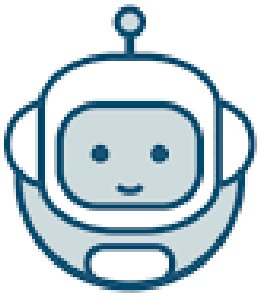
Software Requirement Specification

"*Twin*" An AI-based Companion Robot



Twin

The Companion Robot

Group no. 04

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1. Preface:

Our project is to make an advanced robot which will give company to its owner. Nowadays people are busy with their lives and for that, they have a lot of pressure, tension and often get very little time to spend with someone. So, it will be very helpful to have a companion robot that will show friendly behavior and give him company according to mood. It will help the owner to cool down and lift up the mood.

2. Introduction:

2.1 Purpose:

Studies show that when people feel lonelier they have higher levels of the stress hormone cortisol. And that type of chronic stress raises the risk of cardiovascular disease and other challenges to health and wellness.

Loneliness can also cause suicidal thoughts(suicidal ideation), attempts at suicide, and actual suicide. The extent to which suicides result from loneliness is difficult to determine, however, as there are typically several potential causes involved. As feelings of loneliness intensify so do thoughts of suicide and attempts at suicide. The loneliness that triggers suicidal tendencies impacts all facets of society.

Our motive is to remove loneliness when someone feels lonely because of not having any company.

2.2 Intended Audience:

The project will be made for all the general people. The owner will have the access to use it. Authorised
persons from the family member will have the authorization to access the result.

2.3 Product Scope

This product is for common people from any aspect. Our main focus will be mood detection, setting reminders, and giving company. The scope of the product is totally based on the interaction between the robot and the owner.

2.4 Objective:

To give company to the owner by detecting his mood and give suggestions according to the state of mind.

3. Glossary:

3.1 ERTS:
ERTS is an emotion recognition system that would be able to detect the emotions or expressions of an individual.
It is a computer-generated illustration for measuring facial expression. It has the ability to identify six basic emotions/expressions- anger, disgust, fear, happiness, sadness, and surprise.

3.2 Raspberry-Pi and RP Camera:
The Raspberry Pi is a low-cost, credit-card-sized computer that plugs into a computer
monitor or TV, and uses a standard keyboard and mouse. It is a capable little device
that enables people of all ages to explore computing and to learn how to program in
languages like Scratch and Python.

3.3 OpenCV:
OpenCV is a great tool for image processing and performing computer vision tasks. It is an
open-source library that can be used to perform tasks like face detection, objection tracking,
landmark detection, and much more. It supports multiple languages including python, java C++.

3.4 Internet of things:
The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

4. Requirements discovery:

4.1 Gathering information from the existing system:
The system we are trying to build is similar to some existing systems like Alexa, Pepper, Olly, etc. Through our study, we have figured out several requirements.

4.2 Interview:
As our project mainly focuses on giving company, we have talked to people of different aspects and collected their opinion as our requirements. Various individuals asked for their desires and demands for our project and we found out our requirements.

4.3 Literature Review:
We have found several journals and IEEE papers about Companion Robot systems for mood detection and how it is implemented.

4.4 Questionnaires:
To collect the user requirements, we have used Google form to interact directly with the users to know their requirements. Then we have consulted with our team members to identify and discover Requirements.
Link: https://forms.gle/FWKFLh4wHXDyqJvz5

5. User Requirements:

5.1 The companion robot will be user-friendly and it will have a user-friendly display.

5.2 Firstly the robot will detect the owner.

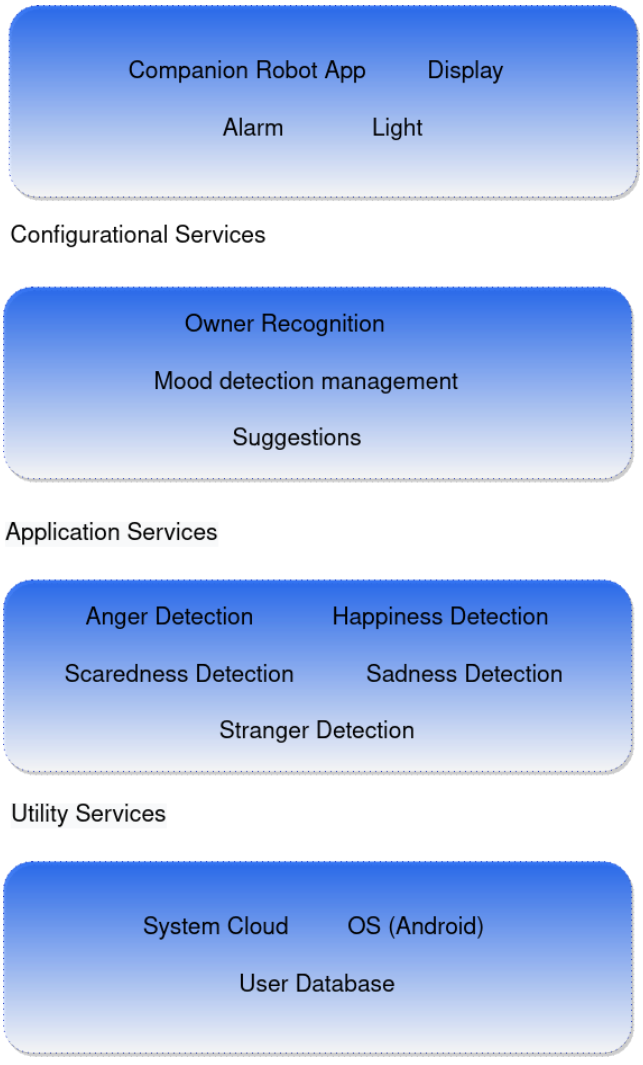
5.3 Happiness, sadness, scaredness, and anger of the user will be detected while using this device.

5.4 Users will be informed by an alarm through an app if any stranger enters the room when the user is not at home.

5.5 Users will be able to use this robot as a table lamp.

5.6 Users will be able to set reminders by voice command.

6. System Architecture:



Tabular Description:

Operating System	Here we are using Android as an operating system that will support our bottom-level architecture.
User Database	Pictures of the owner and family members will be maintained in a separate database. This database will be running in the background all time.
System Cloud	We will not directly run our app from os. We will use a system cloud that will run our program to make the task easier for the device.
Mood Detection Management	Our subsystems will be running in the background like happiness, anger, scaredness, sadness detection systems.
Suggestions	Suggestions will be given according to detection.
Companion Robot App	The app will notify the owner if an intruder comes to the room while he is not there and also capture the video, take pictures of the person and inform the owner.
Display and Alarm	The display and alarm system works in the front layer.

7. System Requirements specification

7.1 System Requirements:

7.1.1 User-friendly interface

1. Easy to operate for the user
2. No complex functionality
3. A well-developed android-app should be designed.

7.1.2 Mood Detection

1. First a camera will take pictures.
2. The AI algorithm will analyze and detect the mood
2. According to the mood, the robot will perform some actions.

7.1.3 Friendly face

1 . It will have a running display that will present a happy face to comfort the user.

2. It will also display the date and time and work as an android display.

7.1.4 Alarm system

1 . Alarm can be set for a particular task to remind the user of that task.
2. Users just need a voice command to set the reminder.

7.1.5 Voice command Response

1. A microphone will be there to convert the voice command into an electrical signal.
2. Then the converter algorithm will convert the electrical signal into text.
3. Then detect keywords from the text and respond accordingly.

7.1.6 Android app

1. From the app only the owner will be able to communicate.
2. Owner will be able to watch the whole room by using it as a CCTV camera from any place by using the internet.
3. If any strange movement is found, the robot will capture it with a camera and send a notification through the app.

7.1.7 Neck movement

1. There will be a neck of one degree of freedom.
2. By moving its neck it will be able to capture images all around the room.

7.1.8 Secured app alert

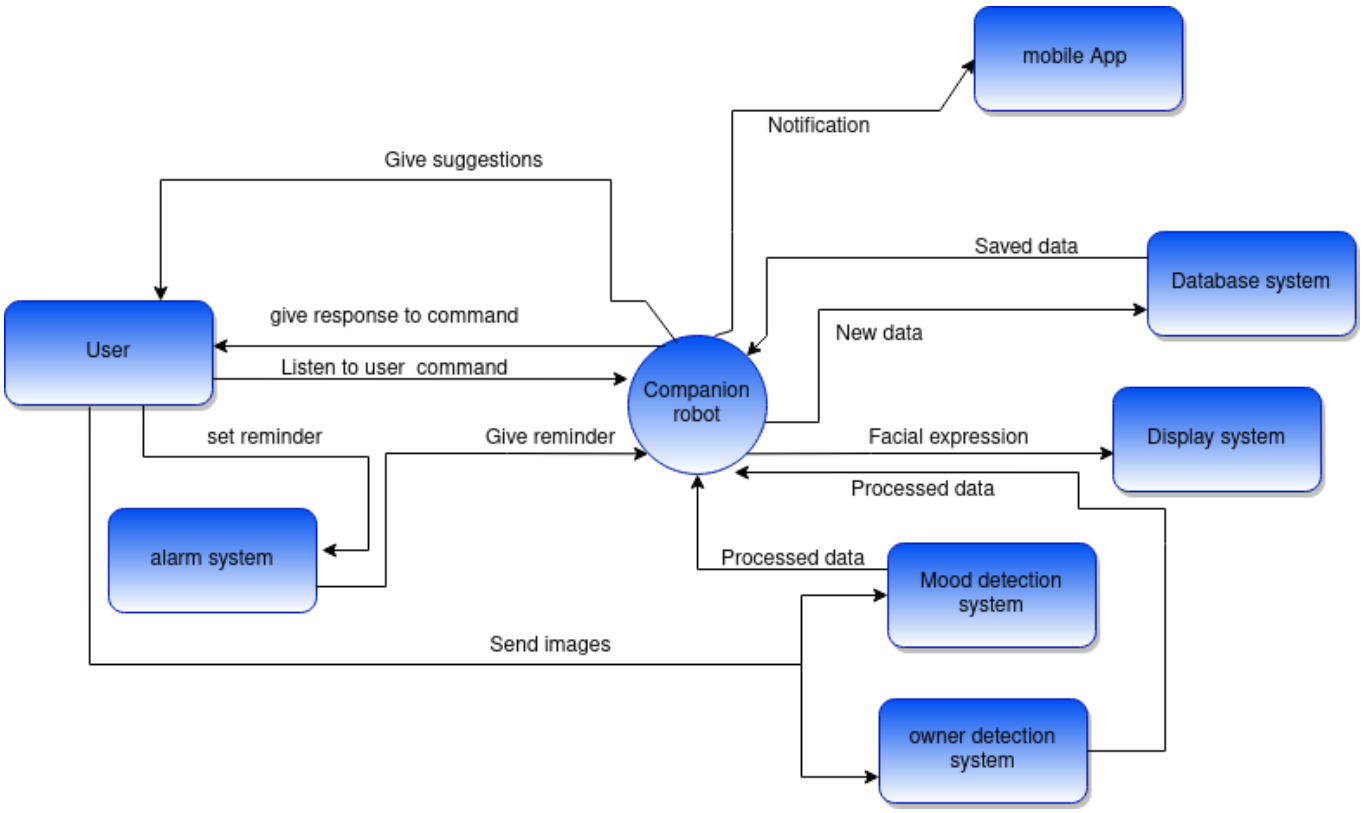
1. The robot will only be able to connect with a single mobile through an app.
2. First owner-phone should be authenticated before use.

7.2 Requirements Classification

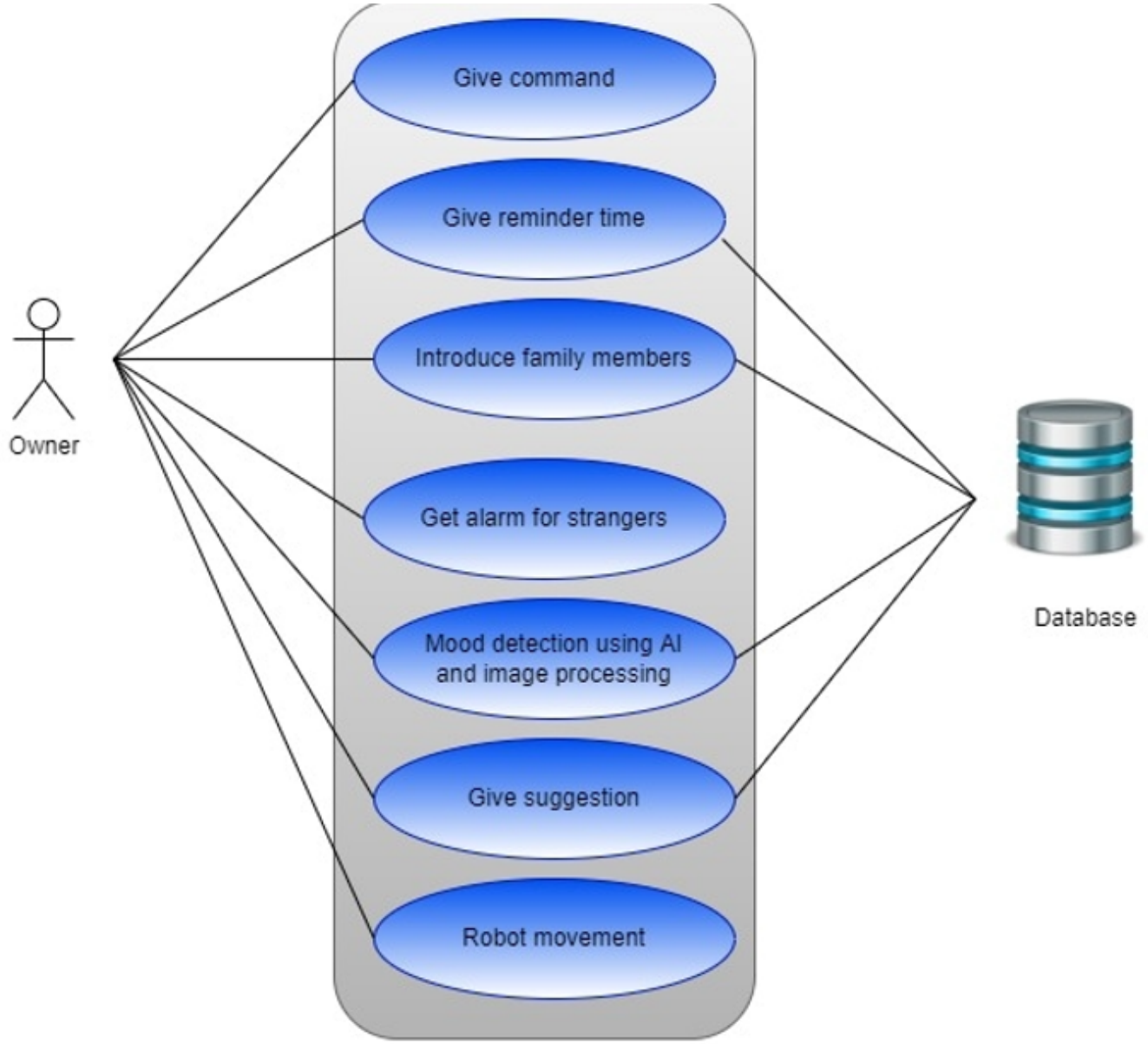
Serial No	System Requirement	Functional	Non-Functional
1	User-friendly interface	✖	✔
2	Mood Detection	✔	✖
3	Stranger Detection	✔	✖
4	Owner Recognition	✔	✖
5	A user-friendly display	✔	✖
6	Voice Command Response	✖	✔
7	Face like Display	✖	✔
8	Give reminder	✔	✖
9	Android App	✔	✖
10	Neck movement	✖	✔
11	Secured app alert	✖	✔

8. System Model

8.1 Context Diagram



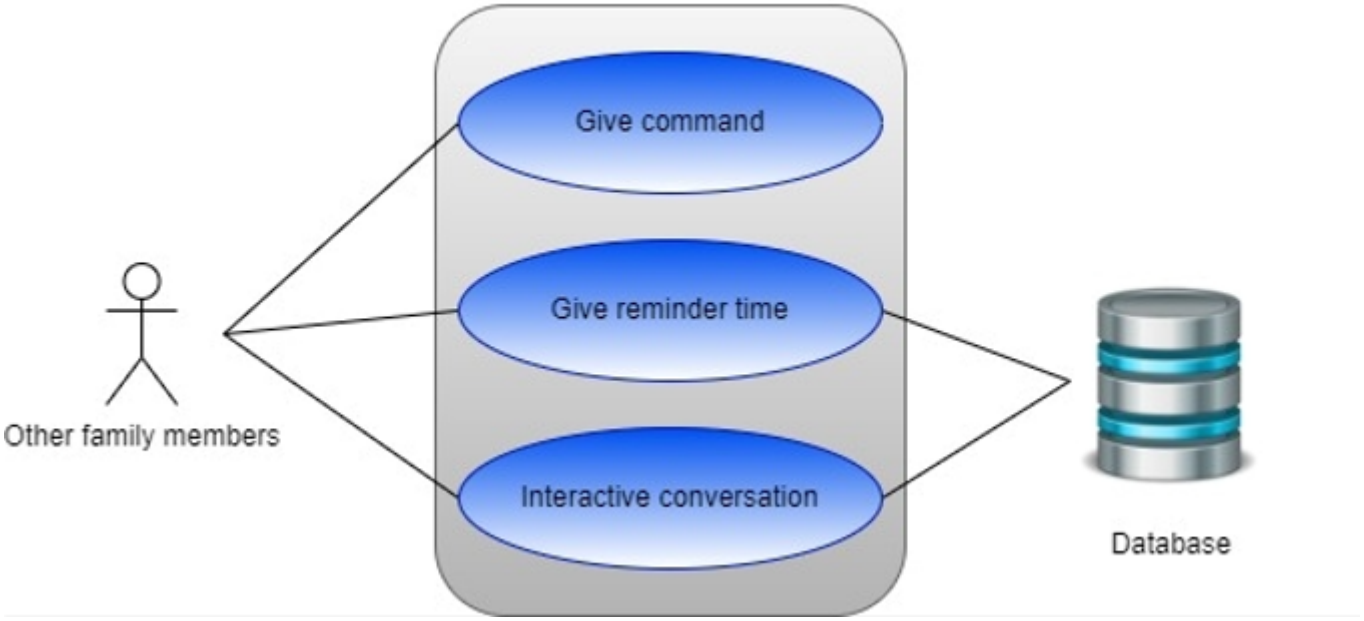
8.2 Use Case Diagram:



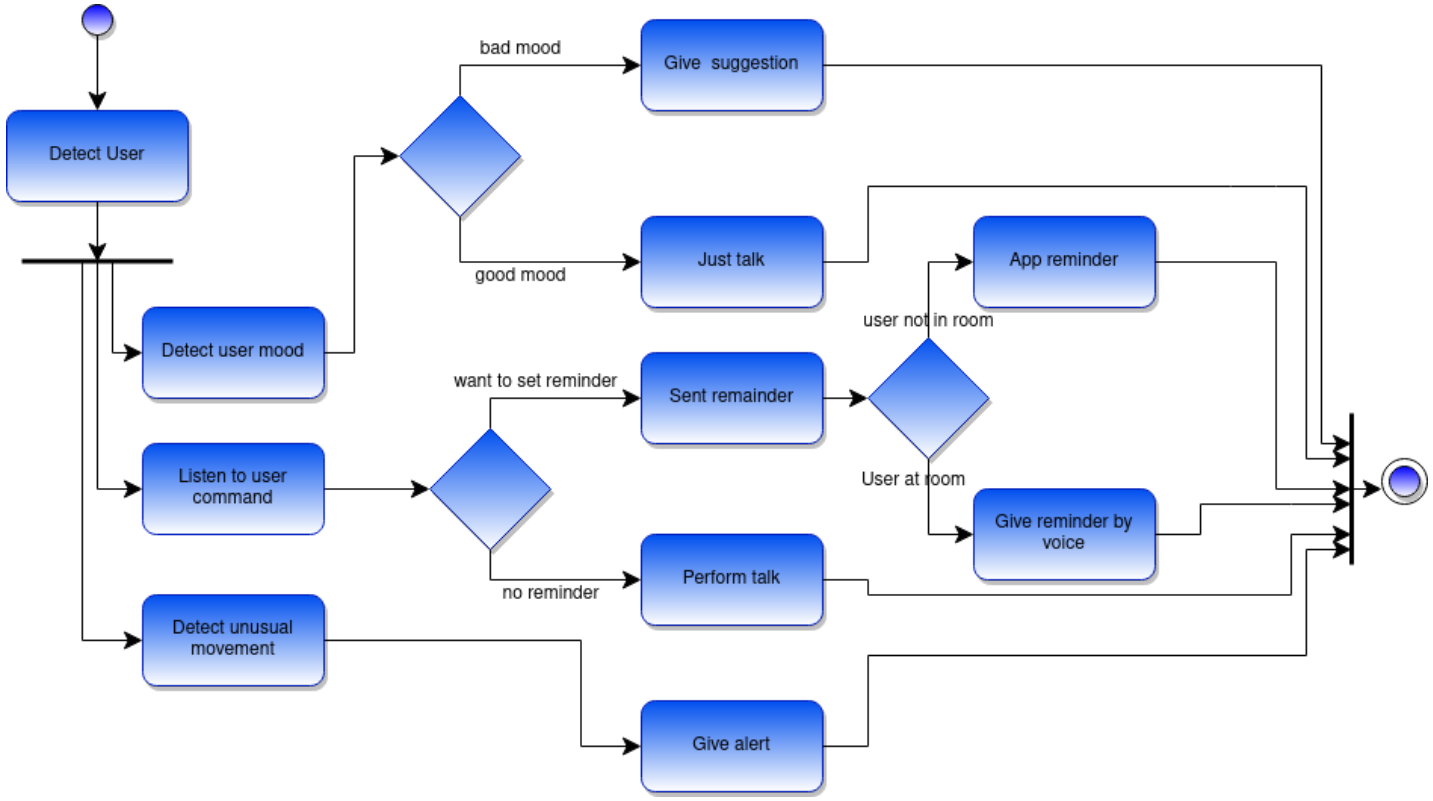
Companion robot:

Actors	Owner of the robot, Other users(Family members), database.
Description	Only the owner and introduced family members can command the robot. The robot will give reminders of the time and will move following the voice command and give an alert for the strangers. The robot will detect the mood of the owner and give suggestions and start a conversation according to the mood.
Data	Voice command, image

Stimulus	User command will be issued by the voice of the owner and family members introduced by the owner.
Response	Confirmation that the command has been taken and the robot will give suggestions correctly.
Comment	The robot will detect mood and according to these, giving suggestions must be helpful.



8.3 Activity Diagram



9 System Evolution :

9.1 If the database is further enriched, the accuracy level will be improved.

9.2 It will be capable of movement and follow its owner.

9.3 It will replace therapists in the future in addressing different mental issues.

9.4 If further improved, it can engage the owner in an interactive conversation.

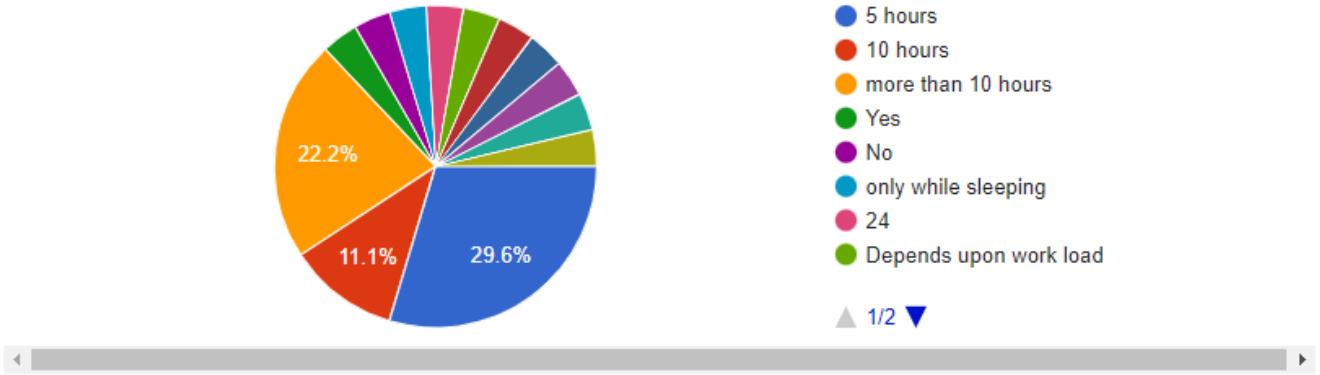
10.Appendix:

We have done a survey on our project by making the questionnaire on the feasibility of Companion robot.Survey link is given below-

https://forms.gle/FWKFLh4wHXDyqJvz5

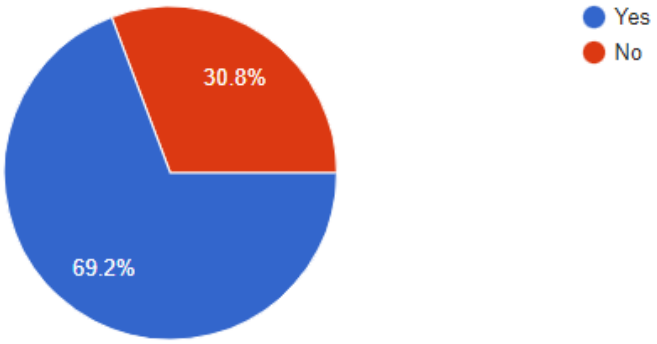
How much time do you spend alone?

27 responses



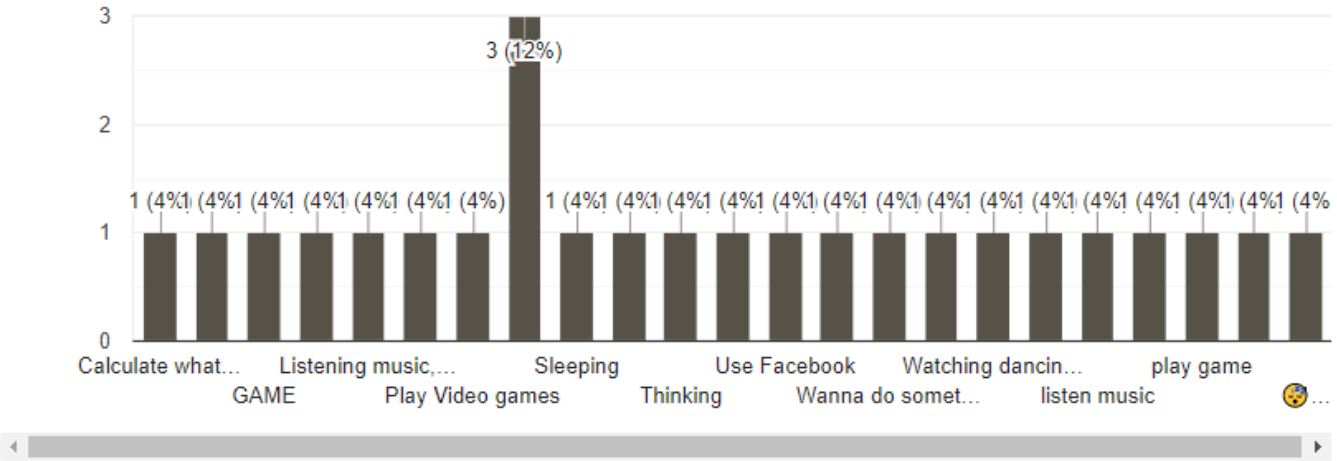
Do you suffer from any kind of mental issues like depression,anxiety,panic attack etc..

26 responses



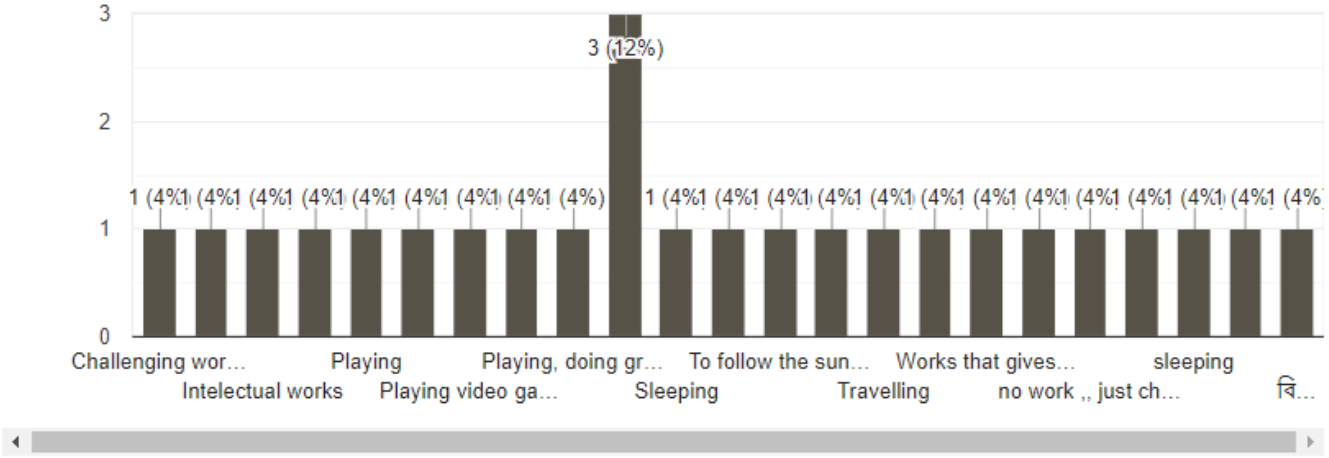
What do you do in your free time?

25 responses



What kinds of works do you enjoy?

25 responses



What do you want from a companion robot?

25 responses