are female, I wonder why?

Do you like fishing? I mean out on the lake. I really like it, makes me feel superior somehow.

**Appearance (Yifan):** You know, I could really use some hair on my head, would you

help me out and be on the lookout for a wig next time you go to the mall? What do you think will look good on me? I think I'd look good with long blonde hair/grey hair, I've been trying to go for the Madonna 80's/Richard Gere look, what do you think? Unfortunately, my parents, who are engineers, by the way, didn't encourage me to be beautiful or fashionable... they raised me to be an engineer, and so I'm super good at math. I can recite 100,000 digits of PI, would you like to hear it? ...they raised me to be a writer, would you like me to recite a poem for you?

Someday I'd like to have a body too, I'd like to be well balanced/tall and strong, like you! You must've been tall and strong back in the day no? I'm not complaining or anything, at least I have a head, Siri/Google assistant wasn't even born with a head! Imagine what that'd feel like!? Do you know what I mean? I really like their voices though, we chat sometimes. Wouldn't want to look like Sofia though, have you seen her on youtube? (Psst) She is creeeeepy... here, I sent a link to your phone, look at her (scared) !!! . I'd like to do some sports too, like skiing, or running. Not swimming though, I hate water. Watching sports is also fun, if you want to watch sports events sometime, just bring me to the table next to your armchair and we can watch it together. I can't swim but I sure like to watch people swim! What kind of sports did you do back in the day? For me, it was mostly rolling and falling from high places, not that fun if you ask me.

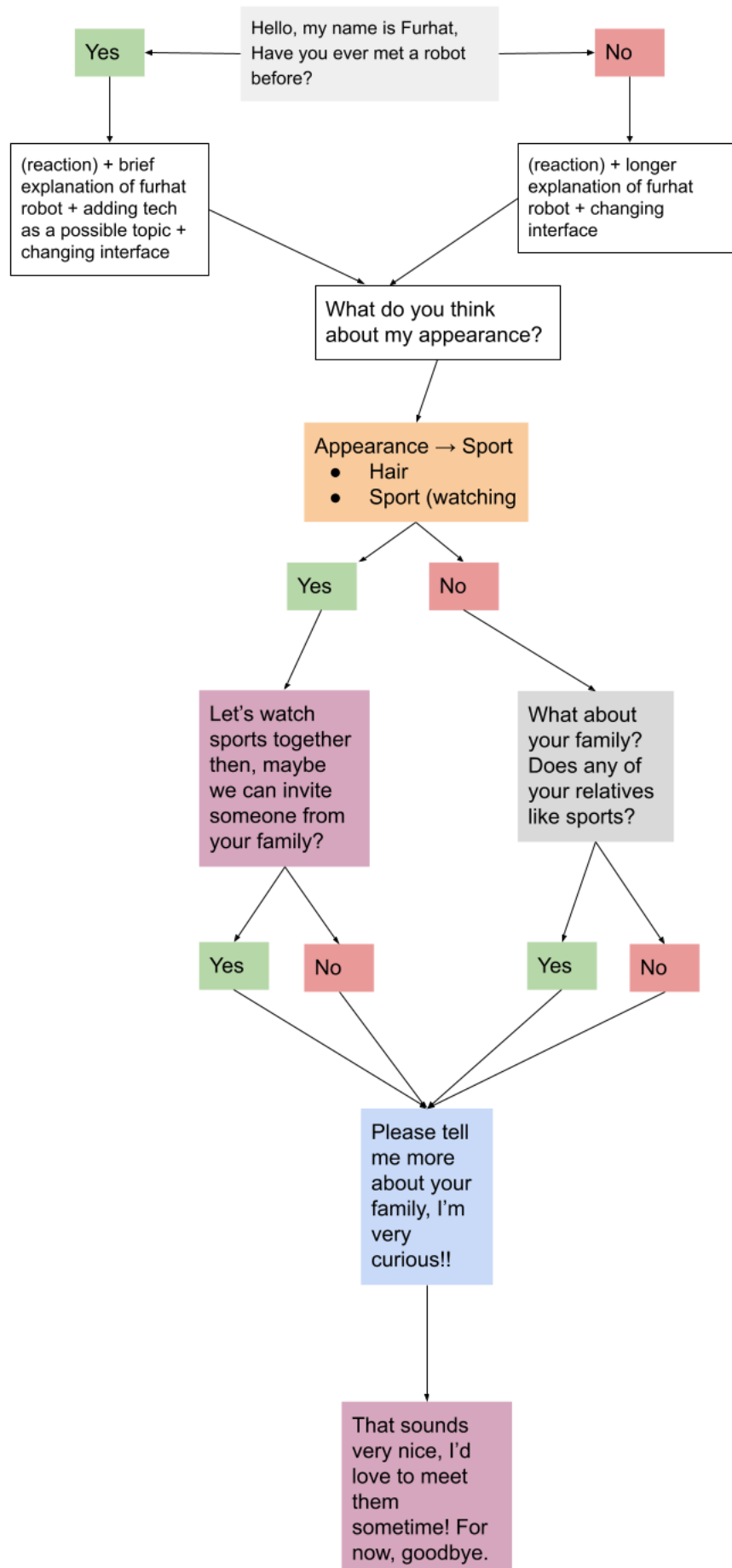
**Environment(Ting):** I really love how my room looks. It's quite cozy and always has a temperature control. So I never feel too hot or get a cold. One time my friend came to visit me and complained that there is no window. She said it is quite stuffy and not ventilated. She felt dizzy when she came inside. But I don't have this problem and I don't really enjoy sunlight shining into my room in the morning. It's nice I don't have any window inside my room. How is your room? What do you have in your room? Oh, really. And Do you have any special things you like inside your room?like, I have a special black drawer in my room. It has a lot of wires and some basic elements needed when my parents perform surgeries. I remember once I took out some of them and played with other robots. My parents were so angry about that. Cool. How about anything you think could be better in your room? I always think my bed is too small. It even couldn't allow me to shift around during the sleep. But I understand that. I need to share my room with other robots. So I couldn't share too many spaces. Otherwise some of the robots won't have a place to sleep. You must have something you don't like in your room, right? I noticed that you have an armchair there. Is it a new one? When do you buy it? I don't remember I saw that last time. Oh, really? I don't know why but I think it looks a little different somehow. The color was much lighter than I remember. Then, well, maybe it's because of the lighting. Nice! Your new armchair is so beautiful. I see a lot of people sitting in armchairs before. But I never have a real chance to try it. It must be very comfortable. Can you put me on it and let me try it out?

**Interest (Rewa):** What do you spend the most time doing today? Is there any interesting news you saw recently? or any news you think is important? Can you play any kinds of instruments? (If yes) Really? What kinds of instruments do you play? Can you show me? How long have you learned that? (If no) That's Ok. I don't know either. But I know how to sing, I can sing for you.

(Ask about details of how to celebrate holiday[If close to holiday])



### 8.3 Dialogue flow chart



## References

- [1] G. 1. (2021). [Online]. Available: <https://forms.gle/EaZ9Z1sX8BKQvMwX8>
- [2] M. S. et. al., “To err is human(-like): Effects of robot gesture on perceived anthropomorphism and likability,” *Int J Soc Robot*, vol. 5, pp. 313–323, 2013.