UNIVERSITETET I BERGEN

ROBOTS AND HOW TO LOVE THEM

DESIGNING TALKIE - THE CHILD INTERVIEW ROBOT

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1.0 Introduction

Humans have been fascinated by robots for centuries. Portraited in literature, film and TV-shows they have been sparking our imagination. Characters like R2-D2, Wall-E and Baymax have touched us, made us feel for them and stolen our hearts. But how is it that we love some, but fear others? Why do we not love the emotionless Cybermen from *Doctor Who* in the same way as we feel for Wall-E? Robots are not only imaginary characters from the genre of sciences fiction, they are living alongside us in our everyday lives – washing our dishes and cutting our grass. Robots comes in all shapes and sized, each one specialised for the job it is designed to perform. Not only do they serve as our muscle and do repetitive work for us, they are also being integrated into the field of entertainment, as our companions and advocates for mental health.

If we are to believe Donald Norman, future robots will need emotions (Norman 2004, 162). The emotional system play an important role in survival, social interactions and cooperation, and learning. If we are to be around them, work alongside them and interact with them – we need to understand them. And we need to understand if they have understood us. They need some way of giving us this feedback, to display their emotion in an equivalent way to how we humans express ourselves through facial expressions and body language (Norman 2004, 162).

Throughout this fall me and my teammates spent a lot of my time creating a prototype of a tiny robot named *Talkie.* She is developed to interview children about sensitive topics. In order to fulfil the role she is intended to perform, Talkie must be able to gain the child's trust. How can one, through design create a robot that a child would trust and consider to be its peer? With our main base in the topics of Human Robot interaction and Design Theory, we are in this paper exploring this question through the design of Talkie.

2.0 Talkie – The social interview robot

Children are our future. They also have stories that deserve to be told. Unfortunately, interviewing children about sensitive topics can be difficult. Young children often say what they think adults want to hear. They might be scared about what would happen if they tell about something they have experienced. Was it their fault? Will they be punished? Instead they confide in their stuffed animals or act it out on their dolls. They are also easily influenced by an interviewer's word choice, tone and body language - all of which can lead them to provide false information - if they say anything at all. When an adult is interviewing a child there is an unbalance in the power dynamic and the method for interviewing must be adjusted to how children are communicating.

We therefor created Talkie (figure 1). Talkie is a social interview robot that interacts and engages in conversation with children. Talkie is small, cute and toy-like. Studies have shown that children are often more likely to open up and share sensitive information to a robot than they are to a human interviewer. Much like children confide in their stuffed animals, a robot could be the solution to this problem (Michaels 2020).

FIGURE 1 – ILLUSTRATION OF TALKIE

The goal of our prototype is to create an interview-robot that would make the process of interviewing children simpler for both the interviewee and the interview-subject. To create a safe frame and establish trust by using a toy-like robot as the interview device. In between the more serious questions; Talkie will be acting silly for example by making fart-noises and asking if they should play games - like hide and seek. Talkie will show the child pictures on the screen and play music that is relevant to their conversation. If the child's favourite animal is a cat, Talkie could imitate a cat's *meow* or show a picture of a cat on the screen. This is in an attempt to establish trust between Talkie and the child, and make sure the child stays interested and engaged in the conversation.

"It is expected that with longer interactions with the robot, the children will treat the robot more as a peer, which would be beneficial in gathering sensitive information." (Bethel, Stevenson og Scassellati 2011)

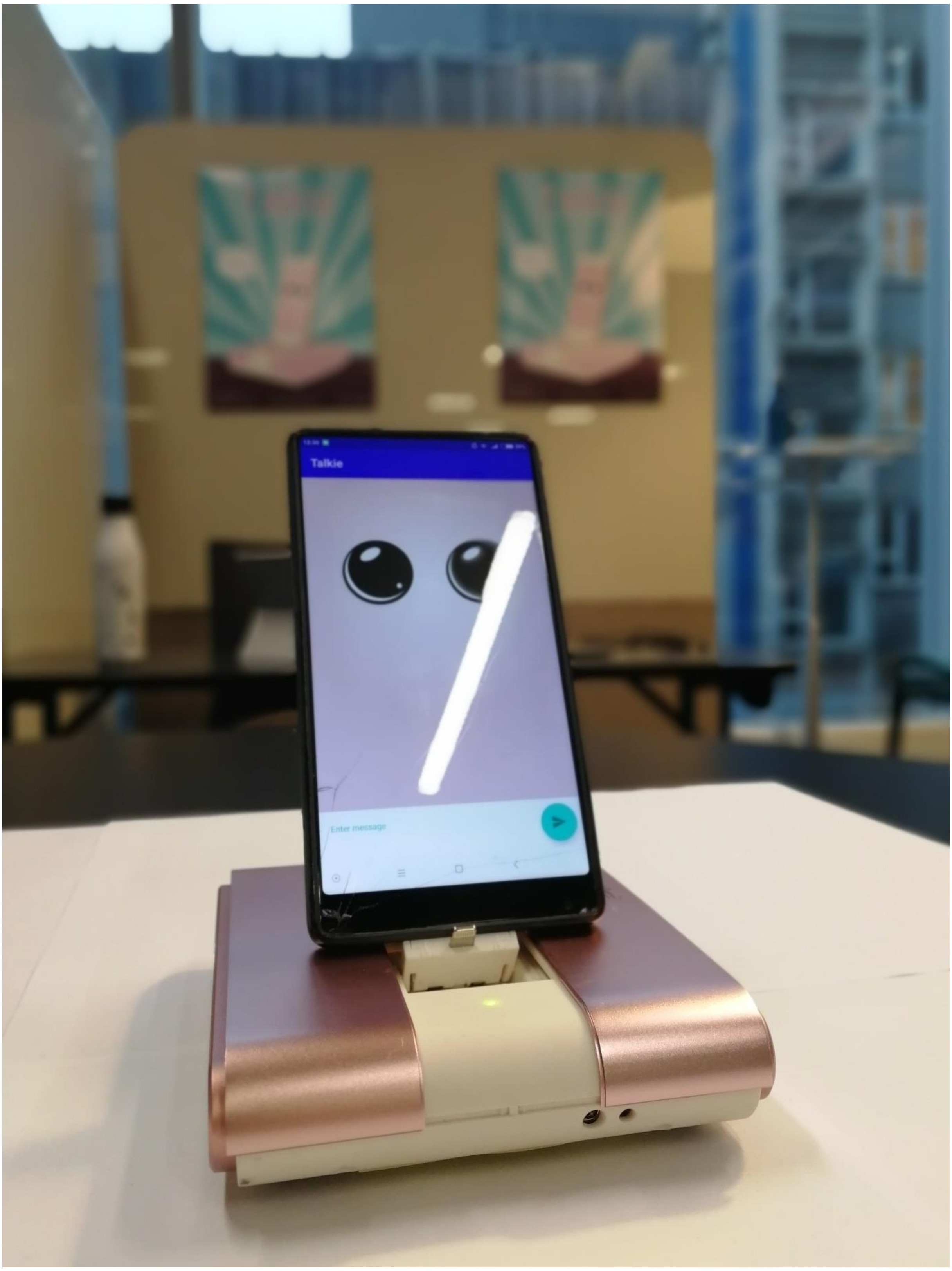

FIGURE 2 - PICTURE OF THE TALKIE-PROTOTYPE TAKEN DURING OUR DEMONSTRATION

As shown in figure 2, Talkie is a small robot. She is approximately twenty centimetres tall with a screen and a crawler motion that enables her to roam around. Her size makes it easy for a child to move her anywhere they like. The child could get down on the floor with the robot, or it could be placed on a table to be in eye-height of a seated child. It is toy sized and would not be intimidating to a child in the same way a larger robot could be.

2.1 Scenario – The Investigating Journalist

We envisioned multiple scenarios where Talkie could be useful, ranging from journalistic cases where Talkie would assist an investigating journalist in interviewing children about coronavirus to more severe cases where Talkie could be assisting a psychologist or a criminal investigator in cases such as child abuse. The scenario we focused on in our development of our prototype was Talkie as an assistant to an investigating journalist. In a storyboard we illustrated how Talkie (*formerly known as Buddy*) could be used and how she would benefit and ease the work of John (figure 3). This illustration shows how we imagined the child would interact with the robot, how it would get down on the floor with it and create a whole different environment than if the child was to be interview by John, an adult investigating journalist.

FIGURE 3 - EARLY STORYBOARD DURING DEVELOPMENT

Talkie would ask the child questions about the coronavirus, establish the child's knowledgebase and ask about the child's experience and feelings around the current pandemic. In-between the more serious questions, she would as mentioned earlier act silly and ask if they should play games. The conversational script that was created for this scenario is attached in the appendix. As we will get to later, we used Artificial Intelligence to train Talkie to be able to attend in conversation about this topic. We gave Talkie a simple emotional system enabling her to express appropriate emotions to their conversation, she will sympathize and have emotional reactions to the user's conversation.

3.0 The Evolution of The Sociable Robot

In the 1940's, Grey Walter and his wife played around with some robotic-parts and assembled a few small robots. Walter took delight in the way his robots seemed to respond to the world like animals did. He wanted to create creatures that showed autonomy, and these creatures are known as his tortoises. Walter himself playfully named them *Machina Speculatrix.* He published two short articles about them titled *An Imitation of Life* (A. Brooks 2002, 17).

A sociable robot is a robot that is socially intelligent in a human like way, that we can communicate and interact with as it were a another person or even a friend (C. L. Breazeal 2002, xii). Rodney Brooks proposes two arguments for designing robots moulded from the human form. The first argument is about *our relevant representation of the world.* Our human form gives us the experience that we use to perceive the word. The second is about the way *people will interact with a robot with human form*. He claims that we will instinctively know how to interact with a robot that sends out the same signals and social clues as we do (A. Brooks 2002, 67).

3.1 Conversations with *Eliza*

In 1966 MIT computer scientist Joseph Weizenbaum developed the simple computer-program Eliza. It is an early example of how emotional an experience with simple computer systems can be. Eliza simulates conversations based on simple scripts written in advance by a programmer. The program has no real understanding of language, but despite that one is able to have seemingly meaningful conversations with Eliza. Weizenbaum was shocked that people took his computer program so seriously, as the program only mimicked understanding by finding patterns in the conversation and responded appropriately (Norman 2004, 188). Eliza caused practicing psychiatrist and other specialist to speculate on the day real psychotherapy might be provided by a machine instead of a human. This shocked Weizenbaum and he could not bear the thought of such a thing ever happening (A. Brooks 2002, 166).

3.2 The gazing *Cog*

Years later, in 1992 a group of researchers attempted to design an artificial two-year old they named Cog (Preece, Rogers og Sharp 2019, 241). When they started working on Cog there were hardly any humanoid robots outside of science fiction. The robot was used to explore theories and models of intelligent behaviour and learning, both physical and social (C. L. Breazeal 2002, 23). Cog had eyes that resembles those of a human, and it could turn its head, focus and change focus. By having a human-like vision system they hoped that people would understand how to interact with it (A. Brooks 2002, 86). Cog is able to quickly change his gaze and follow somebody walking in front of it.

3.3 The emotional *Kismet*

In 1998, Kismet was developed at MIT artificial Intelligence Laboratory by a team of researchers (A. Brooks 2002). Like Eliza, despite being a more complex system, Kismet has no true understanding of human-communication. Kismet is based upon how underlying emotions can be understood without any understanding of language. This is similar to how dogs can understand what mood we are in based on our body language and the pitch of our voice, or how we can identify the mood of another person despite not understanding their language (A. Brooks 2002). Kismet has a camera for eyes, and he is equipped with a microphone so it can detect sounds. The way Kismet interprets, evaluates and responds to the world is a sophisticated structure that combines perception, emotion and attention to control behaviour (A. Brooks 2002). Kismet will look at you when you approach it, and it will eventually start to look bored and look around the room if you just stand there and do nothing. Kismet can detect the emotional tone in your voice and can react accordingly. His range of emotions are wide, and it can move its head, neck, eyes, ears and mouth to express emotions (C. L. Breazeal 2002). When interacting with Kismet, it is hard to believe that Kismet has no understanding of emotions or language, it only responds to the sounds and movements.

3.4 *Aibo* the companion

In 1999, Sony announced their new robotic dog complete with four legs, a movable head and a wagging tail (A. Brooks 2002, 106). Aibo is built like a mechanical pet, with a few simple moods and the ability to sit, walk and chase balls – but he is not very affectionate. Despite this a strange phenomenon accrued – its owners claimed Aibo could recognize them by sight. Aibo has a vision system that can learn new shapes, but he has no facial recognition system. Aibo cannot recognize faces, but his owners like to think that he does, desperate for their dog to understand them despite Sony telling them other vice. Toys like AIBO are the forerunners of intelligent entities that will come to populate our world more and more (A. Brooks 2002, 107).

4.0 Design theory

The human mind is, according to Donald Norman, exquisitely tailored to make sense of the world. It only needs the slights of hint on how something works, and the brain works out the rest. But in order for our brain to do that, the object has to be well designed. Or in this case, a robot. Even more specifically, *Talkie*. All the correct parts of Talkie have to be visible, and they must send us the correct message on how to operate them. If a child is going to be able to operate Talkie, without a manual or an explanation from an adult – Talkie needs to have a design that sends natural signals that is naturally interpreted (Norman 2002).

"Good design requires good communication, especially from machine to person, indicating what actions are possible" (Norman 2002)

4.1 Donald Norman's Design Principles

Norman defined seven design principles based on a form of phycology on how we interact with everyday objects. These principles are based on how to design to be understood and to get a pleasurable experience when we interact with it. These principles show the importance of visibility, appropriate clues, and feedback of one's actions (Norman 2002, 9). His seven principles are discoverability, affordance, signifiers, mapping, constraints, feedback and conceptual models. We are not going into every principle in detail but look at how these principles overall apply to the development of Talkie.

4.1.1 Discoverability

When a product has good discoverability, it is possible to determine what actions are possible, to have good discoverability all other principles have to be present. Using Talkie should be a pleasurable experience and she must communicate how she functions. The child must easily figure out how to work her and the path to discovery should be simple and natural.

When Cynthia Breazeal created Kismet, their prompt was to design *a physical robot that encourages humans to treat it as if it were a young, socially aware creature*. They therefore created a creature with an infant-like appearance so that humans naturally fall into this mode of interaction. If humans were to interact with it using their natural communication channels, it needed a natural an intuitive interface reading and sending human-like social cues (C. L. Breazeal 2002, 51).

For a child to treat Talkie as a peer, the child needs to be convinced by the robot that it is an equal. Talkie needs to send the same human-like social cues as the child. They need to be able to interact intuitively with Talkie in the same way they would another child the same age. Talkie is not a humanoid – her body structure is not similar to a human, and that is not the intention either. She is a social agent with a toy-like appearance and *her social cues* need to be equal to the child's. If the child tried to perform an action and the robot did not respond as intended or respond at all - it would be frustrating. This would break the illusion of Talkie being peer. If a user fails to operate a product, the fault is not in the user – but in the design (Norman 2002).

4.1.2 How things work

Affordance, constraints and mapping are principles that play a part on how the thing works (Norman, The Design of Everyday Things 2002). **How to** use it, **how not to** use it and **how can one use it**. We are looking at these principles with the child as the intended target group, and not the journalist, psychologists or the criminal investigator. But the knowledge about how things function is different depending on the child. A twelve-year-old is not equal to a three-year-old and they would have a different knowledge base. Affordances is about the relationship between the properties of Talkie and the capabilities of the child, and this determines how the robot could possibly be used (Norman, The Design of Everyday Things 2002). Talkie would need to be able to adapt to capabilities of the child. Another principle is constraints. They should limit the possible actions though design without any need for word or symbols, and certainly no need for trial and error. Mapping is the relationship between two things, like the control and the movement. Natural mapping uses physical analogies and cultural standards and leads to immediate understanding. Both mapping and constraints depends on culture and can be different based upon the conventions of that culture (Norman, The Design of Everyday Things 2002).

If Talkie is to be used in different lands and cultures, she would have to be adapted for that. Right now, Talkie only speaks English, if she was to be released in country where they speak a different language she would have to be translated. If a child greets Talkie in Mandarin, Talkie would not understand what to do. But a direct translation might not be enough. How different cultures expresses different moods or how they conduct their greeting might be different and would have to be altered to fit the cultural standard.

4.1.3 Feedback

Feedback is communication. It sends back information to the child about what action has been done and the result of this action. Feedback lets the user know that the command we gave is being worked on (Norman, The Design of Everyday Things 2002). The feedback would also have to be immediate, if the feedback takes too long, we will be forgetting what command we gave. Humans give each other feedback all the time. During a conversation your gaze, your body language, your head nods signifies that you are listen and understanding the person you are having the conversation with. If they ask you a question you will respond appropriately. Talkie would also need feedback in order to know what to do. If in a future version Talkie is able to move around completely autonomously, she would need feedback about the placement of objects, the location of humans, are there stairs or other obstacles and so on. Feedback is important if the human and the robot are to understand each other.

Conceptual models are simplified explanations of how something works (Norman, The Design of Everyday Things 2002). If an object has a good conceptual model, we will recognize it and be able to predict how to use it. It does not have to be accurate but similar enough for us to understand it as so. For Talkie to have a good conceptual model, the child would have to recognise her as a peer. Talkie would have to be a similar enough version of a child that the user would recognise her as so.

5.0 Human-robot interaction

The field of Human Robot Interaction (HRI) is dedicated to the understanding, designing and evaluation of robotic systems for use by or with humans (Goodrich og Schultz 2007, 1). It is a field that recently has been gaining an increase in interest by researchers in the field of autonomous robotics, as well as those in human-computer interaction (HCI). Robots have now been listed as an interface, alongside the more traditional ones like web, mobile and multimedia in the newest edition of *Interaction design* (Preece, Rogers og Sharp 2019, 248). Traditionally autonomous robots have been targeted for applications requiring very little human interaction, they are merely a sophisticated tool. But experiments have shown that people unconsciously treat socially interactive technologies like people by being polite and showing concern for the technology's "feelings". They generally treat them as they would treat other people (C. L. Breazeal 2002, 15).

5.1 What is a sociable robot?

A sociable robot is, according to Cynthia Breazeal, *a robot that is able to communicate and interact with humans, understand and even relate to humans in a personal way* (C. L. Breazeal 2002, 1). Like the title of Walters articles, a social robot must do just that – *imitate life*. They must be believed as an illusion of life and convey a personality to the human that it interacts with it. To interact with robots as naturally as we interact with other people, robots have to reflect life-like qualities (C. L. Breazeal 2002, 8). Social robots must perceive and understand the richness and complexity of natural human social behaviour.

"Socially intelligent robots can better support these human characteristics if they are embodied and socially situated with people." (C. L. Breazeal 2002, 7). As Brooks has promoted the importance of, our human bodies provide us with the means to relate to the world and provide meaning to our experiences (C. L. Breazeal 2002, 7). For a robot, having a body provides them with the possibility to experience and interact with the social world and is beneficial for both human and robot.

5.1.1 Autonomy

Humans and animals are autonomous. We are autonomous in order to survive, to be able to perform our task in any situation and to be able to maintain a relationship with and adapt to our everchanging environment (C. L. Breazeal 2002). If robots are to imitate life – they must be autonomous as well. For a life-imitating machine to be able to act autonomously in the world it must perceive its surroundings and be able to act on them (Wiener 1989, 36). Their *perception* is based on sensors, *action* is based on actuators and *steering* is based on feedback. In other words, they need to be able to *see, hear* and *move.*

To be able to see a robot could be equipped with a camera as their sensor. Talkie has this technology, but the current version of Talkie is blind, and her movements is controlled by a human operator. Unlike Cog, she cannot follow humans with her gaze but must be controlled by a human operator. This can give a sense of felt autonomy for the child interacting with it, but it requires for an adult to be in the room or in some other way be able to oversee the interaction between the child and Talkie to play the appropriate movements. Talkie has no real sense of her surroundings and she cannot navigate a room autonomously. But even if she could, autonomy alone is not sufficiently life-like for human-style sociability.

5.1.2 Communication

Autonomous robot has traditionally required very little human interaction. Proximate interaction is required for a robot to be social and to be able to interact with humans, this means they have to be co-located in the same physical room or environment (Kanda 2012). Humans are one of the most complex and socially advanced of all species and even the simples replications of human social clues is considered sophisticated (C. L. Breazeal 2002). The most important is that the robot is believable and interacts with the human as a peer.

Turn-taking is an important part when communicating with a robot and will make the conversation feel natural. *Kismet* has the basic mechanisms of turn-taking with pauses, gaze shift and filling of awkward silences when the human does not speak (A. Brooks 2002, 95). Even though Kismet has no language, people understand how to communicate with him (A. Brooks 2002, 96). Talkie on the other hand can both listen and speak being equipped with a microphone (*sensor*) and a speaker (*actuators*), but she only speaks when she is spoken to. With her face currently being static her eyes will stay fixed in one spot.

Talkies conversational skills are the most complex about her. Unlike Eliza, Talkie is using Conversational Artificial Intelligence and can be trained to engage in conversations on any topic. She will learn, remember and adapt the conversations to the child. When training Talkie, we used a script created for a scenario where she is used by a journalist interviewing a child about the coronavirus. She is currently able to ask any of the questions prepared in the script, but if she gets a response from the human that she did not anticipate, she will not know what to do but will try to give an appropriate response with mixed results. With more training she will be able to respond appropriately to any question asked.

Her voice is currently the voice of a synthetic, adult female – similar to Apple's Siri or other speech assistants. If Talkie is to be considered as a peer by a child, she would have to appear more youthful.

Despite her tiny body and cute face – Talkie could currently be perceived as more of an adult than a child.

5.1.3 Emotions

Emotions is an important part about being human, and machines needs to be emotional to. Their emotions do not have to be an exact replication of the emotions we have - but has to fit the needs of the machine itself (Norman 2004, 162). Our emotions enable us to translate intelligence into action and we need emotions to perform complex decisions.

Talkie has an emotion system and can express a few emotions with both facial expressions, movements and verbally (figure 4). This enables Talkie to sympathize with the child and have emotional reactions to the child's conversation and behaviour. If the child states that he or she is happy on the question *How are you feeling,* Talkie could respond *That makes me happy too*, give the child a smile and spin around in a joyful motion. If the answer is sad on the other hand, Talkie could reply *That makes me sad too*, frown and slightly turn to one side.

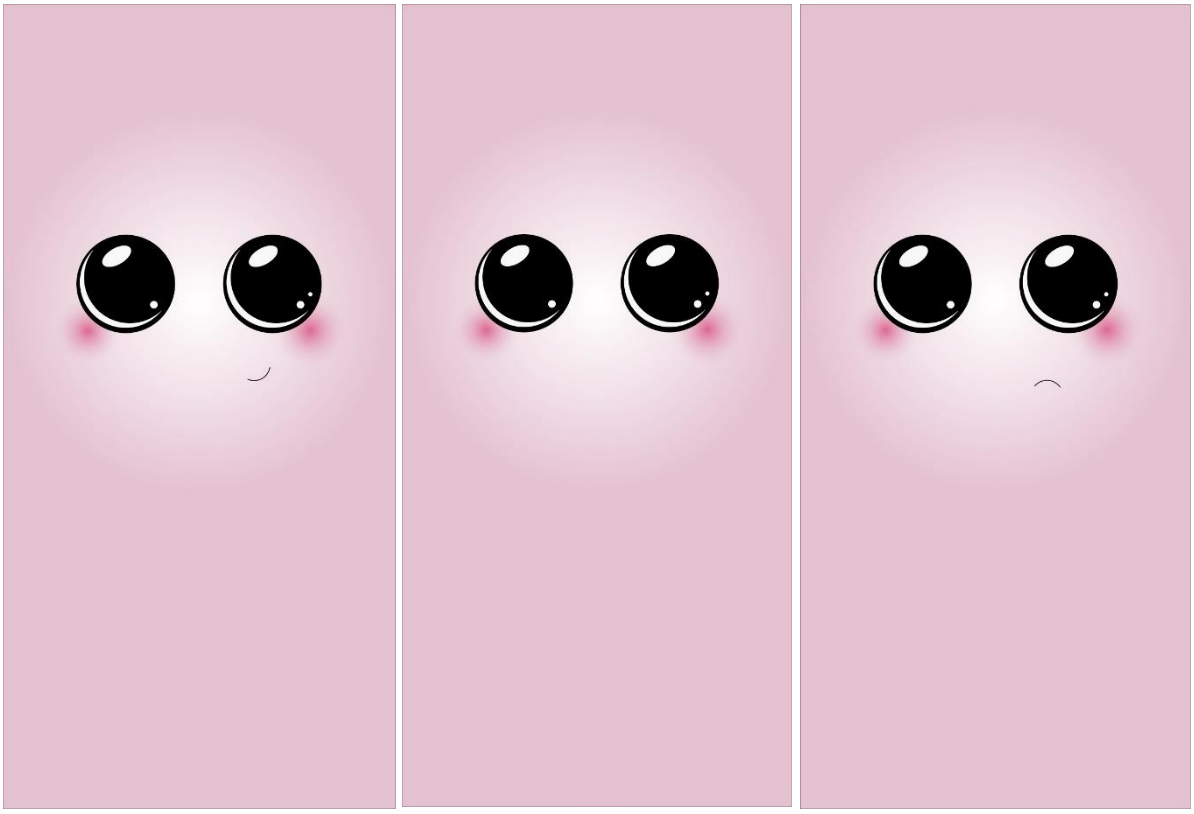

FIGURE 4 - TALKIE'S FACIAL EXPRESSIONS

Only two of Talkies *emotions* is implemented in the current version in addition to her neutral state, but more emotions were planned out. Based on Russell's circumplex model of core affects we simplified and defined four main categories of emotions; Happy, sad, anxious and neutral (figure 5) (Turner 2017, 82). Each emotion was connected to a facial expression, a movement and a sound. The happy emotion was connected to a smile, the movement of spinning around in full circle combined with a high-pitched laugh. Her sad emotion on the other had was connected to a slight turn sideways combined with a sad noise.

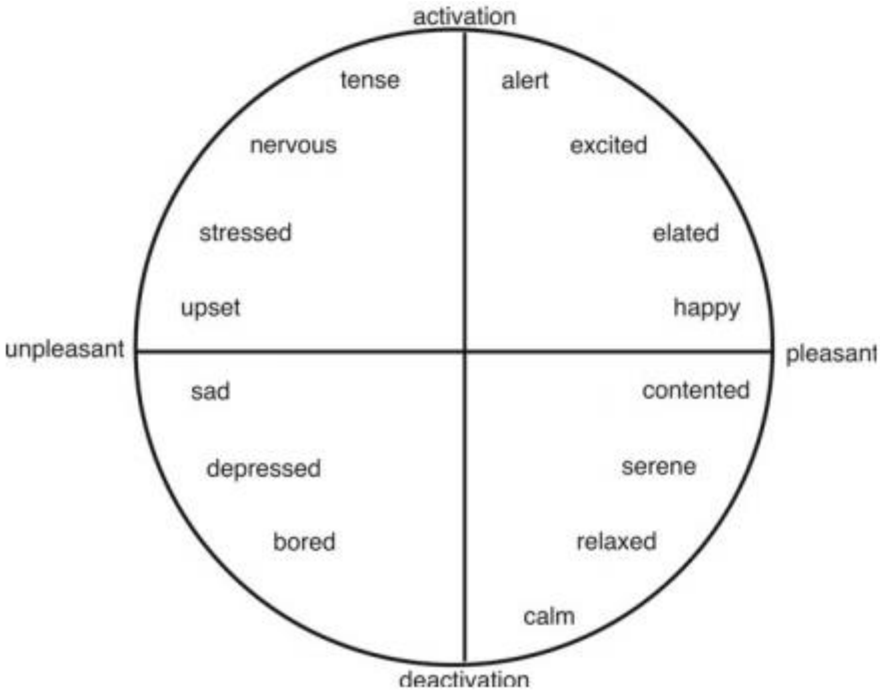

FIGURE 5 - CORE AFFECT

In the pitch of someone voice, there is small variants called prosody. Through these prosodic patterns one can detect a human's emotional state (A. Brooks 2002, 95). Talkie has no variants in the pitch of her voice, and she cannot detect variants in the voice of whom she is communicating with either. There are no emotions in Talkies tone of voice, only in her words. In this way Kismet is more complex, even though Kismet has no language it is able to detect their prosodic signals at it can affect Kismets mood.

Kismet also have a more complex emotional system compared to our robot (figure 6). Talkies facial expressions are static, they can switch between happy, neutral and sad but her face is not animated any further. Comparing her to Kismet, Kismet is able to keep eye-contact, read people's moods from the intonation of their voice and carry a conversation without proper language. Kismet can display a wide range of facial expressions in order to communicate and express itself – with individual movable facial features like ears, eyebrows, eyelids, lip and some freedom on the jaw (C. L. Breazeal 2002).

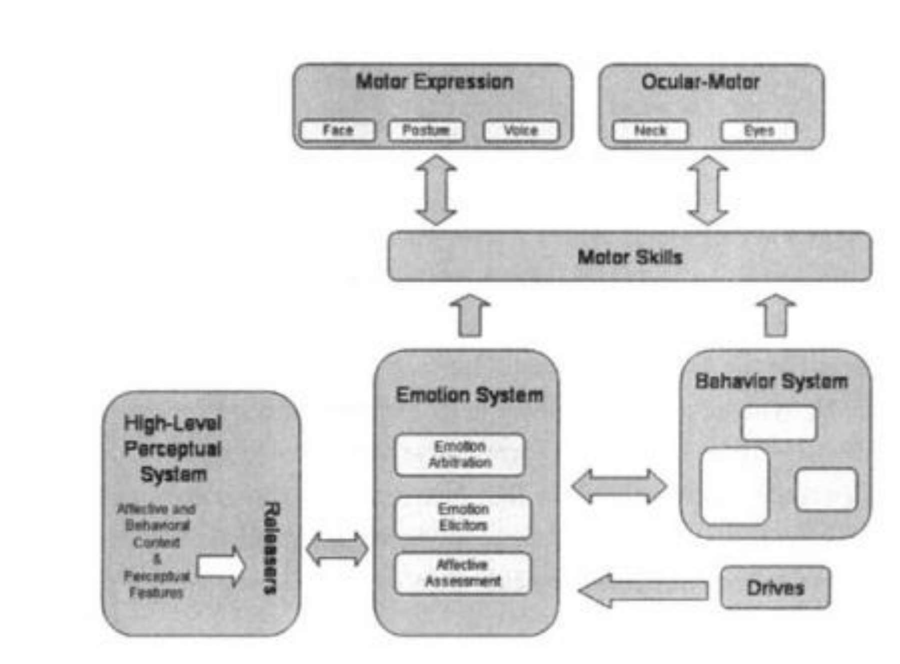

FIGURE 6 - KISMETS EMOTIONAL SYSTEM

5.1.4 Anthropomorphism

Anthropomorphism is the act of giving animals and inanimate objects attributions of human motivations, beliefs and feelings (Norman 2004, 136). It derives from the Greek word anthrōpómorphos meaning *having a human form* (Merriam-Webster 2020). Humans, and especially children inclined to be enchanted by inanimate objects possessing human or animal-like qualities. This has led many designers within the field of human-computer interaction to model human-computer dialogs on how humans talk to each other (Preece, Rogers og Sharp 2019, 187). This is also the reason we designed Talkie to look like she does. Due to her tiny body, and her big eyes people usually react to Talkie by making the sound *aww* as a reaction to her cute-ness. The object does not need be that advanced for the effect of anthropomorphism to occur. This is showed in Aibo, where the owners were giving him advanced capabilities he did not truly possess. By giving technology personalities and human-like attributes can make them more enjoyable to interact with (Preece, Rogers og Sharp 2019, 187). In addition to her appearance, giving Talkie human-like capabilities like being able to keep a conversation and show simple emotions we hoped to – *imitate life*.

6.0 Future Talkie

Talkie is just a first iteration prototype, but still in her simplest form she is still quite astonishing in her performance as a socially intelligent agent. When Talkie would make mistakes like saying *Goodbye* in response to a *Hello*, we laugh and say things like: *She tries her best*. We have given her a female pronoun without even thinking about it and we treat her as she is a living creature with feelings we can hurt and not just simply an interface. The anthropomorphism is already strong. If we had no limits to our design, imagine what Talkie could become.

6.1 Scenario 2 – The Criminal Investigator

Somewhere into the future, an awful crime has been committed. A child has been molested by a relative and refuses to speak to anyone about it. The child has been told to keep quite by the molester or they would hurt their sibling. Without any evidence, the crime might go by unpunished – and would likely be repeated.

A little girl is sitting patently, waiting in an interrogation room. This interrogation room is not like any interrogation room we have seen before. Filled to the brim with toys, and furniture fit for a small child. There are tiny ramps everywhere, leading up from the floor to the top of the tiny furniture. The girl is feeling a bit frightened – she is afraid she has done something wrong or that she is in trouble. But the strange décor in this room has left her a bit curious.

In trough a tiny door – located next to a regular sized door, comes a robot. It is cute, it is pinks and it spins around in circles on the floor. It is of course able to avoid all the obstacles on the floor, with a camera as a sensor and a mental map of the room – it knows where it is going and can recognise and register objects and people. Autonomously she navigates herself through the room. The girl laughs and the robot drives up the ramp and parks perfectly in the centre of the table, right in front of the girl. The robot stares the girl directly into her eyes and says:

"Hello! I have not met you yet! I am your new friend, Talkie!"

Talkie gives her a big smile and a tiny wink. Talkie would of course have remembered if she had seen the girl before. Equipped with facial recognition, artificial intelligence and voice recognition Talkie never forgets a name. Or a face. Or a voice.

The girl and Talkie engage in games and playful conversations. They become friends, trusty companions. Talkie asks the girl about her relative, and the girl shares her secrets to her compassionate robot friend. Talkie knows that the girl is telling the truth. With heat detecting camera and by reading the girl's facial expression and body language Talkie is able to spot a lie with amazingly high accuracy. Changes or deviation in the child's behaviour does not go by unnoticed.

Talkie also interviews the girl's younger sister. Detecting that this was a younger child, Talkie adapted her communication style, language and games to be the appropriate peer. Thanks to Talkie, they gathered enough data to have the relative put to justice, and the two young girls was spared for further abuse.

7.0 Provocative prototyping

Provocative design is an approach where asking questions is just as important as solving a problem. The design itself could be used as a provotype, as a way to explore future design possibilities (Raptis, et al. 2017, 30). Provocative design should be unexpected, break with norms and it should make you think.

While designing Talkie, lot of questions was raised among or selves and among the people we old or showed our prototype to. Just the simple fact that its prime functions is to interview children is provocative and made would have us think and reflect. She is specially designed to engage children in conversations concerning sensitive topics such as abuse. If purchased by for example a psychologist, she could be replacing a function and a role that conventionally is filled by a living human with real emotions and compassion. What effects could this have on a child – essentially tricking the children into spilling sensitive data to a highly advanced toy. And could this data be trusted? Is this something we want for our society? Joseph Weizenbaum was shocked to see that people where fantasising about Eliza replacing professional psychiatrists, what would he say to the technology and the capabilities we have for this type of technology today? No matter how convincingly emotional these types of robots are designed to be – they will never have real compassion for the child. They will never be able to retaliate the child's feelings and the trust they have for a robot like Talkie.

8.0 Summary

In this paper we have explored the current and futuristic versions of Talkie – the social interview robot. We have explored what qualities she needs to possess (*at least according to the references used in this paper*) in order to be able to convince a child to trust her and to be considered as their peer.

In order for a child to be able to operate Talkie, the robot should follow Donald Normans seven design principles. The child must easily figure out how Talkie works and how to communicate with her. Talkie must also be able to communicate with the child in a way they both understand. This is done by having Talkie send out natural signals that are naturally interpreted by the user. They need to give each other feedback on their actions in order to understand is their actions have been received and understood.

If Talkie are to be considered as a peer and gain the child's trust, Talkie has to be sociable and engage in proximate interactions. She would have to possess some level of autonomy in order to perform her tasks and adapt to her environment. For the child to be able to communicate naturally to the robot, the robot needs to convince the child that she is human-like by using human-like social cues. And she needs to have some form of emotions in order to survive and understand the world.

And lastly; Talkie must be *believable as an imitation of life.*

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Appendix

Talkie Conversation Script

Implemented

General Conversations

INTRODUCTION-SEQUENCE (FIRST MEETING)

Child:

1. Hei
2. Hello

Talkie: Hello, I am Talkie. What's your name?
Child: (name)
Talkie: Hey there (name)! How are you doing?

1. Sad
2. Happy

If sad
Talkie: I am sorry you have to go through this. Sending a virtual hug.
(Makes sad movement and sad-face-expression)
Talkie: Did that help?

1. Yes
2. No

If happy
Talkie: I am that you are happy! (Makes happy-movement and happy-face)
Talkie: Can I ask you about something?

1. Yes
2. No

If no
Talkie: Goodbye

SCENARIO 1: COVID19 - HOW CHILDREN ARE AFFECTED BY THE PANDEMIC

Talkie: Do you know what the coronavirus is?
(Establish knowledge base)

3. Yes
4. No

If yes
Talkie: Tell me what you know.

- Say something about corona
  - Example:
    - Corona is scary
    - Corona is deadly
    - Corona is dangerous

Talkie: That is correct. You are so smart. (Happy movements)

If no
Talkie: Coronavirus makes people sick. That is why we need to wash our hands and stay home a lot, so we won't be sick.

Talkie: How does the coronavirus make you feel?

1. Lonely

If lonely
Talkie: It is okay to feel lonely.
Talkie: Why does it make you feel lonely?

- Say something about friends and family
  - Example:
    - I miss my friends
    - I cannot see my family

Talkie: I hope you can see them soon. Do you know anyone who is sick?

1. Yes
2. No

If yes
Talkie: I hope you stay safe and healthy and remember to wash your hands. We will go through this together!

If no
Talkie: Are you afraid of getting sick?
Talkie: Are you afraid someone you know will get sick?

1. Yes
   No

Both yes and no
Talkie: I hope you stay safe and healthy and remember to wash your hands. We will go through this together!

Not implemented

INTRODUCTION-SEQUENCE (SECOND/THIRD ETC. MEETING)

Talkie will remember the child's name.
Talkie: Hello, (name), nice to see you again! Now what were we doing last time? Oh, I remember we talked about (something here). (second, third time ect)

Talkie: What's your favourite animal?

1. Dog
2. Cat
3. Rabbit

Talkie: "Shows picture of the favourite animal and makes the noise of the animal"

Talkie: What's your favourite colour?

1. Blue
2. Pink
3. Yellow

Talkie: "(Colour) is my favourite colour too"

Talkie: What is your favourite movie, (name)?

1. Hannah Montana
2. Lion King
3. Frozen

Talkie: “Plays the theme song of favourite movie” (happy movements)

GAMES

Talkie: Let us play a game! Do you know hide and seek?

1. Yes
2. No

Talkie: I will hide, and you will try and find me! Close your eyes and count till 10. Can you do that? (Walkie drives off and hides pretty badly so it is easy to find)

If child finds Talkie:
Talkie: You found me! Good job! (Happy movements)

If child can’t find Talkie:
Talkie: (makes a “pip”-noise every 5 seconds until found)

If child still can’t find Talkie after 2 minutes
Talkie: I am here! (comes out from hiding place)
Talkie: It is okay that you did not find me. I liked hiding! (Happy movements)