ASSIGNMENT – 2:

Analysis and Design of a MCT device simulator

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An MCT Device Simulator

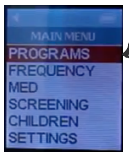
A patient is treated by an MCT device simulator. It has batteries at the back, USB plug on the bottom so the patient can charge it. It also has an electrode, which is applied on the affected areas at the time of treatment. On the front body of device, there is a screen which will help patient to perform various treatments, 4 buttons to navigate through menu, 1 button for going to the previous menu, 1 button to return to the main menu, 1 ok button to confirm, battery level is shown on the top right corner of screen, and 1 button to turn ON/OFF the device.
When the patient will turn it ON for the first time, it will make a little sound. The screen will be displayed in Russian language, so the patient has scroll down to very bottom (which is settings press OK button), thereafter the patient has to scroll down to the word язык, which is language section. After clicking into this section, a user or patient can choose his language out of 4 options, which are: German, Russian, English, French.
So, now there are 24 programs to treat injuries, the user can choose any one of the programs to treat injuries. There is a pad that can be attached to the electrode, thereafter the pad can be applied on the injured area or as depicted in screen where to apply on skin. (If a patient doesn't have major injury, the user can also apply electrode on fingers in this case the user doesn't have to use pads). After choosing the program the user can set the power at which he wants to treat himself. After setting the power as soon as it is applied to the body part the timer will start. If the user wants to choose the different frequency level, they can choose it. There is option to children also which is divided into four categories like: - upto 1 year, 1 to 3, 3 to 7, and 7 to 12 years. In the settings option a user can switch themes, change brightness, record audio, change timings, set alarm etc.

USE CASE ONE(UC1):

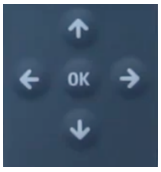
Patient presses the on/off button on the device.
Screen Lights up, Main Menu on the screen.
Clicks ok button to choose programs:

scrolls down pressing down button and presses ok chooses throat.
Body part (finger) is shown on screen, where to apply electrode.
Increases the power to 9 using right button
Puts finger on electrode.
Timer of 10 minutes starts.
Presses back button to go back to main menu.

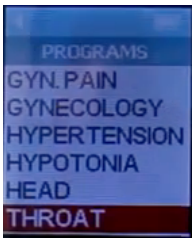
clicks on this button



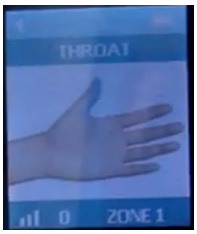
Chooses programs



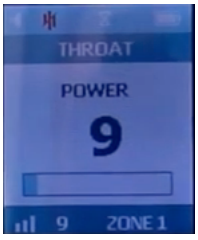
OK and scrolling buttons



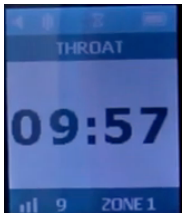
chooses throat



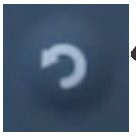
body part is shown



chooses power 9 using



timer Started

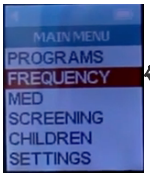


back button

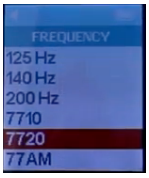
USE CASE TWO(UC2):

Patient presses the on/off button on the device.
Screen Lights up, Main Menu on the screen.
Clicks ok button to choose frequency by pressing OK:
- Chooses frequency level 7720
- Increases the power to 6 using right button
- Puts finger on electrode.
- Timer starts.
- Presses back button to go back to main menu.

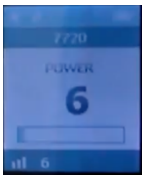
Clicks on on/off button to turn off.



scrolls down presses OK

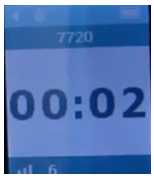


scrolls down presses OK



uses → button to increase power

scroll down button

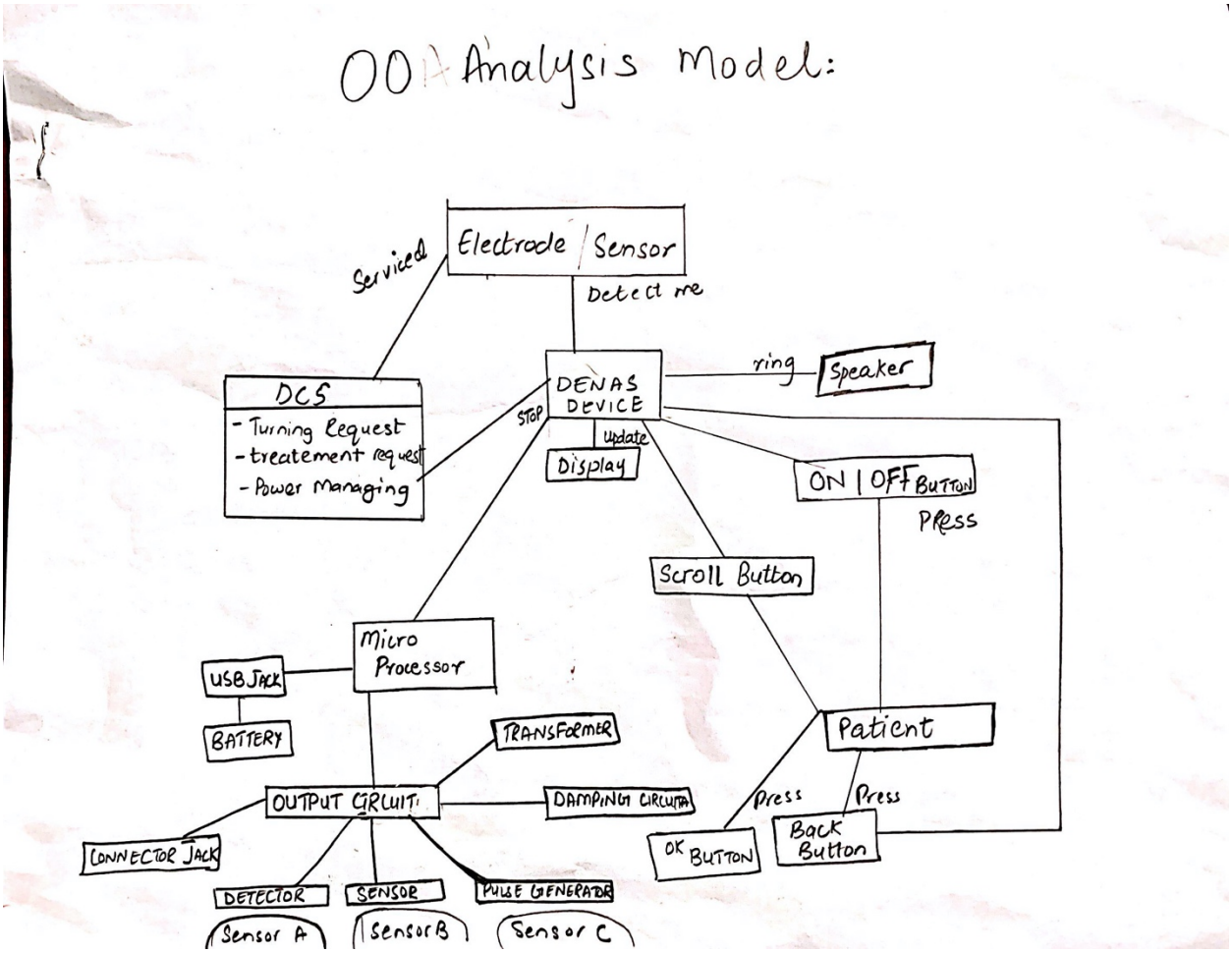


timer starts

presses back button to

Click on turn off button to turn off

An OO Analysis Model:



OO Analysis Model

Figure above reflects the requirements of an Object-Oriented Analysis Model. This Model shows in detail about the structure and functioning of the DENAS device by relating different components and features offered by the device itself.

Detailed description (Software)

Starting from the patient who will be the primary user, in specific cases the user can be nurse/doctor as well. The patient starts to use to device by accessing the on/OFF button, the

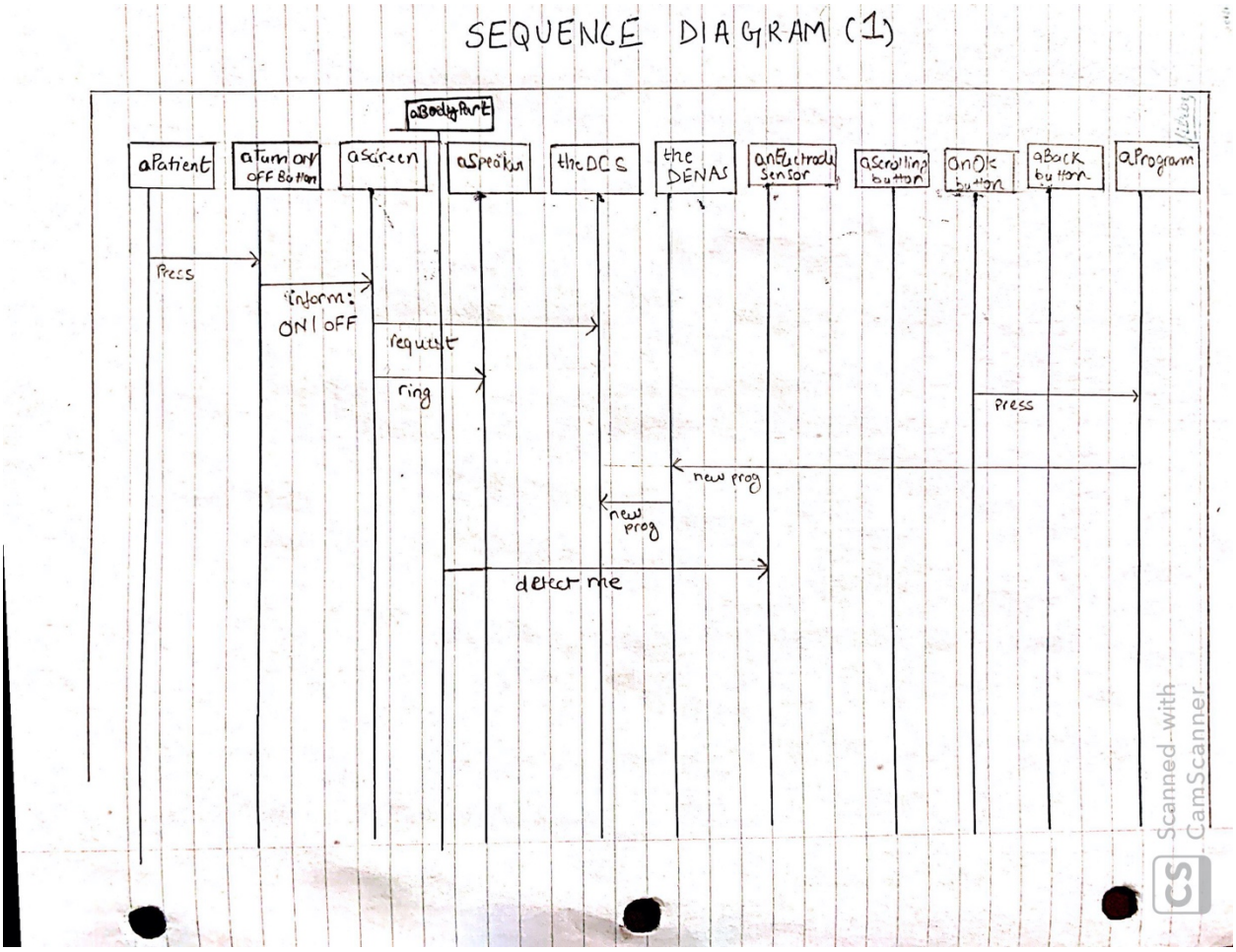
device starts with ring (through speaker), and displays the logo. After few seconds, it displays DCS (DENAS Controlling System) which displays many options such as main program, frequency, clock, med etc.
The device has a scrolling button which enables the user to go back and forth using any feature on the device. For example, if the patient uses headache option and performs the steps, later the patient feels he's having pain in joint, he can then go back from the headache option and chose joint.
All the DENAS devices comes with the electrode sensor which is used for tissue organs detection purpose so the medical testing purpose of the device can be activated, and the users can receive medical treatment at their homes.

Detailed description (Hardware)

Microprocessor: The device has various external components such as USB interface for battery and connector jack used for charging the device.
Output Circuitry: This is where electrode sensor's function enables, output circuitry contains sensors for detecting and pulse generating feature of the sensor. It also has Transformer and Damping circuit components.

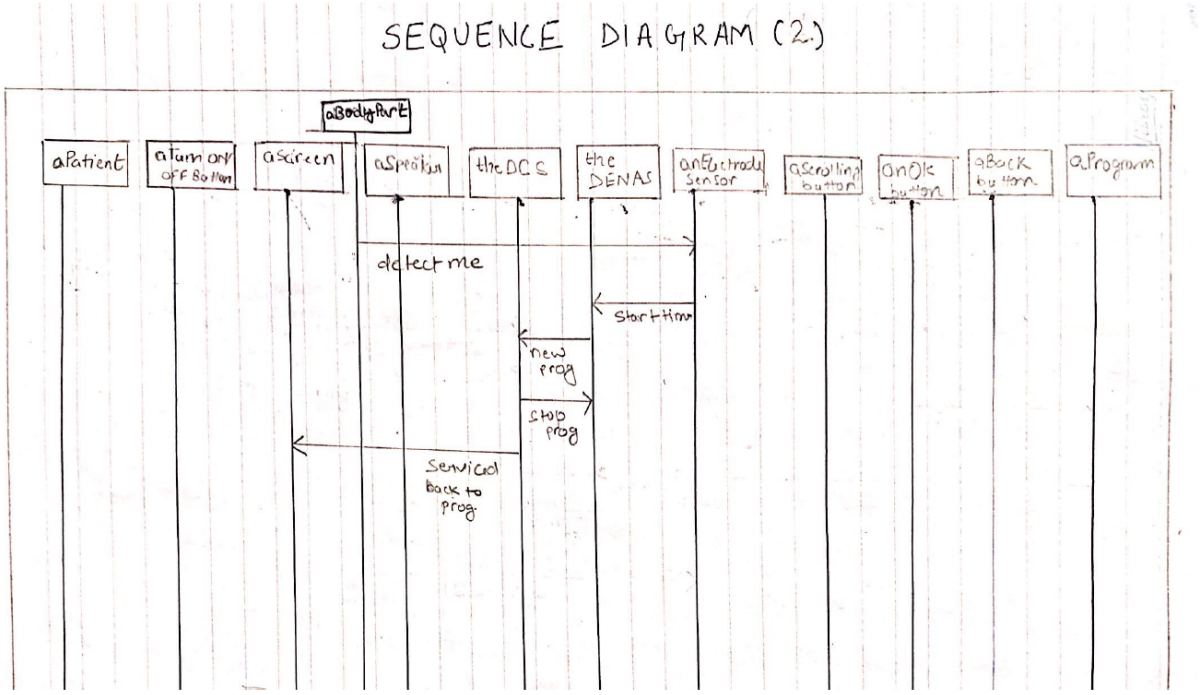
Lines in the diagram help us to understand the overall structure itself, more importantly it shows the correct relation between the user and device. The interaction of both with each other is what OO Analysis model are used for, they analyze the whole structure of the device and show its relationship with the user and hardware.

SEQUENCE DIAGRAM (1)



1.The patient here presses the on/off button to switch on the device
2.On/Off button informs to the screen about the action
3. As the screen is on it rings through the speaker
4. The screen is now sending request to DCS.
5. the body part now uses detect me for detecting purpose to the electrode sensor
6. pressing ok/back buttons allows you to go back and forth for exploring more options
7.Through program options now new program can be chosen
8. Once another program option is chosen, step 5 will be repeated all over again.

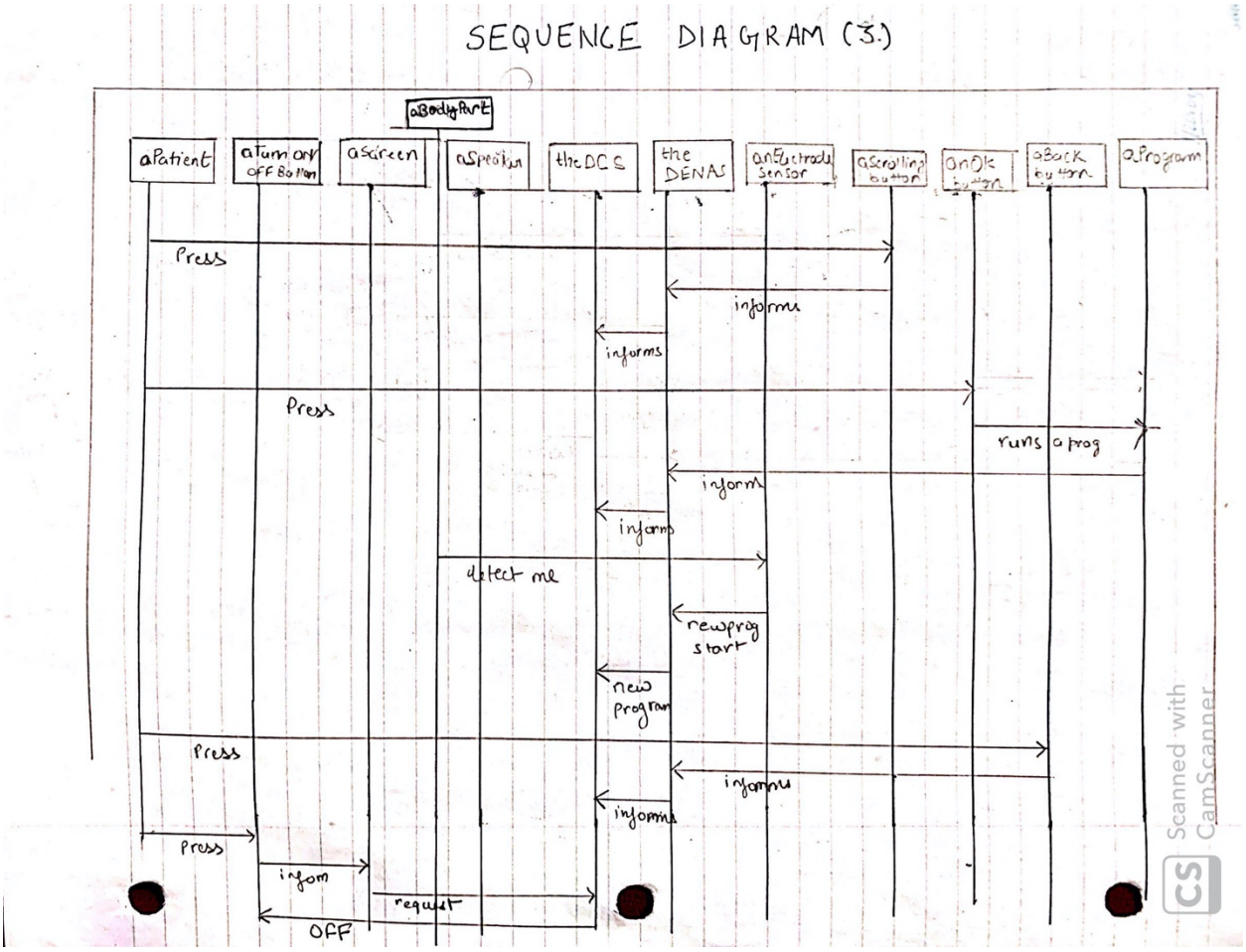
SEQUENCE DIAGRAM (2)



This sequence diagram has some new features such as servicing,

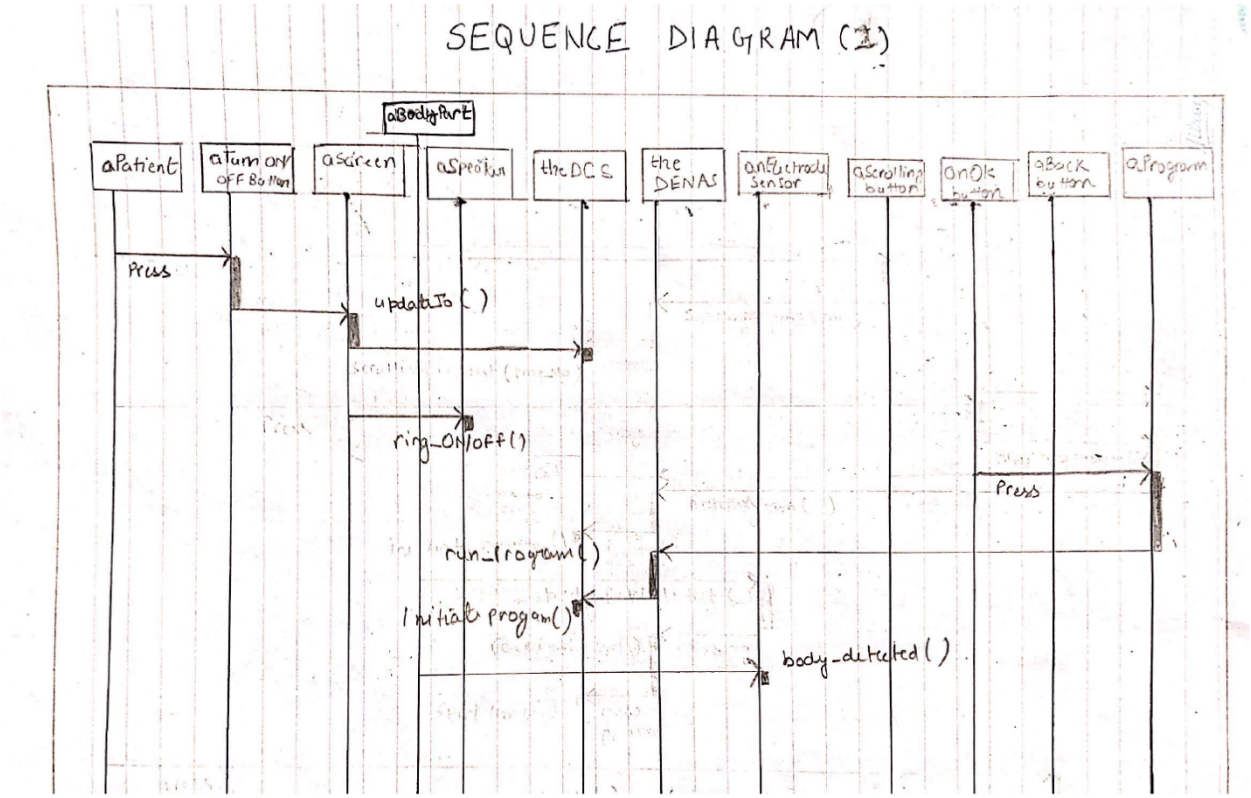
1. Here we are able to use start time and stop program feature.
2. As seen in our previous sequence diagram, the body part is placed on the electrode sensor for detecting purposes but now some modifications are also added.
3. Start time begins when the electrode is placed on the body part and within few seconds the time ends.
4. Once the procedure ends the device either stops the program or asks for new program request from the user.
5. If the user chooses new program, the device goes back all the way to screen where the 2st step of this sequence diagram onwards is followed again.

SEQUENCE DIAGRAM (3)



1. The third sequence diagram is a very straightforward one as its performing press feature for enabling all the features of the device.
2. The DENAS is informing on the DCS followed by the program informing back to DENAS when the program needs to be changed.
3. Back button, Ok button have been going back and forth now to explore the options of the device.
4. The screen is also requesting the DENAS which has been the first step of all the sequence diagrams.
5. In the end when all the requests have been performed then the DENAS Device closes using the Off button.

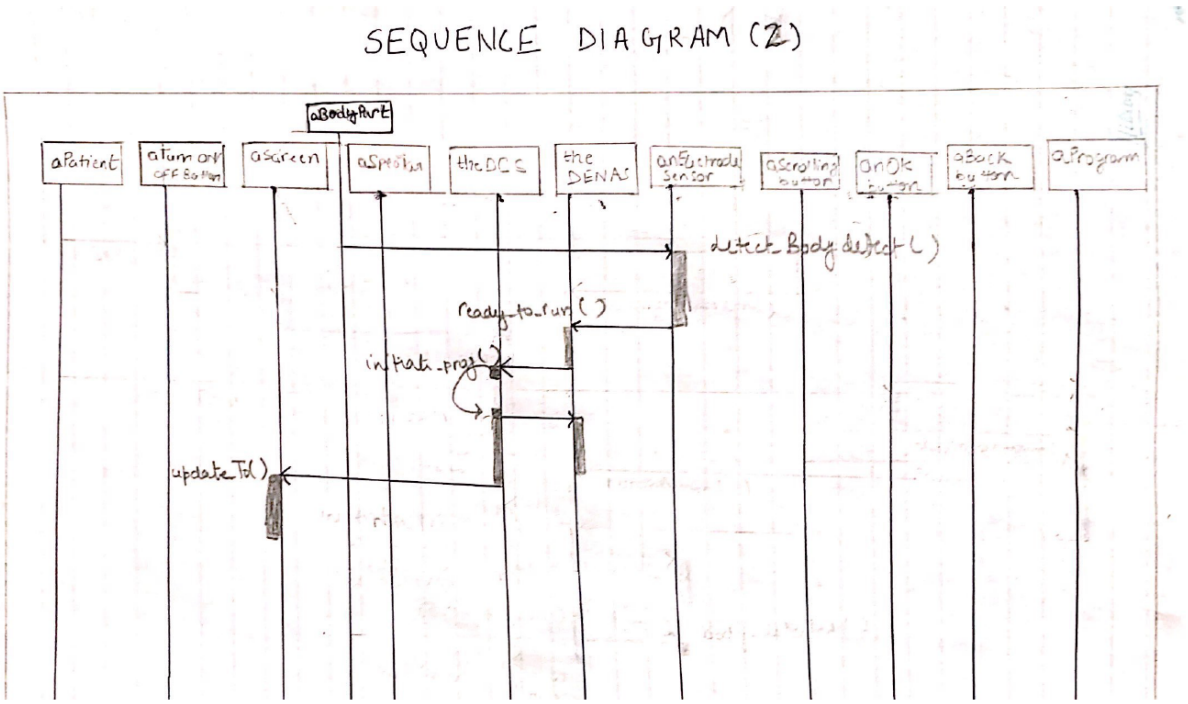
SEQUENCE DIAGRAM (1) OOD



This sequence diagram is adding some details to the OOA diagram 1,

1. The ring On/OFF () is sending request to the Denas for enabling ring when they display screen switches on
2. By having updateTo() function now anyone can change the option in the DCS
3. As seen in our previous sequence diagram, the body part is placed on the electrode sensor for detecting purpose, now bodydetected() function has been added to fulfil this requirement.
4. Initial program() and run-program() functionalities are making the program start and run smoothly
5. If the user chooses new program , the device goes back all the way to screen where the 2st step of this sequence diagram onwards is followed again.

SEQUENCE DIAGRAM (2) OOD



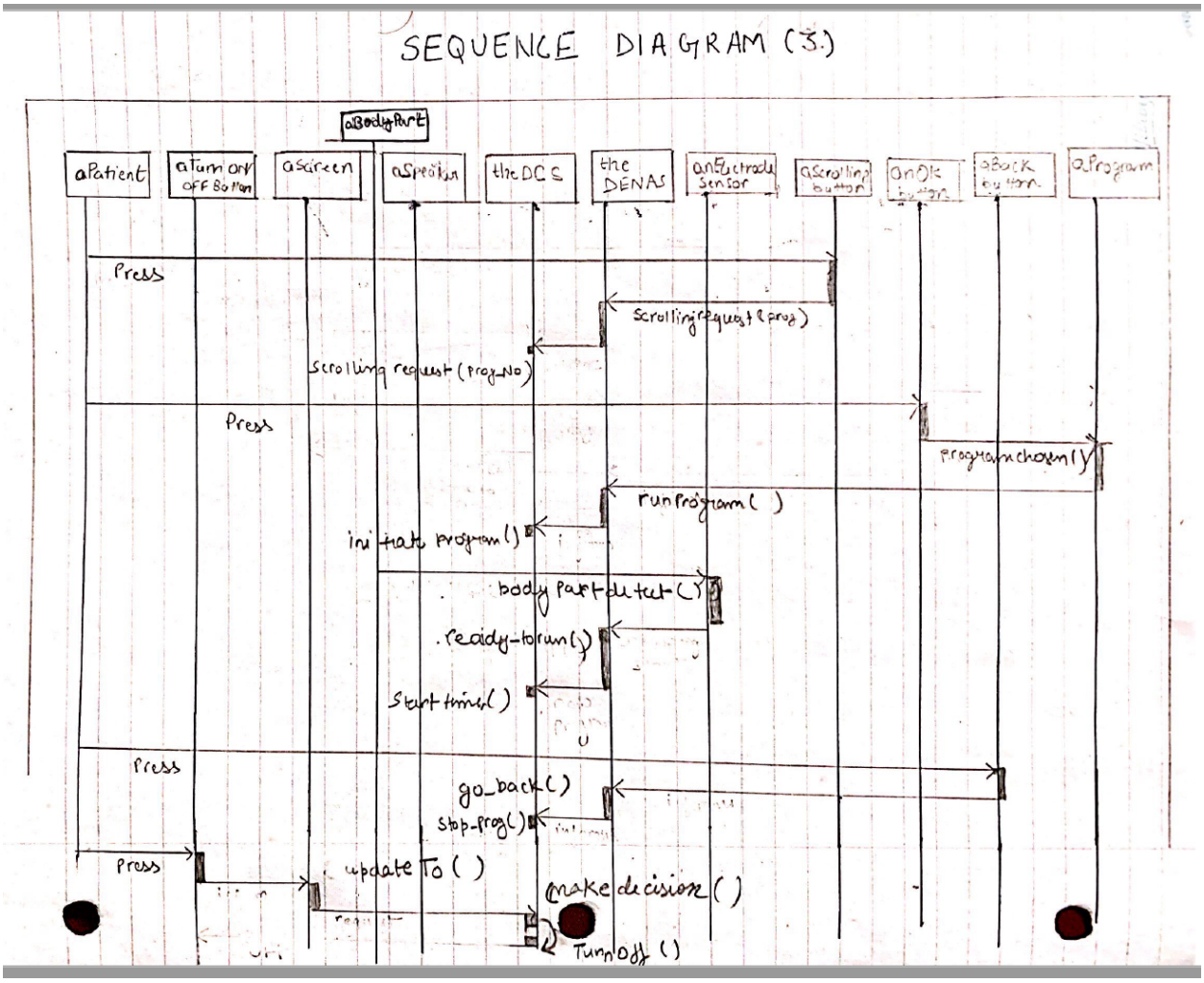
As sequence diagram 2 of OOA was very step by step for using the device, for our OOD purpose we have just added few functionalities which makes the steps easier to work having proper functions assigned to them.

- ***For example***:
- readytorun() sends signal from electrode sensor to the device

Initial prog () is the starting program functioning the device

- updateTo() is functioning between the DCS and screen when user wants to go back all the way to do something new or different
- detect_body() is used when the user choses the program (any medical condition) to electrode sensor where they want to attach their body part for treatment.

SEQUENCE DIAGRAM (3) OOD



1 The OOD third sequence diagram is now working out details on the OOA third diagram

2 The DENAS is informing on the DCS followed by the program informing back to DENAS when the program needs to be changed. But now its emphasizing more on the decision making process.

3 Scrolling request is been in action more often now so the patient choses as many options they want from DCS.

4 Any transitioning happening is requiring request and make decision function for proceeding further

Initial program () , body part test (),start time (), run program(), turnoff(),update to() are some new functionalities added to the diagram which is working out on more detailed