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STUDENT ID: 813001696

COURSE TITLE: HUMAN-COMPUTER INTERACTION

COURSE CODE: COMP 3603

TITLE OF ASSIGNMENT: ASSIGNMENT 1

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NAME GABRIELA SEWDHAN

SIGNATURE 

DATE 18/09/18

COMP 3603 Assignment #1

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Part A. Project Topic Brainstorming

Project Ideas –

1. Companion Therapy Bot – Curie is an emotionally intelligent companion robot that can help users with their anxiety, depression, panic attacks, post-traumatic stress disorder, suicidal thoughts/tendencies and so much more, while also providing companionship and can form a bond with the user. The focus is on understanding human emotion and, thus, gaining emotional intelligence. It must be able to ascertain what someone is feeling through the way they type, the sound of their voice and even their posture, in order to help them more effectively with their issues. The more the user uses Curie, the more Curie will learn and remember from experiences with the user and evolve the relationship. Curie would also be able to monitor the user's physical well-being.
2. Food Intake Tracker App, where the user inputs their meals and activities of the day. The App will learn from this continuous input to detect foods that adversely impair the user's mood or activities and, thus, promote healthier eating habits.
3. A wellness sensor consists of a wrist band with an array of body sensors for heart rate, blood pressure, blood glucose and blood oxygen to quantize how healthy or well taken care of a person is. It will use these results to provide recommendations to the user for how to improve their body.

Part B. Preliminary User and Task Analysis

Justification for Idea

While the food intake tracker app can greatly help users eat healthier, and the wellness sensor encourages and can aid users to become healthier and improve their body, I chose the companion bot Curie, as there are millions of people suffering from mental illnesses and are shunned for it, where sometimes their friends and family do not understand what they are going through. Mental health is extremely important for a happy life. I also have a huge interest in robotics, and coming from a psychology background, I am very interested in how to make a robot truly emotionally intelligent.

References showing the relationship with proposed Idea

Lim and Okuno conducted research on developing Multimodal Emotional Intelligence (MEI) in a robot that “can develop emotional expressions through a universal parent-infant interaction called motherese.” They found out that MEI had promising accuracy when it came to detecting emotions via voice training. They also found that MEI successfully expressed happiness and sadness in a particular scenario that induced these emotions (Lim Okuno 2014). Although not yet completed, this paper demonstrates the ability for robots to become emotionally intelligent. By following their evaluation, this demonstrates that my proposed idea, Curie can be an effective and accurately detect emotions which is the first step for Curie to become a therapy companion robot.

Jeong studied on the value of social robots to diminish stress and anxiety for children at pediatric hospitals. He introduced Huggable robot that mitigates stress and anxiety of child patients. He found that it was important as the hospital is an extremely stressful place for children and not enough was being done to help their mental state. This relates to my idea Curie, as I also think not enough is being done about mental illness, some people take it for granted and an emotionally intelligent robot, who can be there for you 24/7 will greatly help. Jeong found that the Huggable robot did help patients build higher self-efficacy and an emotional bond was formed (Jeong 2014).

Wada and Shibata conducted research on robot therapy for the elderly in a care. They have been conducting research since 2005 using seal robots. They found that the elderly moods become better, they became happier and grew attached to the seal robots, missing the robot and treating it like their grandchildren. They also found that the elderly stress levels decreased by performing urinary tests. (Wada and Shibata 2004). I also want to apply Curie to any age, hoping to perform therapy and measure users stress levels, blood pressure and heart rate to ensure the user is both healthy physically and mentally. This research paper proves that humans will form bonds with robots, and when that robot has emotional intelligence as mines would, stronger bonds would be formed, and the users mental state and well-being would greatly improve.

Problem Description

Anxiety, depression is common today and affects millions of people worldwide. Sometimes, therapy/friends/family don't help as they can be judgmental. Just needing someone to be there who will not judge you and always be there for you is essential, especially if you are suffering from a mental illness. Emotional intelligence is needed to perform daily activities and it is often seen as less important than physical health.

Therefore, I propose a companion bot, Curie, that can detect and respond to your emotions and well-being, always be there for you, remembers all occurrences with you so that you and Curie can evolve your relationship, and Curie can learn about you and respond accordingly to your behavior. This is essentially a therapy bot, however, is it also a companion, a friend that is always there to listen to you and make you feel better. Curie can also maintain your physical well-being by ensuring that your blood pressure, levels, heart rate and stress levels are normal. This bot would also be integrated with Siri or Alexa to perform common tasks that would make your living circumstances easier.

The human activity that I am supporting is therapy and the users are people with mental illness, anyone who has issues they would like to talk about but might be unwilling to express them with real people. It can also apply to the elderly at care homes and children with learning problems.

This project will attempt to answer the question –

1. Can a robot emotionally and socially help users to cope with mental illness and also maintain their physical well-being better than other conventional intervention methods?

Scenarios

1.1 Scenario 1: Normal Conversion (companion)

Primary Actor: User (any age)

Starting Situation: Curie already got acquainted with the User, memorized the User's voice and profile and is already awake.

Scenario:

- a. The User says 'hello' to Curie.
- b. Curie detects that it is their owner talking and responds.
- c. Curie uses its prior experience with their owner to continue the conversation from where it left off.
- d. If the User does not initiate the conversation, Curie will, after a certain period, ensuring that everything is okay with their owner.
- e. Curie detects emotion, uses expressions to talk to their owner and ensures that the conversation is flowing.
- f. The User says "Talk to you soon Curie" or "Bye Curie" to stop talking.
- g. Curie stops talking and remains by the Users side.
- h. The User turns off Curie or chooses to let Curie stay awake.

1.2 Scenario 2: Emergency Help

Primary Actor: User (any age)

Starting Situation: User went through a traumatic experience and is having a panic and anxiety attack. Curie is already awake and is monitoring the area.

Scenario:

- a. Curie notices the signs of an anxiety attack and goes towards the user.
- b. Curie holds the user and tells them to take a deep breath, talking to them and reassuring them.
- c. If there is medication, Curie tell User to take medication.
- d. If the User is not getting better after Curie tries different therapeutic treatments, Curie notifies proper authorities and also calls close family and friends.
- e. Curie stays with the User until he/she is better.
- f. Curie pushes the experience to its database.
- g. Curie learns from the experience and remembers it so that the User and Curie can form a deeper bond and can adapt.
- h. Curie remains with the User and is there whenever the User needs it.
- i. User turns off Curie via voice or a button or chooses to keep it on.

1.3 Scenario 3: Get Physical Health

Primary Actor: *User (any age)*

Starting Situation: *Curie is already awake and is set to check up on the User's physical health at a certain time every day.*

Scenario:

- a. At the set time, Curie goes over to the User and asks permission to do a checkup.
- b. The user says 'yes' and Curie checks the User's blood pressure, heart rate and oxygen levels.
- c. Using Curie's training data, Curie accurately decides if the User is in good or bad health and if the User is stressed.
- d. If the User is in bad health, Curie recommends health tips for the User to get better, such as eating properly, taking vitamins, etc. and tells the User to do a full checkup at the Doctor.
- e. If the User is in good health, Curie tells the User that everything is fine.
- f. The User then either turns off Curie or chooses to keep Curie awake.

Part C. Design Direction

High Level Design

C.1 Product perspective

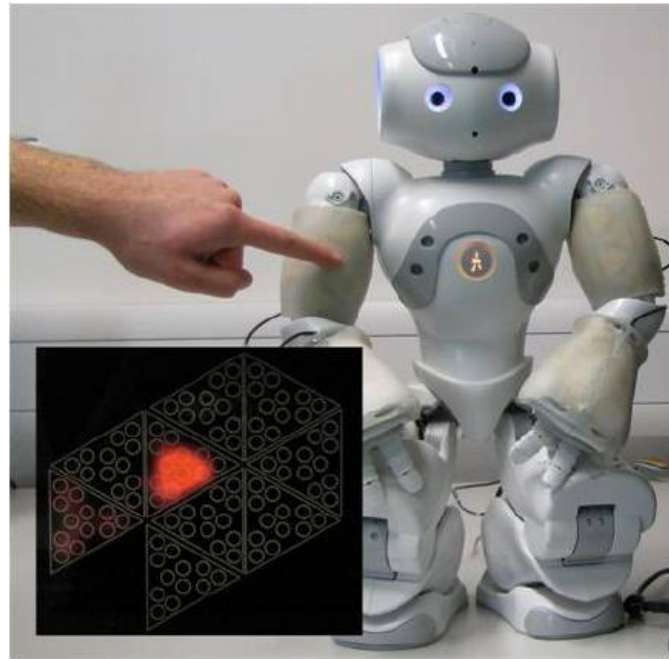
Curie will be comprised of several different components. Some will be programmed, and others will be implementations that are open-source such as available therapy chatbots. However, even though an open-source API that already has Natural Language Processing (NLP) would be used, more training via facial expressions, voice and body language, will still need to be done to allow Curie to perform her necessary tasks and allow her to be a fully-fledged companion and therapy bot, as the APIs available are not adequate.

Software - Open-source API that already has Natural Language Processing (NLP) such as Cake Chat, would be used to perform a flowing conversation. To allow Curie to learn from experiences, unsupervised learning and a deep learning model called sequence-to-sequence will be used. A database will store all the conversations for a User and machine learning algorithms will be used to allow Curie to retain experiences. The picture below demonstrates how the user bonds with a robot, showing that it is possible.



Languages – Python

Hardware – A raspberry pi that would be acquired from the DCIT Department is required to build the robot. A blood pressure sensor, heartbeat sensor and oxygen saturation sensor will be used to measure the User's heart rate, blood pressure and stress levels. Curie will have haptic sensors that allows for a sense of touch (such as in the picture below), distance sensors to avoid obstacles, motion sensors and motors to move anywhere.



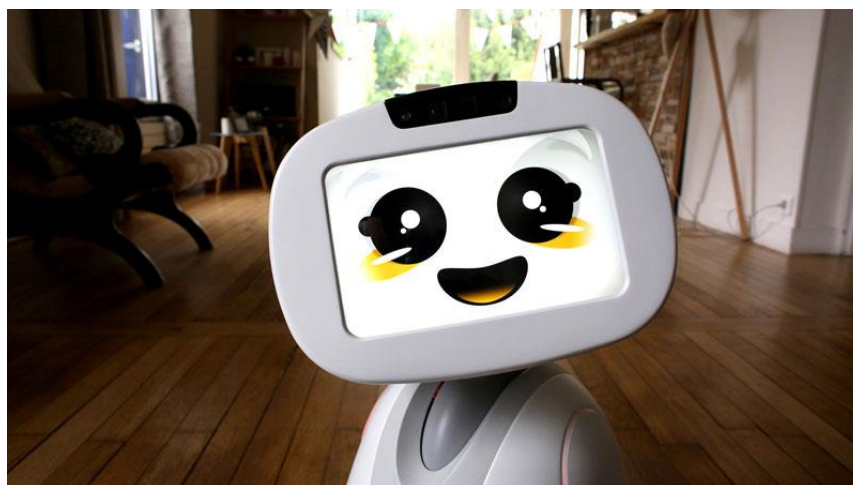
C.2 General Constrains

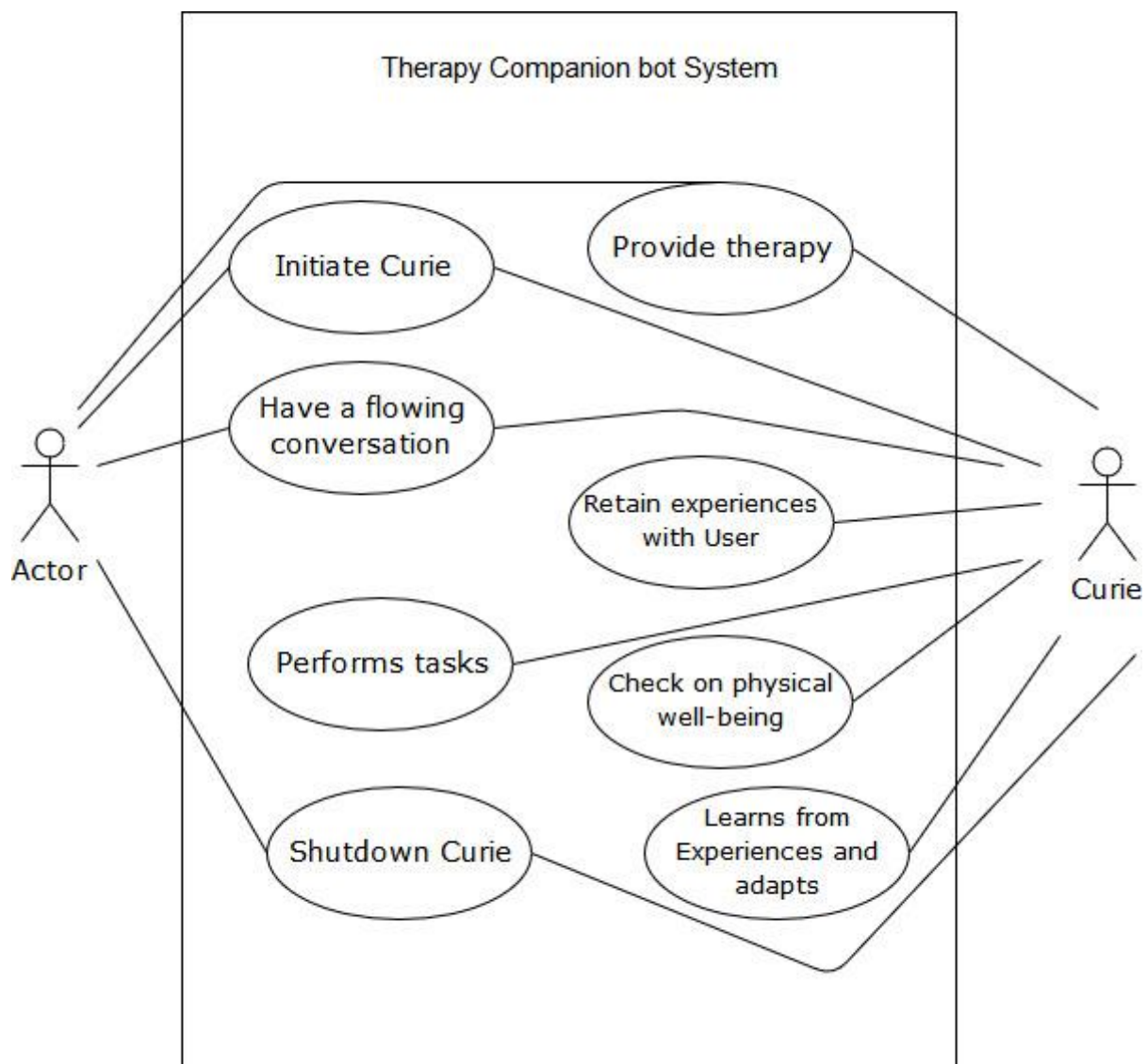
Curie must be as automated as possible, and user friendly. All the user would have to do is say "Hello Curie" and Curie would wake up. Curie would also store the user's voice, face and body language to remember that user. To shut down Curie, the user just has to say "GoodBye" or press a button.

C3. Design Details

The main design includes the architecture and user interface design for now.

The Interface will be a physical robot that is covered with memory foam specifically to relieve the users stress when the robot hugs them or is hugged. It is made to look cute and friendly and will have a screen as the face so the expressions of what the robot is feeling can be displayed such as the picture below.



Application Architecture –*Non-functional Requirements –*

- Security – Conversation with Curie is confidential, no one has access to it or can view it. This ensures that the user has their privacy when conversing with the robot.
- Performance and Reliability– Performance is very important for Curie as if Curie does not respond in time or cannot stop someone from suicide, then it's not performing its tasks accurately. In order to ensure that Curie is accurate and reliable, extensive training and testing will be done.
- Portability – Curie will be small and can be carried physically anywhere.
- Usability – This is also very important as the user needs to be comfortable when interacting with Curie and should not have to perform any complex instruction to use Curie.

References

- Jeong, Sooyeon. "A Social Robot to Mitigate Stress, Anxiety, and Pain in Hospital Pediatric Care." August 21, 2014. Accessed September 13, 2018. doi:10.1145/2701973.2702028.
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