Happy with Lappy

Software Requirements Specification

12/06/14

Prepared for
Software Engineering
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Revision History

Date	Description	Author	Comments
12/03/2014	Version 1	Aditee Nagle Lizilina Parhi Rachna Gajre Seema Sardesai	First Revision

Document Approval

The following Software Requirements Specification has been accepted and approved by the following:

Signature	Printed Name	Title	Date
	Dr. Leyna Zimdars	Instructor	
	Zoltan Kurczveil	Instructor	

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1. Introduction

1.1 Purpose

The purpose of this document is to provide a detailed overview of the software applications in Lappy. This document will contian the details of the functionalities of the software applications and its target audience. It will provide a glimpse of the user interface and its software, hardware and other technical dependencies.

1.2 Scope

Autism is a neurological disorder that result in impaired social interaction, verbal and non-verbal communication, and restricted and repetitive behaviour. It is mostly diagosed in children at an early age i.e when a child is 3-5 years old. The symptoms develop gradually which could lead to autistic children becoming dependent for various activities including communicating their needs. When they cannot express themselves and communicate their needs, they can get aggressive and perform activities harmful to themselves and others. 'Happy with Lappy' is a project attempted to create a device called Lappy that would have software applications designed help autistic children communicate, assist in learning various skills, reduce stress levels and make them happy.

Since autism affects children with varying severity, the Lappy software will be customized to the needs and likes or dislikes of the autistic child who will be using it. Lappy can be used by the autistic child as well as by other stakeholders who assist the child in his/her day-to-day activities.

1.3 Definitions, Acronyms, and Abbreviations

TERMS	DEFINITION
System	Touch screen laptop. The name of the laptop is Lappy.
Student	An autistic child for whom the system shall be customized.
Caretaker	Parent/teacher/helper who assists the autistic child in performing various activities on the system.
User	Person using the system. It could be student or caretaker.
ASD	Autism Spectrum Disorder
Apps	Software applications provided in the system to perform various activities.
Schedule	The plan of activities that an autistic child needs to refer in a course of day.
Cloud database	The database which is synchronized with the system.
Levels	The different system configuration for different degree of ASD. It has apps and user interface specific to their needs and likes.
Slate	Alternative to keyboard which is a blank touch screen that can act as a drawing/writing surface
Home Screen	The screen displayed after the welcome screen

1.4 References

- http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0002494/
- http://www.autism-society.org/about-autism/
- http://www.autismspeaks.org/what-autism/facts-about-autism
- http://en.wikipedia.org/wiki/Autism
- http://www.nytimes.com/2014/10/19/fashion/how-apples-siri-became-one-autistic-boys-bff.html?_r=0
- http://www.templegrandin.com/
- http://www.brainyquote.com/quotes/keywords/autism.html
- IEEE Std 830-1984 Guide to SRS

1.5 Overview

Following is the brief description of what the document would contain

Section one inlcudes:
- Brief introduction to the Lappy
- Glossory
- References

Section two includes:
- Functions of the product
- User characteristics
- Assumptions made

Section three includes:
- Hardware and software interfaces
- Requirement Engineering models
- Non functional requirements

Section four includes:
- Analysis models
- Change Management Process

2. General Description

This section will give an overview of the whole system in terms of product perspectives and product functions. This section gives the big picture of what the system is encompassed to do. The system will solve some of the problems faced by autistic patients and also bridge the gap between caretaker and the patient. It acts a communication medium between them

2.1 Product Perspective

This is a customized system designed specifically for the needs of the student. The system will display apps according to the likes and needs of the student. A student can view ans use the apps

to perform activities included in the apps. Various apps included in the system are puzzles, maths, video, music, drawing etc.

The system will be designed for multiple levels depending on the severity of ASD of student. This document describes the following levels:
- Level 1
- Level 2

Level 1 is for students who are severely affected by ASD. In this level the number of apps will less and icons representing these apps will be big.
Level 2 is for students who are less affected by ASD. In this level, more apps will be provided and their icons will be smaller in size.

This system will have two touch screens, one acting as the display for apps and other as an alternative for keyboard or slate. A stylus will be provided with the system for ease of use.

The system data will be stored on cloud database as backup. In case a caretaker makes any modifcations or updates to the app data, the same will be updated in the cloud and synchronized with the system whenever the system connected to the internet via Wifi. The caretaker can make modifications or updates using the system as well as other devices like smart phones, PCs, tablets etc.

2.2 Product Functions

- The system shall be a customized device to suit the likes and needs of students.
- The system can be used by a caretaker as well as the student.
- The system shall accept caretaker unique login user name and password.
- The system level shall be decided on the basis of the student affected.
- The system shall display apps that are selected based on the needs and interests of the student.
- The system shall contain a scheduling app irrespective of the level / interests of the student. The scheduling app shall accept inputs from the caretaker to plan daily activities of the student.
- The system shall be connected via internet to cloud database.
- The system shall have voice output which can be used to translate the words selected by the student.
- The system shall contain a search option for the student or caretaker to search app and data.
- The system shall contain a help option to assist students or caretaker with information about the system and apps.
- The system shall contain a like option which will be used to provide feedback about the system or app.
- The system shall contain an option for returning to home screen once the student or caretaker has entered a particular app.
- The system shall contain an option for cancel which will be used to cancel the current activity and return to the previous activity.
- The system shall contain a USB port which can be used to update app related data.

- The system shall be fully touch sensitive and have a keyboard and slate option for data input.
- The system shall contain only pictures to represent the apps so that it is easy for the student to relate.
- The system shall display a static communication bar to facilitate communication about the basic needs like eat/drink/restroom at all times while accessing the system.
- The system shall display information about the upcoming activity planned in the schedule. The information will be static and displayed at all times while accessing the system.

2.3 User Characteristics

2.3.1 User characteristics for Students

- Level of education: Since ASD can be diagnosed at young age (around 3 years), very young students may not have ability to read / write / type. Also, since some students may need excessive training to reach a basic level of reading/ writing skills, their ability to read or write cannot be tied with their physical age.
- Level of severity: ASD is a spectrum disorder i.e. it covers a large spectrum. Hence the patients at low end of the spectrum may have severe disabilities regarding motor skills (restricted movements), communication (not able to express their needs or feelings in words), and cognition (not able to process sensory inputs as fast as they are being received, not able to process multiple inputs at the same time). The severity of these conditions varies across the spectrum. Students at the higher end of spectrum may have one or more of these conditions with much less severity.
- Thinking mechanisms: Some students think in terms of pictures, some think in terms of patterns and some in terms of words. One of the skills is much higher sometimes at the expense of others. Hence a student may be highly capable of understanding patterns but lack capability to process words. Based on their basic capability, students have different interests and they like to do tasks that they are comfortable with.
- Unlike non-autistic people, autistic mind thinks in specific terms rather than general (big picture). Hence students need specific concrete instructions or objectives when performing any task.
- Since it is difficult for students to adjust to changes, all of them like to stick to a routine or schedule that they are used to.
- Many students have good procedural memory, i.e. once they understand steps of a process, they can remember them and perform them with ease.

2.3.2 User characteristics of Caretaker

- Caretakers have ability to read, write and type.
- Caretakers become a part of the routine followed by students. Hence, they would use the product on regular basis. There will be very few number of occasional users.

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- Caretakers may be novice / skilled users depending upon their exposure to new computer technology.

2.4 General Constraints

- No assumptions regarding literacy be made while designing UI that will be accessed by students.
- User interface shall be usable for students with restricted motor skills. Size and placement of graphical icons shall be decided based on this constraint.
- Installation of new apps cannot be performed by individual users. Only the technical support team shall be able to add or remove apps to or from the system.
- A request shall be raised at the company in order to either increase or decrease the level of the system.
- The number and type of apps installed on the system are limited based on the level selected.
- The schedule can only be updated via the cloud database and so the system has to be connected to the internet for those changes to be reflected.
- This device will not replace the existing applications available on other devices.

2.5 Assumptions and Dependencies

- It is assumed that users are conversant with touch-screen technologies.
- Correct initial configuration of the system depends on accuracy and availability of student information. It is necessary to know student's interests and needs in advance to enable appropriate initial set up.
- Updates to the system and apps data need synchronization with cloud database. Hence it is assumed that the system is connected to the internet via Wifi whenever changes need to be synchronized.
- All app related data is backed up on cloud and needs to be synchronized with the system at all times. Hence possible modifications to data depend on availability, capacity, portability and usability of cloud database management system.
- Cloud database management system can be accessed from smart phones, PCs, tablets etc by installing the necessary application.

3. Specific Requirements

3.1 External Interface Requirements

This section provides a description of the inputs and outputs to the system. It also provides a brief description of the hardware, software and user interfaces.

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3.1.1 User Interfaces
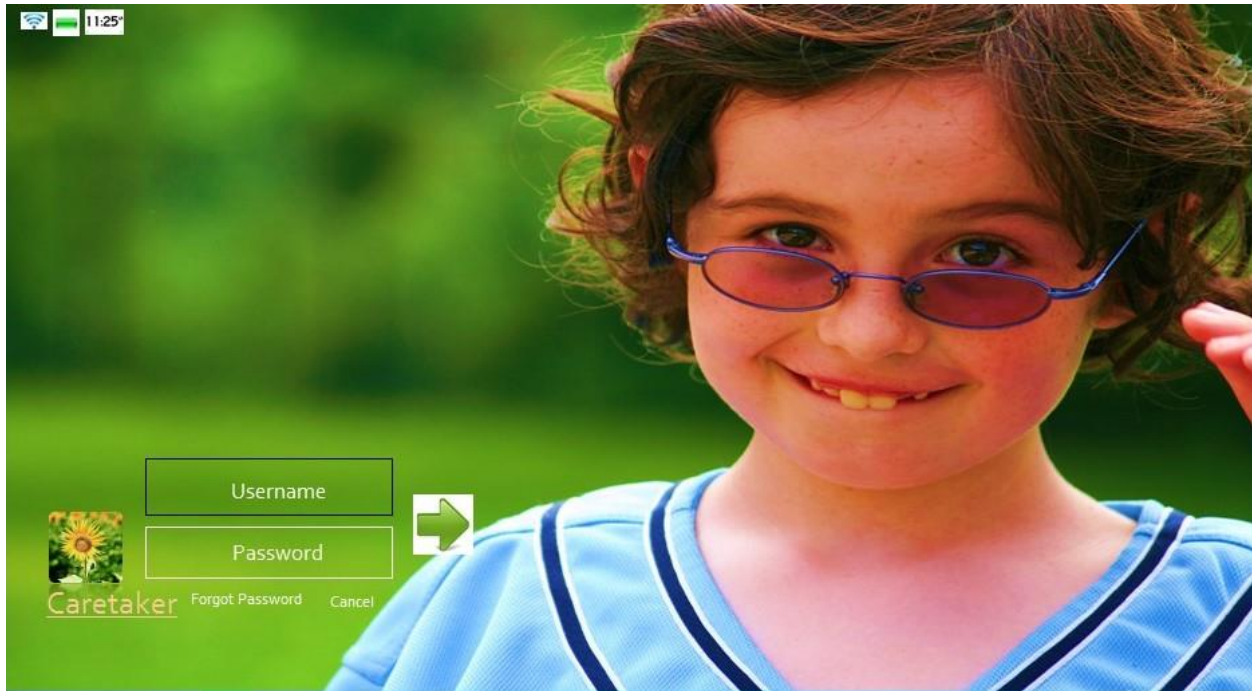
When the student accesses the system, the welcome screen will be displayed which will be a customized screen. The student will not require any login to access the apps. The welcome screen will have a picture selected for the student and a welcome note. The entire screen will be touch screen and the student can tap anywhere on the screen to proceed to the next screen.

The caretaker will have a login option on the welcome screen to login to the system. The caretaker can choose to either login or just touch anywhere on the screen to proceed to the next section. If the caretaker logs in to the system using valid username and password, the apps will display options to modify data.

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When the student or caretaker proceeds to the next screen, they will be able to see the apps installed on the system. The apps will be represented by discriptive picture icons. This screen will also contain a static bar which will contain the communication icons. This static bar will be present on all the screens that the user navigates to. The user can choose to cancel the action or return to the home page by selecting the options present at the bottom of the screen. Also there is a like and help option provided and the top right corner. This option can be used by the user to know more about the app or to like a particular app.

If the user clicks on any icon to enter the app, the details of the app will be displayed. The app will display the various activities the user can perform. The static communication bar can be

used to communicate the activity and the sound bar will have a voice output to all the activities performed on this screen.

3.1.2 Hardware Interfaces

The updates and the data transmission on the apps are handled by the server on the cloud.
The apps are developed on Chrome OS to assist in fast response to the users. The Chrome OS facilitates data update from the cloud server to the apps. The apps data can also be updated via a smartphone or tablet, where the data will be first sent to the cloud and then synchronized with the app.
The cloud contains all the login data to validate and authenticate caretaker logins.
The system will provide interfaces for the wifi and USB port to update or modify the apps.

3.1.3 Software Interfaces

The system apps are devloped on Chrome OS using the Java JDK(Java Developmet Kit)
The Login functionality shall communicate with the cloud to authenticate the caretaker.
The apps shall communicate with the cloud to synchronize the updated data and display it to the user.
The voice output system shall communicate with the local database to get the standard voice output commands.

3.1.4 Communications Interfaces

The apps shall use the internet in order to synchronize the data from the cloud for the recent updates on the apps.
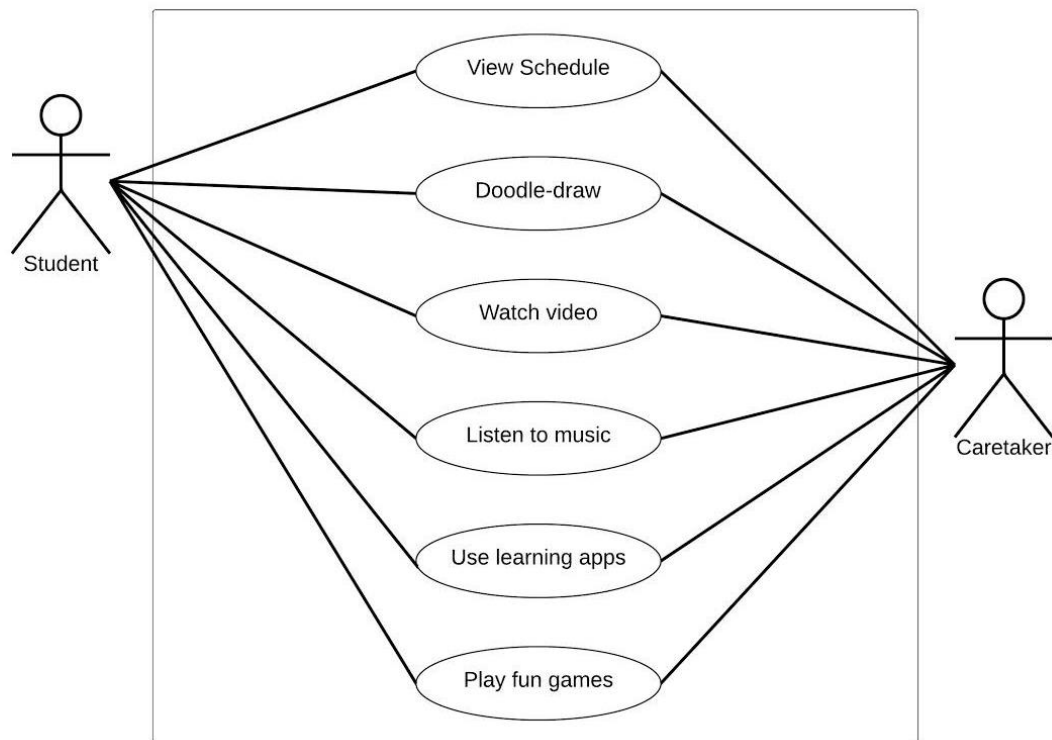
3.2 Use Cases

This section illustrates operational requirements in details using fully dressed use cases and use case diagrams. It documents the interaction of system with various actors by specifying elements like actors, goals and different possible scenarios.

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3.2.1 Use Case 0: Top level Use Case Diagram
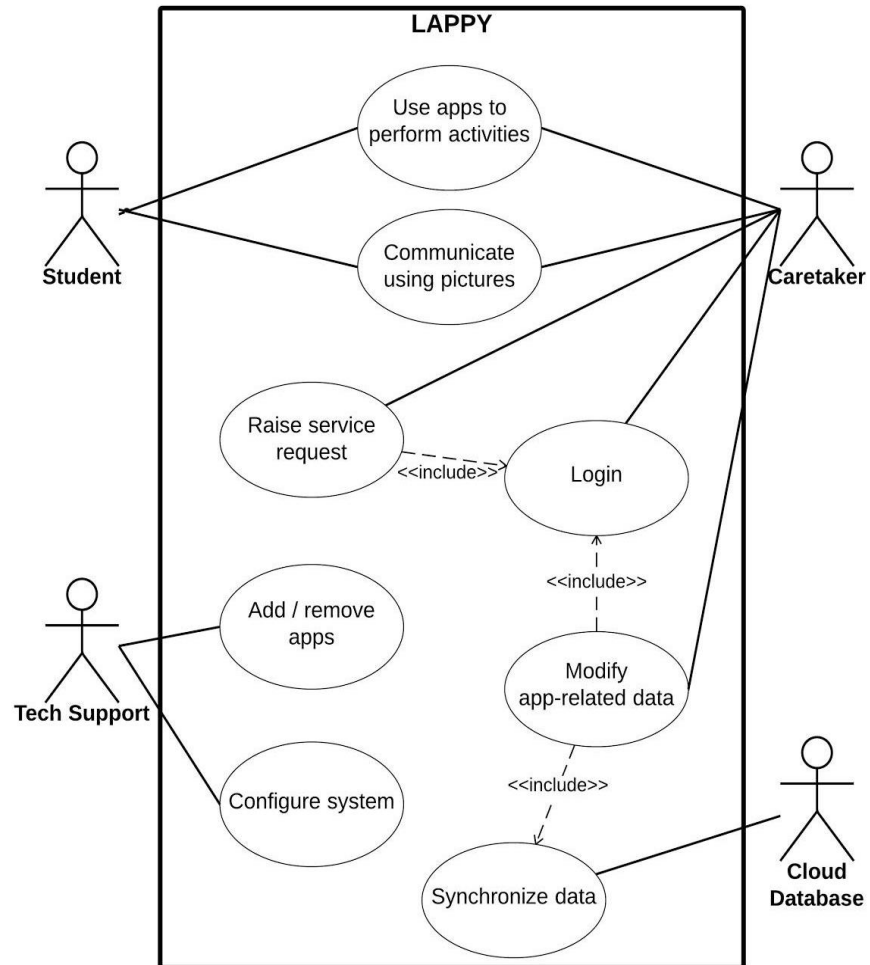
3.2.2 Use Case UC1: Use apps to perform activities

Primary Actor: Student and/or caretaker
Goal in Context: Use various apps installed on system to perform scheduled or unscheduled activities
Scope: System.
Level: User-goal level
Stakeholders and interests:
  ● Student wants to perform an activity specified in his/her schedule using an app installed on system or practice an unscheduled activity using the app
  ● Caretaker wants the student to perform activity specified in the schedule using app installed on system. If needed, the caretaker wants to work with the student to use app and perform the activity.
Preconditions: System is configured to student's personal skills and interests. System is switched on and is displaying installed apps.
Success guarantee: Specified activity is performed using an app.
Trigger: Start time for scheduled upcoming activity is same as current time or student wants to perform a particular activity.
**Main success scenario**:
  1. Student/caretaker identifies current activity on schedule (or chooses an activity if not following any schedule).
  2. He/she locates the app on system that is to be used for this activity.
  3. He/she starts the app and performs the activity.
  4. He/she exits the app.

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Extensions:
      2a. Required app is not found on system:
            1. Caretaker chooses another activity for current time and modifies schedule [using use case: Modify app-related data].
                1a. App is marked as required and needs to be installed.
                1b. Service request is raised with Tech support [using Use case: Raise service request] to install new app. Use case ends.
      3a. Additional data / files are required to perform the activity:
            1. Caretaker logins to system
            2. He/she adds new files [Use case: Modify app-related data]
            3. Caretaker logs out to return to app

3.2.3 Use Case UC2: Communicate using pictures
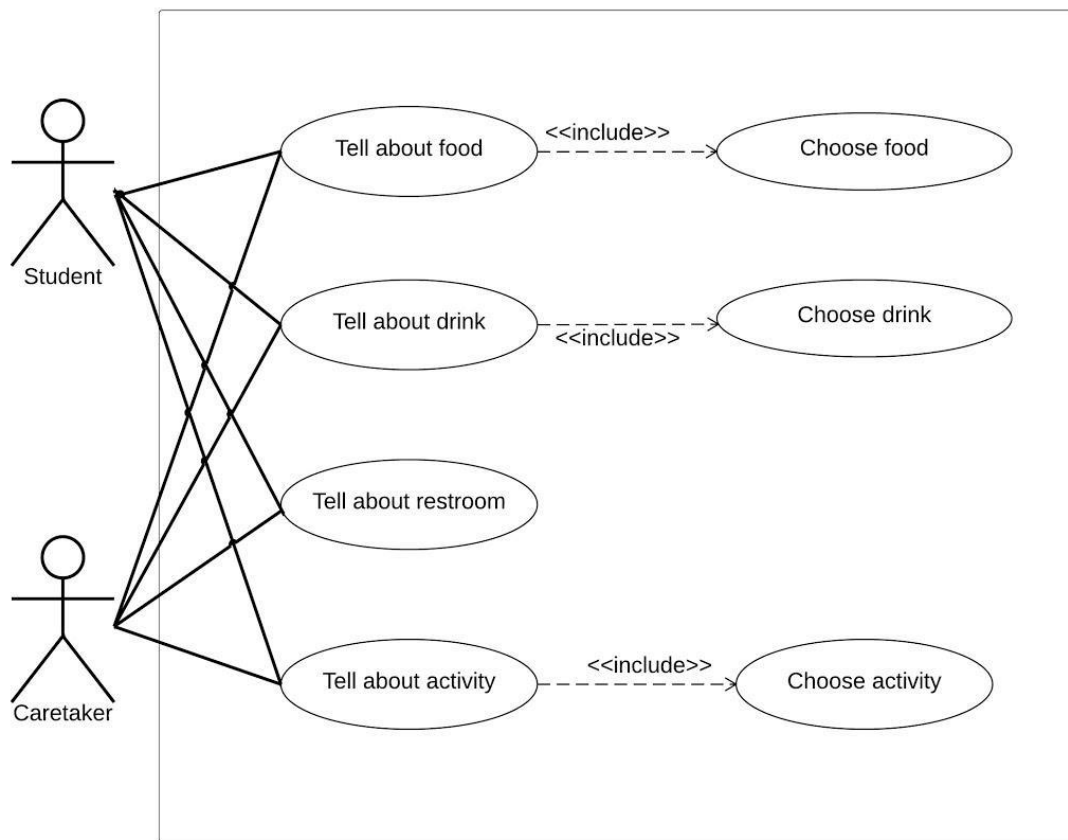
Primary Actor: Student and/or caretaker
Goal in Context: Communicate with caretaker/student about basic needs and interests.
Scope: System.
Level: User-goal level
Stakeholders and interests:

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- Student wants to tell the caretaker about basic needs like eating, drinking, using restroom. He/she wants to express their feeling about certain foods, drinks, things or activities.
- Caretaker wants to understand student's basic needs. He/she wants to instruct student about eating, drinking, using restroom or using apps. He/she wants to teach student about using words in sentence for communication.

**Preconditions**: Student understands the meaning of each symbol used in pictorial representation.

Success guarantees: Correct message is communicated between student and caretaker using pictorial representations.

Trigger: Student or caretaker feel the need to communicate using pictures

Main success scenario:
1. Student/caretaker needs to tell about food/drink/restroom/app.
2. He/she chooses the option that correctly represents one of the above.
3. He/she chooses a specific item listed under each of the options (for example, choose items like fruit, cookie, burger etc. under option food).
4. He/she constructs sentence using pictures chosen for current purpose.
5. System displays the sentence constructed on screen and gives audio output reading the sentence.

3.2.4 Use Case UC3: View Schedule
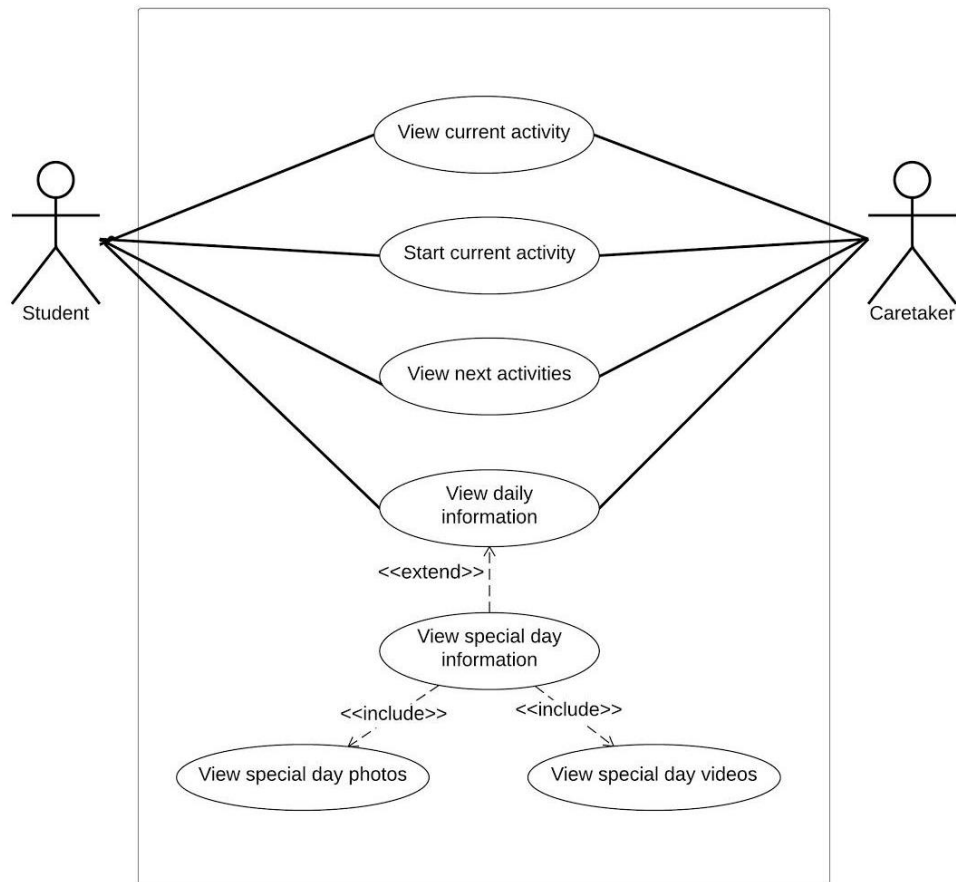
Primary Actor: Student and/or caretaker
Goal in Context: Refer to the pre-determined schedule to identify current and upcoming activities to be performed
Scope: System
Level: User-level
Stakeholders and interests:
- Student wants to look up schedule to know current and future activities and information related to them like start time, end time, name of caretaker assigned for that activity.
- Caretaker wants to look up schedule to know current and future activities and information related to them.

Preconditions: A pre-determined schedule is saved in the system
Minimal guarantees: Student and/or caretaker knows what activity is scheduled at current time
Success guarantees: Student and/or caretaker knows the activity scheduled at current time, app to be used for this activity, teacher who will assist the student for this activity, start and end times for this activity. He/she also knows the upcoming activities in the schedule and their related information.
Triggers: Student and/or caretaker wishes to know current or upcoming activity and related information.
Main success scenario:
1. Student and/or caretaker opens Scheduler app.
2. System displays information about today, for example current day, date and time.
3. System displays information about current activity on schedule (start time, end time, app to be used if applicable, caretaker who will be accompanying the student for this activity).
4. System displays information about upcoming activities on schedule.
5. Student and/or caretaker reads displayed information and becomes familiar with information required to perform scheduled activity.
6. He/she exits Scheduler app.

Extensions:
    2a. Today is a special day (example festivals/birthdays) with occasional activities:
        1. System displays information about the special day [Extension: View special day information].
        2. System displays options to view photos from previous occurrence of this special day.
        3. System displays options to watch videos from previous occurrence of this special day.
    3a. Scheduled activity does not use app installed on system:
        1. System displays name of artifact to be used for activity instead of app to be used.
    4a. Current activity is the last scheduled activity for today:
        1. System does not display information about upcoming activities
    6a. Student and/or caretaker starts the app to be used for current activity from within the Scheduler app and starts current activity [using Use Case: Use apps to perform activities]
Other related information:

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Scheduler app displays data stored in cloud database. This data could be managed by other caretakers from system as well as any device that has the app for cloud database management. To make changes to the schedule, a caretaker needs to login to access cloud data (either from a System or other devices equipped with the app for cloud data management). Any changes made to cloud database will be saved and updates will be synchronized to the system when the system will be connected to the internet via WiFi.

3.2.5 Use Case UC4: Login
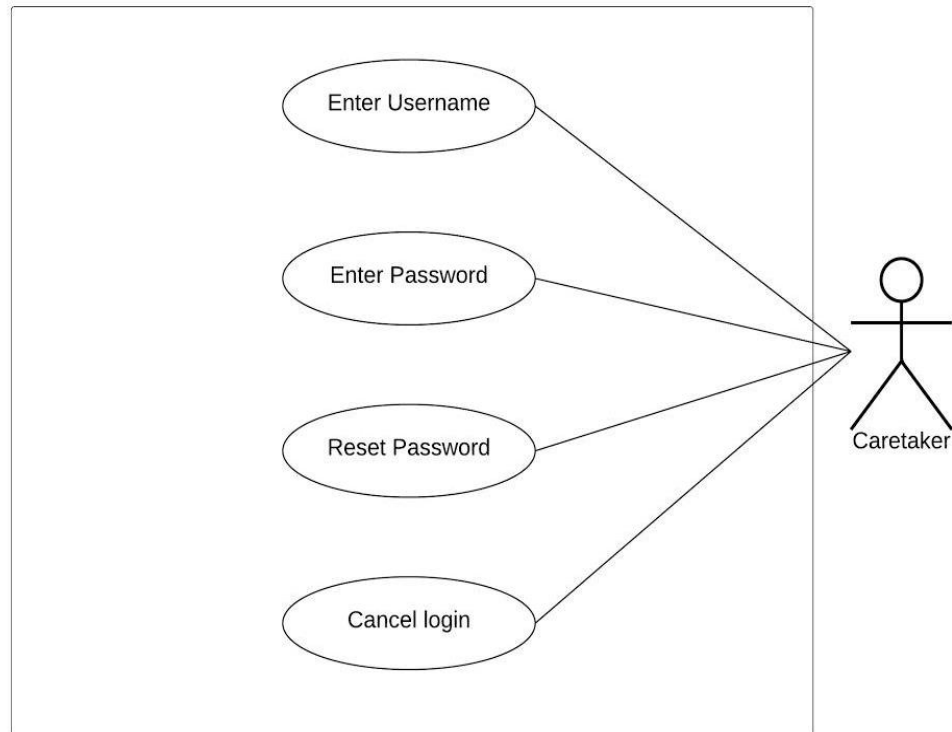
Primary Actor: Caretaker
Goal in Context: Login to system to perform privileged tasks like modifying app-related data, updating cloud data
Scope: System
Level: User-level
Stakeholders and interests:
- Caretaker wants to perform privileged tasks like modifying app-related data on individual system or cloud database
- Tech support manages login account for caretakers by generating new accounts for new users and deleting old accounts for retired caretakers.

Preconditions: None
Minimal guarantees: In case of failed login, modification to data is not possible but current data is accessible through apps installed on system

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Success guarantees: Caretaker is successfully logged in to the system to perform privileged tasks. Caretaker can access functions for data modification within each individual app as applicable.

Triggers: Caretaker decides to make changes to current data for one or multiple apps.

Main success scenario:

1. Caretaker clicks on login icon to start login process.

2. System shows login screen.

3. Caretaker types username, password and hits enter key/clicks on Go icon.

4. System checks for valid input.

5. System show successful login message when input is valid.

6. Functions for data modification are now accessible to carekater.

Extensions:

　　1-3a. At any time if caretaker wants to cancel login action:

　　　　1. Caretaker clicks "Cancel" icon to revert back to original screen.

　　5a. Username and password entered are invalid:

　　　　1. System shows error message.

　　　　2. System shows login screen for another attempt.

　　　　3. Caretaker ren-enters username and password and clicks on "Go" icon.

　　3a. Caretaker forgot password and chooses to reset password using "Reset password" option.

Other related information: A caretaker is required to register with Tech Support in order to obtain valid user-name and password. Upon reset password, new password will be delivered by e-mail to the e-mail account of the caretaker that was registered at the time of account creation.

3.2.6 Use case UC5: Modify app-related data
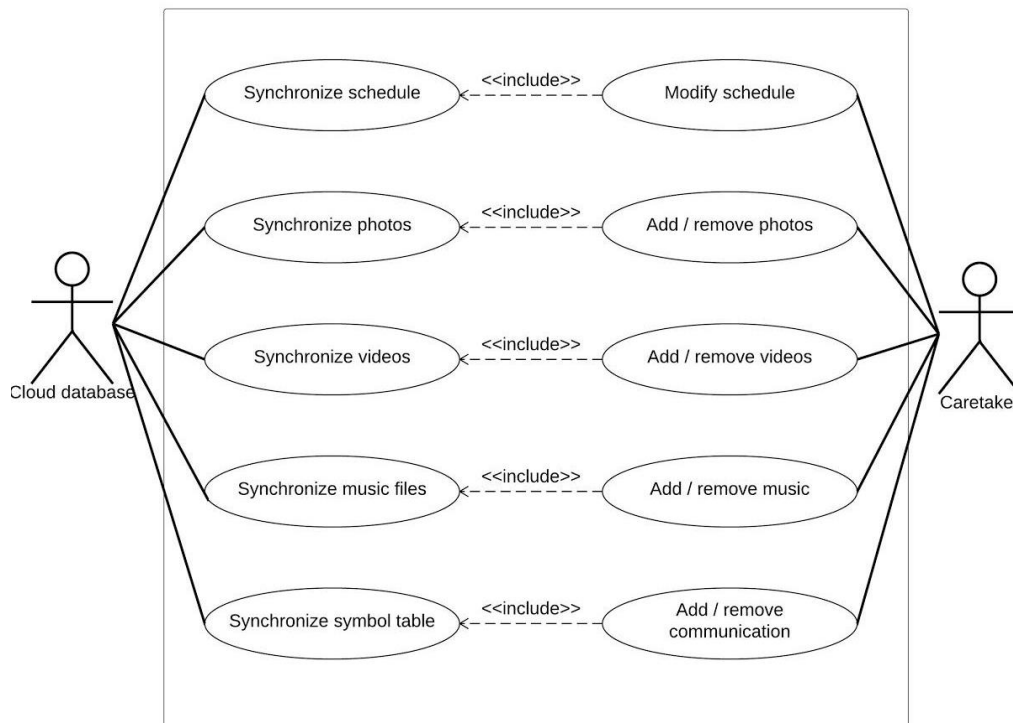
Primary Actor: Caretaker
Goal in Context: Modify app-related data stored in individual System or cloud database
Scope: System.
Level: User-level
Stakeholders and interests:
- Caretaker wants to make changes to app-related data stored on individual system or cloud database. These include creating new schedule, updating saved schedule, adding new videos, photos, music files, communication icons.
- Student needs new data in order to use apps to perform stated activity.
- Cloud database saves the modifications and pushes updates to the individual system if necessary.

Preconditions: Caretaker has successfully logged in to the system [Use case: <u>Login</u>]. System is connected to internet in order to access cloud database.
Success guarantees: Modified data is saved in cloud as well as individual system (if applicable)
Triggers: Caretaker decides to add/remove/update data
User scenarios vary based on the app being used. Following is an example where a caretaker needs to add a new video to the videos app.
Main Scenario for add/remove video:
1. Caretaker connects USB pen drive to System.
2. He/she clicks on Add Video button.
3. System asks caretaker to choose the source of the video file (USB or cloud).
4. Caretaker chooses USB option and navigates to the desired folder on USB pen drive.
5. He/she selects the video file to be added and clicks OK.
6. System copies the selected video to a local folder and initiates synchronization with cloud.
7. Data is synchronized.
8. System displays the newly added video in the list of available videos on Videos apps screen along with the old videos

Extensions:
    4a. Caretaker chooses "cloud" option as source:
        1. Caretaker navigates to desired location in cloud file system.
        2. He/she selects the file to added to System and clicks OK
    6a. Not enough space on disk drive:
        1. System shows error message and asks caretaker if he/she wants to remove one or more existing video files.
        2. Caretaker removes older videos to make enough space for the new file.
        3. System copies new file to disk.

3.3 Functional Requirements

This section will give some fundamental functions performed by the system, which were captured in the use cases. The full description of the functions captured in use cases is shown in this section

3.3.1 Login Scenario

Use Case Name	Login
Primary Actor	Caretaker
Trigger	The caretaker clicks the caretaker icon
Precondition	The caretaker is an existing user with an existing account.
Basic Path	1. The caretaker writes his/her valid username. 2. The caretaker then enters the correct password.
Alternative Paths	Caretaker enter invalid user name and password. Caretaker forgets the existing password and resets the password.
Postcondition	1. Successful login and user is redirected to home page. 2. If wrong login password or if user forgot password then reset the password by clicking **Forgot password link.**
Exception Paths	The caretaker may cancel login.

3.3.2 Perform Activity

Use Case Name	Use apps
Primary Actor(s)	User
Trigger	The user can select an app
Precondition	The user screen should have all the app.
Basic Path	1. The user views the multiple app icons. 2. The user selects one of the app icons. 3. The app then launches the activity on the screen.
Alternative Paths	None
Postcondition	1. Activity is launched. 2. Activity can be aborted
Exception Paths	None

3.3.3 Modify App Data

Use Case Name	Modify app data
Primary actor	Caretaker
Trigger	Caretaker wants to modify app data
Precondition	The caretaker must login.
Basic Path	1. The caretaker views the existing apps. 2. The caretaker selects an app to modify. 3. The caretaker adds/removes data. 4. The caretaker then saves the changes.
Alternative Paths	None.
Postcondition	The app data is modified.

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Exception Paths	None

33.3.4 Communicating using icons

Use Case Name	Communicate using icons.
Primary actor	user
Trigger	The user selects a app.
Precondition	The communication icons are displayed.
Basic Path	1. The user selects food. 2. The user selects the type of food. 3. The system generates voice output for the action selected.
Alternative Paths	1. The user selects drinks. 2. The user selects restroom.
Postcondition	Need is communicated.
Exception Paths	None.

3.4 Non-Functional Requirements

3.4.1 Usability:

- Apps icons shall be represented using image rather than text for ease of understanding.
- Static communication bar present on all screens for users to communicate basic needs at any point while using this system.
- Voice output provided to assist the student to communicate.
- App icon size vary depending on the level of the system.

3.4.2 Emotional factors:

- The apps shall be designed such that users can learn basic things by enjoying and having fun.

3.4.3 Reliability:

- The apps shall start on receiving touch input (finger or stylus).
- The current app shall not stop or crash even if other apps are open.
- The voice output shall be clear so that it can be heard.
- The video resolution shall be equivalent than 720p.

3.4.4 Response Time:

- Response time shall be under 3 seconds to display the apps.

3.4.5 Portability:

- App data shall be accessible to user through system or any other device such as smart phone or tablet to modify.

3.4.6 Extensibility:

- The systems level can be changed in future.

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- The new apps can be added in future.

3.4.7 Supportability:
- The apps shall be installed in system according to users need.
- Any new app requested by user shall be added by tech support team.

3.7 Design Constraints

The following are some of the design contraints for the system:
- No user can install any app on the system. Only the tech support team can install new apps.
- Only one USB port is provided to the system and no other external interface provided to the system to maintain the weight and robustness of the system.
- Only Wifi internet connectivity available and so the apps can be updated via the cloud only when connected to WiFi.
- No text added on the screens for ease of communication with the students.
- Icon size cannot be below 1*1 inches.
- No audio input provided.
- Only touch based input is accepted in the system.
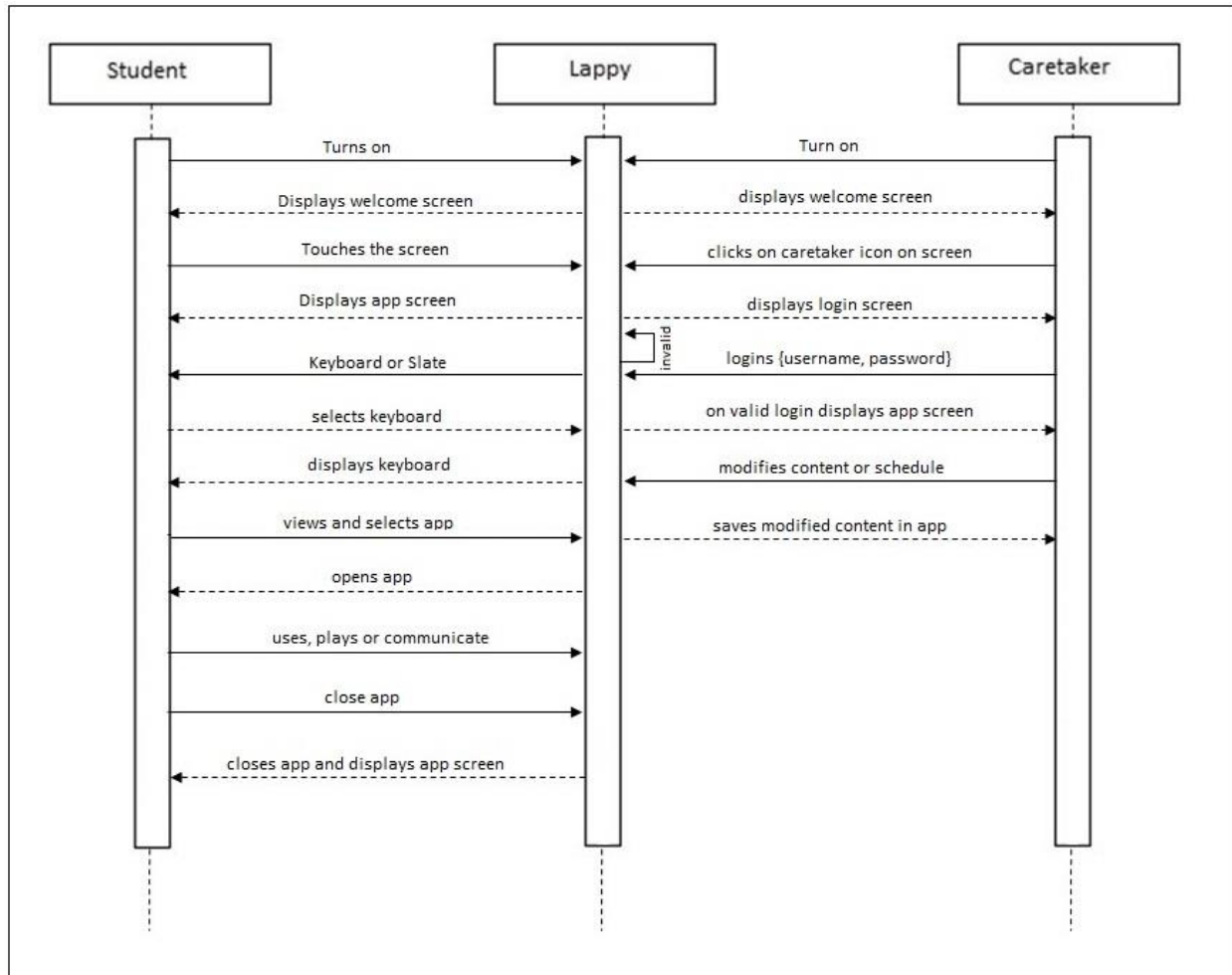
3.8 Other Requirements

Other requirements of the system include:
- System shall provide a slate with color options for drawing and coloring.
- System shall have power saver mode.
- System User Interface should be colorful and attractive for the students.
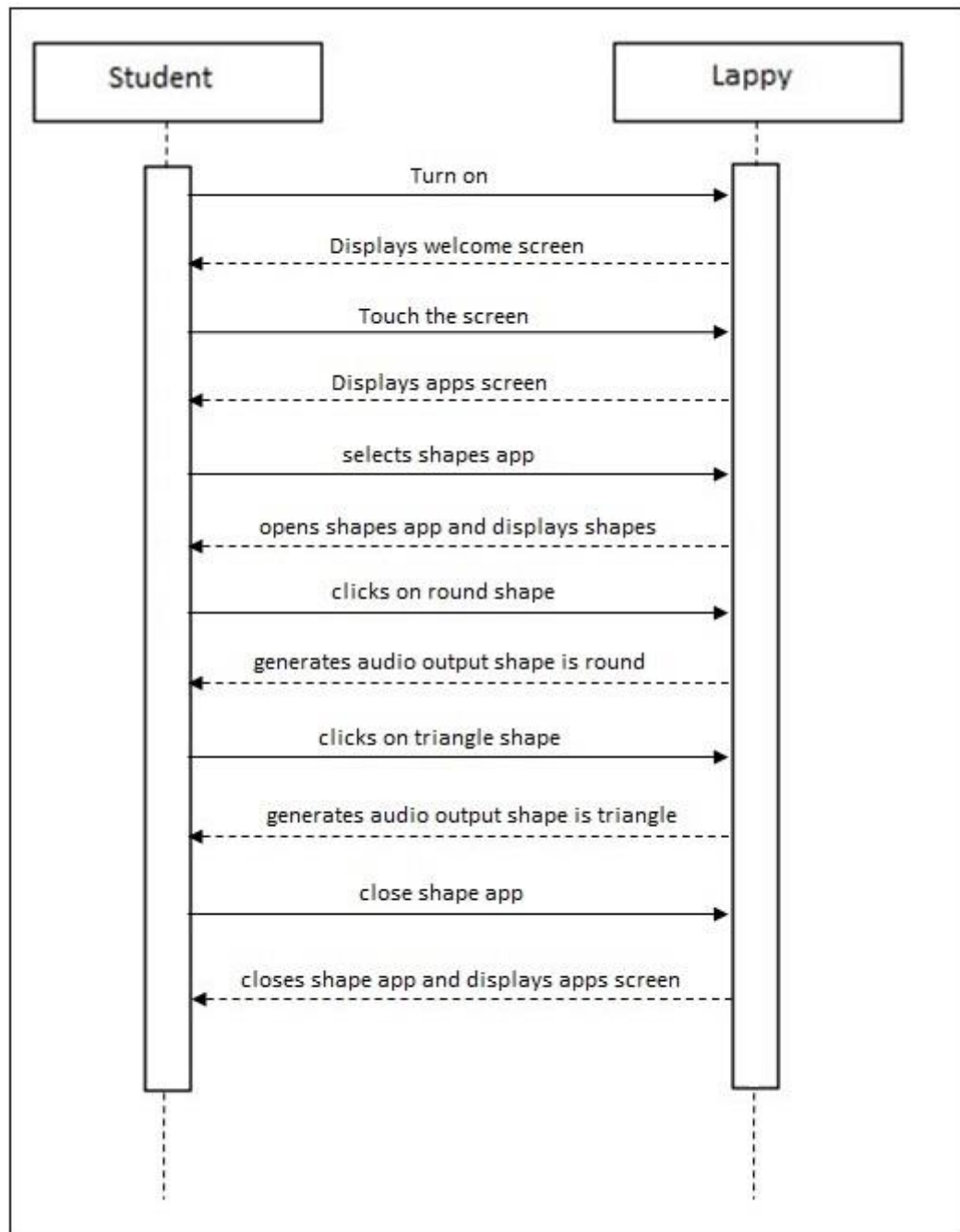
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4. Analysis Models

4.1 Sequence Diagrams

4.1.1 Basic scenrio

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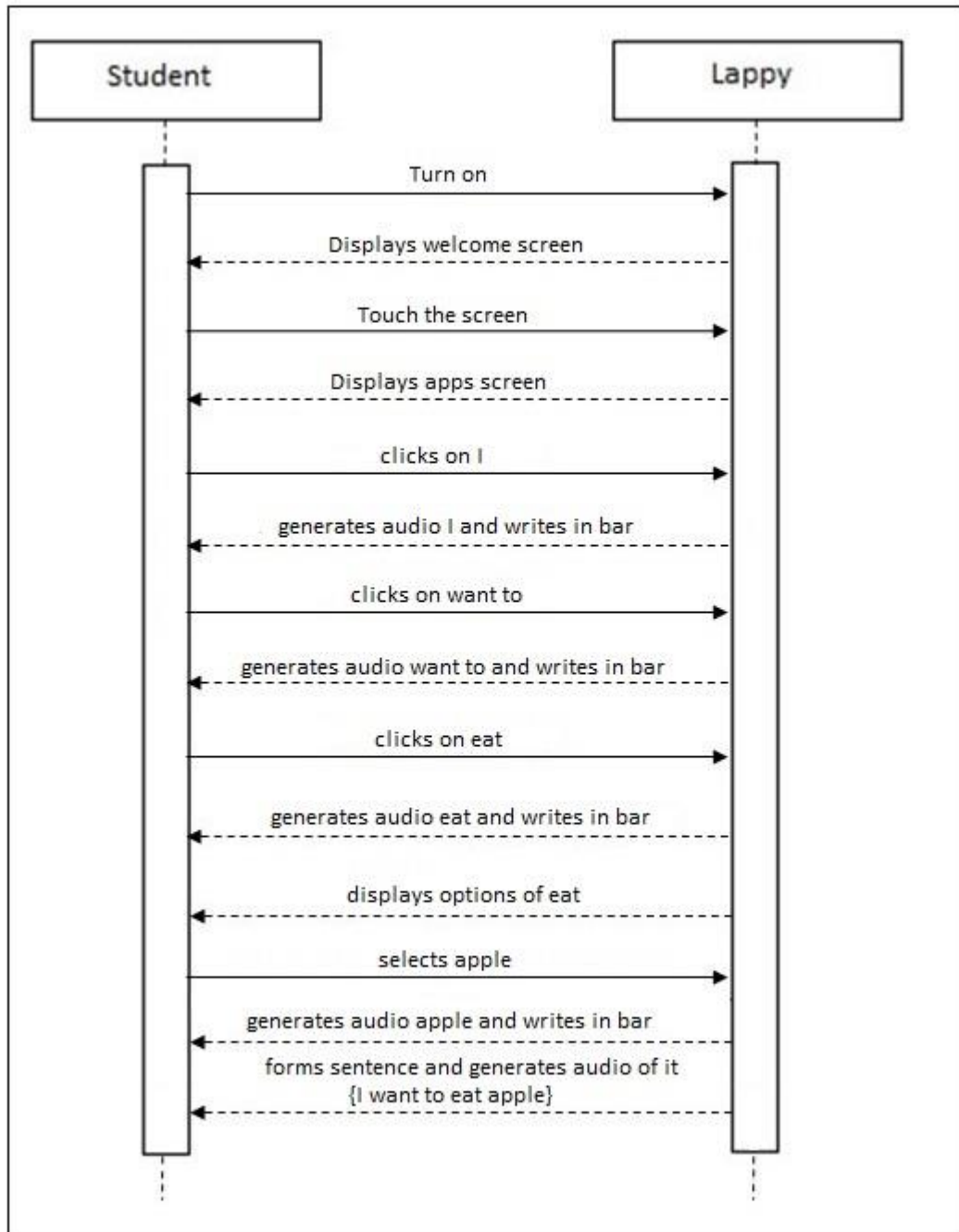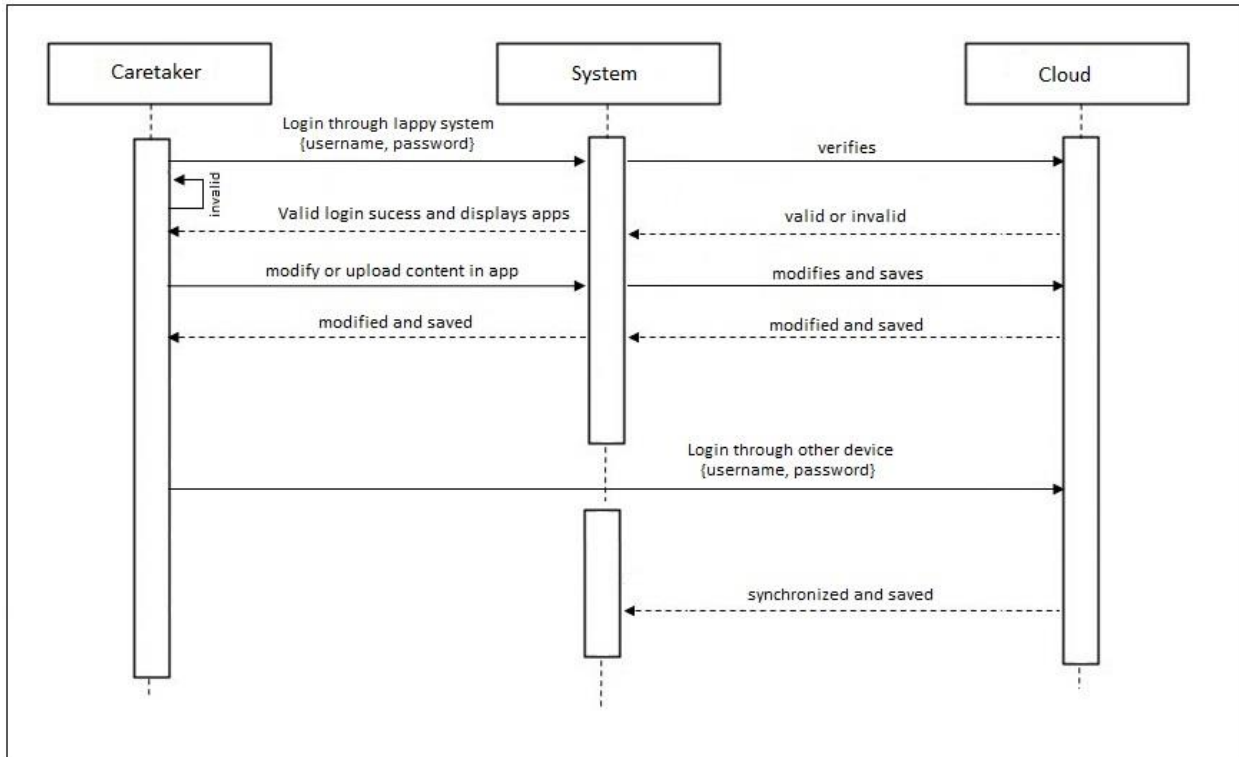
4.1.2 Student using app
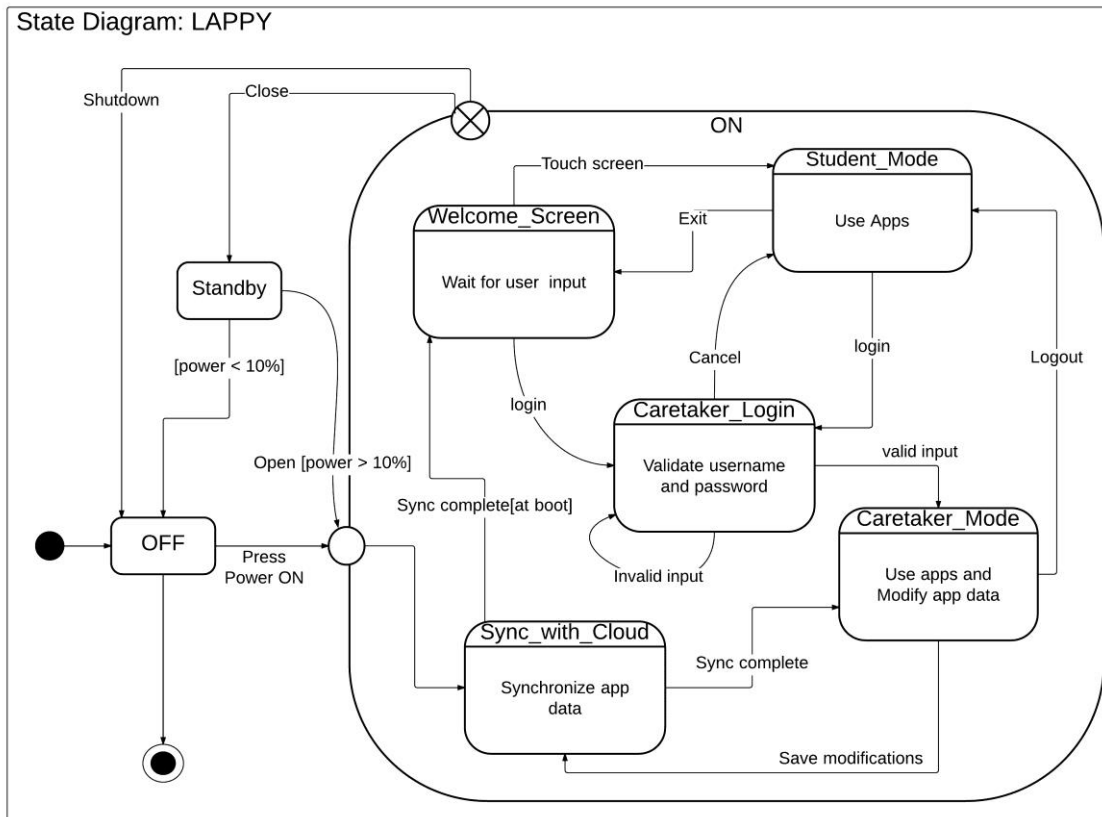
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4.1.3 Student communicating using voice ouput on the system

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4.1.4 Caretaker modifying app through cloud


```
Caretaker                    System                        Cloud

Login through lappy system
{username, password}
                                            verifies

invalid

Valid login sucess and displays apps        valid or invalid

modify or upload content in app             modifies and saves

modified and saved                          modified and saved


                         Login through other device
                         {username, password}


                                        synchronized and saved
```
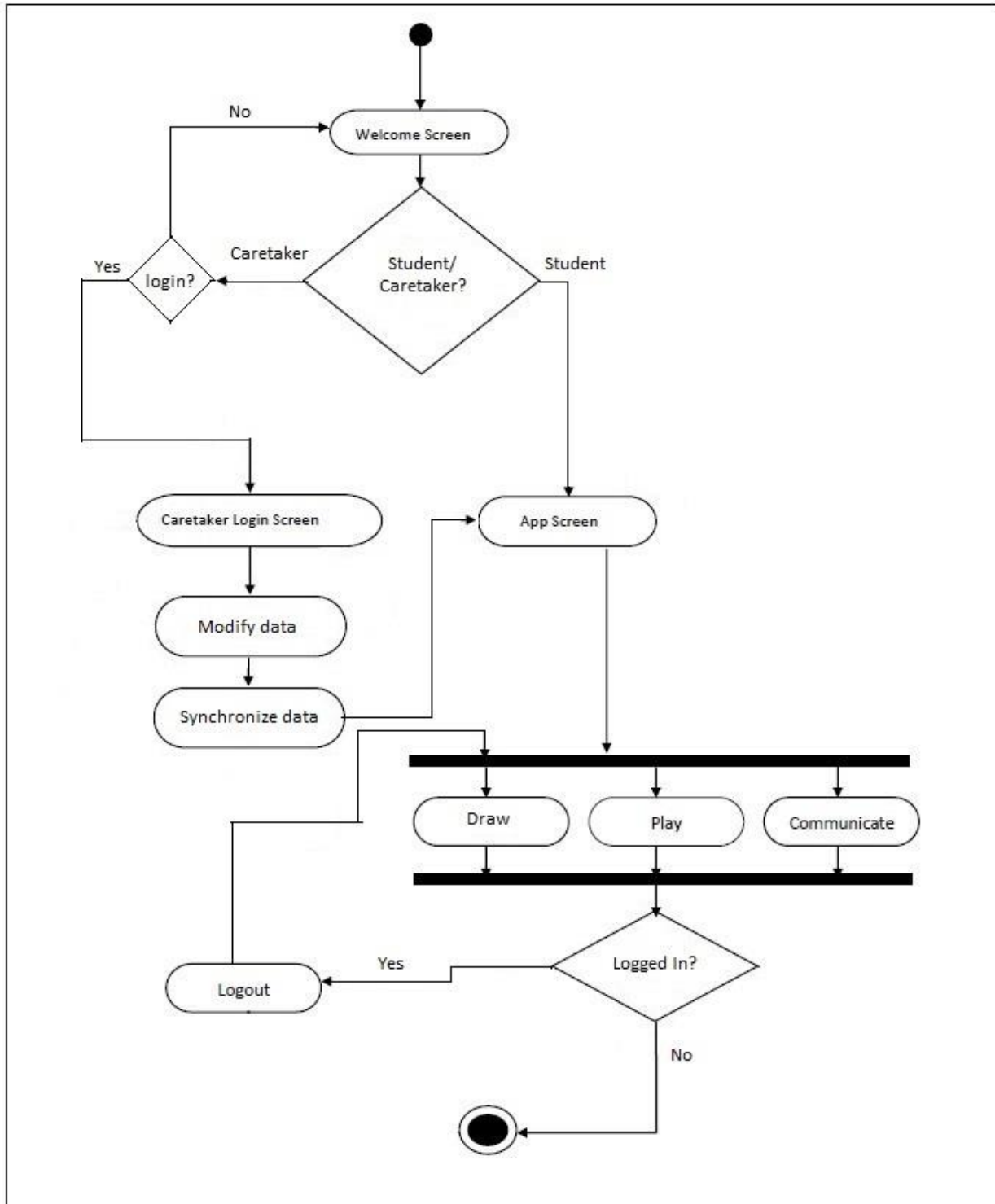
4.2 State-Transition Diagram (STD)

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4.3 Activity Diagram

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5. Change Management Process

The change management for system can have two possible scenrios:
1) Change request is raised to add a new app to the existing level
2) Change request is raised to enhance the level of system. For eg. to enhance from Level 2 to Level 3.

When a request for either scenarios is raised with the tech support team, the team will verify the information of the student provided. After verifying the information the existing modules of the system will be analyzed to identify how the request can be incorporated. The implementation team will do a feasibility study of the requirement and once it is confirmed the requirements can be incorporated with the necessary changes to the system. The testing team will then test the entire system to check if all the requirements are met and a regression testing will be performed to confirm whether the incorporated changes are accurately working or not.
During this process, the necessary documents will be updated to incorporate the changes and the product will be ready for release.

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A. Appendices

A.1 Appendix 1

Images	System Name	Lappy
	Audio	Available
	Bluetooth	Available
	Display	10"
	Text	Colorful
	Headphone jack	Available
	HDMI	Available
	Input	Touchpad
	Memory	2GB/4GB
	Memory Card Slot	Available
	Microphone	Not Available
	Operating System	Google Chrome
	Optical Drive	DVD
	Power	Rechargeable Lithium ion battery
	Processor	Intel core i5
	Storage	8GB SD
	Stylus	Available length 5" or 12.5 cm
	USB	Available
	Webcam	Not Available
	Wireless connectivity	Available