Initial Report

Human Robot Interaction in Healthcare: supporting everyday task

CM3203 – ONE SEMESTER INDIVIDUAL PROJECT

CREDITS: 40

SCHOOL OF COMPUTER SCIENCE

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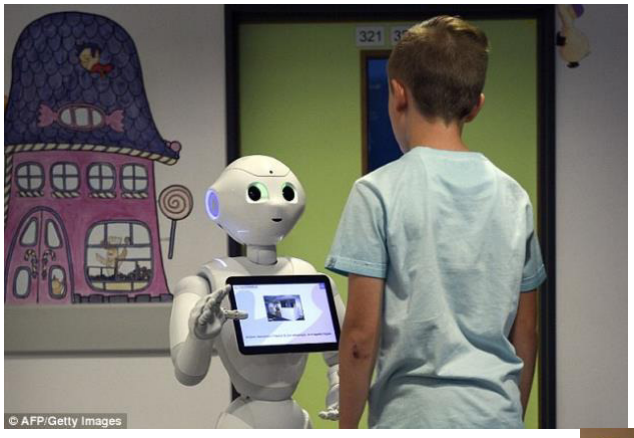

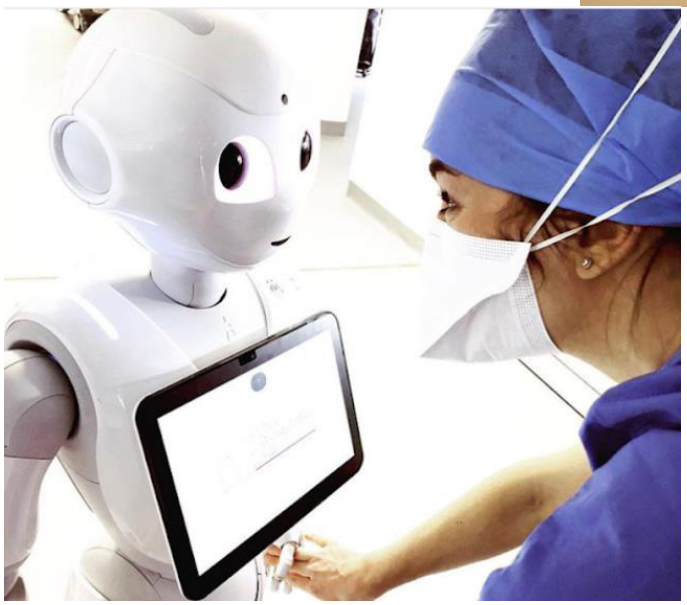

As the title suggests, the problem being tackled here is supporting everyday tasks in a Healthcare environment with the help of robots. The robot being used here is Pepper, a semi-humanoid robot that was manufactured by SoftBank Robotics.
In a healthcare environment, Pepper can perform a myriad of everyday tasks, involving greeting hospital visitors, carrying small talks with patients or their families and keeping them entertained, communicating with nurses to provide instructions, Pepper can also help children and adults with special needs overcome their anxiety about their upcoming procedures*, and Pepper can also educate and inform visitors on remaining compliant with health regulations, ensuring everyone's safety. Apart from this, Pepper has a lot to offer in the context of entertainment for the guests and patients, like performing animations and having small talks. While researching on my project I came across several case studies and articles about Pepper and of its uses and benefits in the Healthcare environment. One of such Case Study stated could especially be useful in Cognitive Activation and Dementia Prevention, through the regular activation the patient through speeches, entertainment, etc*. The overall aim is a simplification of everyday tasks and reduces stress on medical staff which allows them to focus on more imperative tasks.
The main aim of this project is to design QiChat applications that perform everyday tasks, and the main focus is on the conversation of Pepper with humans emphasizing on the conversations being:

- Conversational
- Cooperative (Quantity, Quality, Relation, Manner)
- Character-Driven
- Context-Driven
- Multichannel

To implement the tasks required for this project I would be using Choregraphe, which is a graphical environment for programming Pepper. Choregraphe allows using a library of prebuilt code blocks based on Python, so easy to use and customise. When we first start up Pepper it requires some minor configurations, however after that Pepper starts to walk in an autonomous walking state until it detects a person. Then, Pepper analyses the person and can deduce the age, gender, mood, etc. Once the age and gender parameters are all set up, a user-interaction scenario is initiated accordingly. Once the interaction is over, or after receiving no response from the person, Pepper gets reset and goes back to its autonomous walking state.
My work here would involve selecting the user-interaction scenario to accommodate a healthcare environment, which would make Pepper more useful in such an environment.

Links I took reference from to understand Pepper's application in a Healthcare Environment.
* https://www.softbankrobotics.com/emea/en/pepper-healthcare-ga
* https://www.softbankrobotics.com/emea/en/blog/news-trends/pepper-mitigating-anxiety-during-vaccination-process-germany
* https://www.softbankrobotics.com/emea/sites/default/files/blog/pepper-healthcare_St.Marienpdf.pdf

The tasks that I have chosen to work on include:

- Greeting Visitors:

  The task involves using QiChat to create a simple application that enables Pepper to welcome the visitor in Zone 1 (0 – 6 feet away) by waving at them and saying greetings like hey, hello, welcome, etc. followed by asking their name by saying "what's your name?".
- Identifying the visitor:

  The task involves enabling Pepper to identify if the human in the hospital is a Patient or a Family member of a Patient. By asking them "What's the purpose of their visit?".
- Small talk / Entertainment:

  The task involves enabling Pepper to carry a small talk with the human it is having a conversation with, Pepper starts by asking the human, "How are you doing today?", if the human replies with **bad or not good**, Pepper gives a sad response and wishes that they get well soon, however, if the human replies **good,** then Pepper gives a positive response and continues to have a small talk on any random topic, for example, favourite colour, music, weather, animals, and sports. To Implement this in QiChat, I need to simply add concepts and train Pepper to handle the responses from the human.

  For example:

  concept: (colour) [red green blue purple yellow black]

  proposal: %smalltalk %favouritecolor what is your favourite colour?

  u: (_~colour) $1 that's a good choice!

  Furthermore, the task involves enabling Pepper, after the small talk, to ask the human if they would be interested in checking out something entertaining on receiving a **yes** as a reply, Pepper would randomly perform either an animation, like playing an Air Guitar, doing a dance move, or making animal sounds, etc.
- Introducing Pepper:

  The task involves Pepper asking the human if they would like to know about Pepper and its functions and if the human replies in a yes, Pepper goes on to provide a brief description of itself and its functions.
- Helping overcome anxiety:

  The task involves enabling Pepper to keep children and adults with special needs occupied before a medical procedure to help them overcome their anxiety. To do so, Pepper first asks the child or adult if they are feeling anxious and if they reply in a **yes**, then Pepper randomly selects a small talk topic or decides to tell a joke which is made possible using the proposal and topic progression functions (for example ^gotoRandom and ^goto) available in QiChat.

- Nurses communicating to give instructions:

  The task involves enabling Pepper to communicate with a nurse, the nurse instructs Pepper to find a patient with specific patient id and then Pepper goes to a patient, asks them for their id and if it matches Pepper delivers the message to them from the nurse or if the nurse wants to connect to the patient virtually Pepper uses its telepresence to enable that. This task would involve storing the patient id given to Pepper from the nurse and then matching it to the patients until Pepper finds the Patient.
- Patients communicating to ask for help:

  The task involves enabling Pepper to communicate with a Patient, ask if they need any help and if it's something Pepper knows the solution for (has the solution programmed in its QiChat dialog, for example providing help with some equipment in the hospital), Pepper gives the solution else goes on to call a nurse or even use its telepresence feature to connect the Patient to the nurse.
- Guests/Family Visitors communicating to ask for help:

  The task involves enabling Pepper to help Guests/Family Visitors to search for a patient by giving the patient id or to find a nurse for some assistance just by answering that they need to speak to a nurse when Pepper asks them how it can help them. This task also enables Pepper to provide solutions to problems that are programmed in its QiChat dialog. (For example, how to use some equipment in the hospital.)

Work Plan (Gantt Chart):

I would be following the work plan given below in order to achieve the milestones set and to create the final report.

Meeting 4th Feb 2022	Meeting 17th Feb 2022	Meeting 3rd Mar 2022	Meeting 17th Mar 2022	Meeting 31st Mar 2022	Meeting 14th Apr 2022	Meeting 28th Apr 2022	Meeting 12th May 2022

Week / Work	7th Feb 2022	14th Feb 2022	21st Feb 2022	28th Feb 2022	7th Mar 2022	14th Mar 2022	21st Mar 2022	28th Mar 2022	4th Apr 2022	11th Apr 2022	18th Apr 2022	25th Apr 2022	2nd May 2022	13th May 2022
Initial Plan														
Task: Greeting Visitor														
Task: Identifying Visitors														
Task: Small Talk / Entertainment														
Task: Introduction														
Task: Helping Overcome Fear														
Task: Communicating with Nurse to give Instruction														
Task: Patients communicating to ask for help														
Task: Guests/Family Visitors communicating to ask for help														
Final Report														

Meeting Schedule:

The meeting schedule, after careful discussion with my supervisor, has been decided to be **once every two weeks**, this breakdown of the schedule would allow me to work on my tasks carefully and then discuss it with my supervisor and get her very important insights on how I can improve it or add to it.
(All meeting dates are marked in the Gantt Chart as well.)