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Requirement Specification of Baby Heart

Introduction

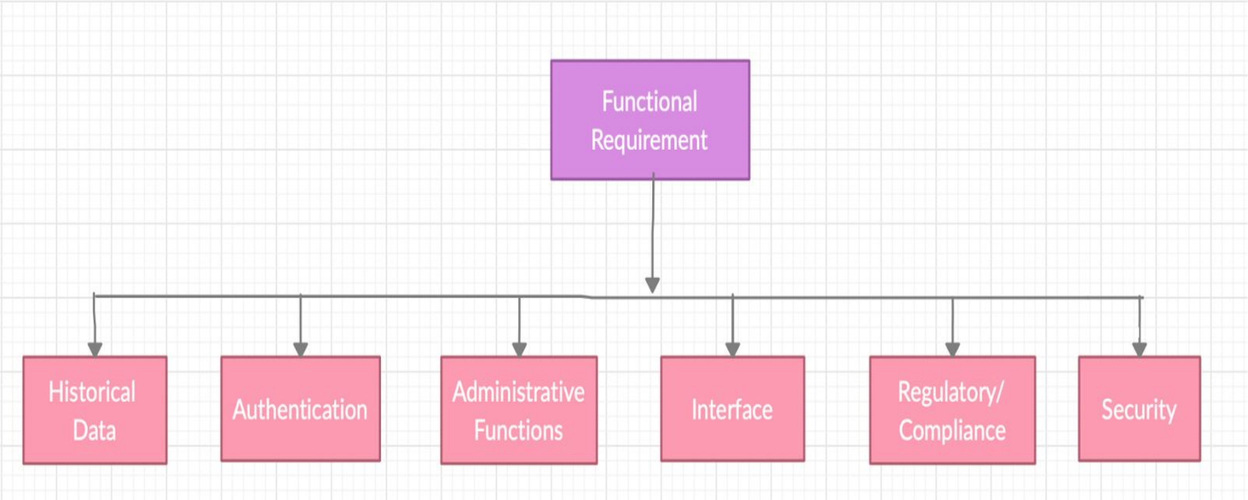
The system, “Baby Heart,” design uses the transducer, a device that produces sound waves that bounce off body tissues and make echoes, with an LED device in the apple watch to monitor unborn fetus’ heart rate. This software will provide the heart rate of the mother as well as the baby’s heart rate by observing the difference in the heart rates in beats per minute, which means the heart rates are not closer together. It will also provide the audio of it, not just visual, by using a transducer. The smart watch will be in contact with the mother’s belly and the sensors in the transducer will be used to observe the sound of the baby. It will display the pattern, and audio of the heart beats. Moreover, It will give users the two options to have either automatic or manual mode. Under automatic mode, the user will get the display containing their fetus’ heart rate as well as sound using a transducer all the time and changes can’t be made. Whereas under the manual mode they will have the option to turn it on or off or enter the display time as an input. In the event of miscarriage, the system for the fetus’ heart rate should automatically stop its cycle when there’s just single heart rate of the mother is detected. Therefore, this system is intended to serve the expected mothers or pregnant users. The system will be designed to provide efficiency, functionality, accessibility, and information to the users. It will address the preference/ goal to hear or get a visual of their baby’s heart rate which is thrilling for the parents and can provide information in case of risks such as miscarriage, etc.

User Requirements Specification

The user requirements contain both functional and non-functional requirements. The functional requirements help capture the intended behavior of the system.Therefore,

1. The system should start working right after the watch has been worn by the user and stop when it’s taken off.
2. The system should provide the visual as well as audio of the baby’s heartbeat.
3. The personal information of the user should be entered in the system by the users as an input.
4. “Baby Heart” system should record the users’ and baby’s heart rate on a daily basis.
5. The history of the heartbeats should be recorded for later use.
6. The software should be portable.

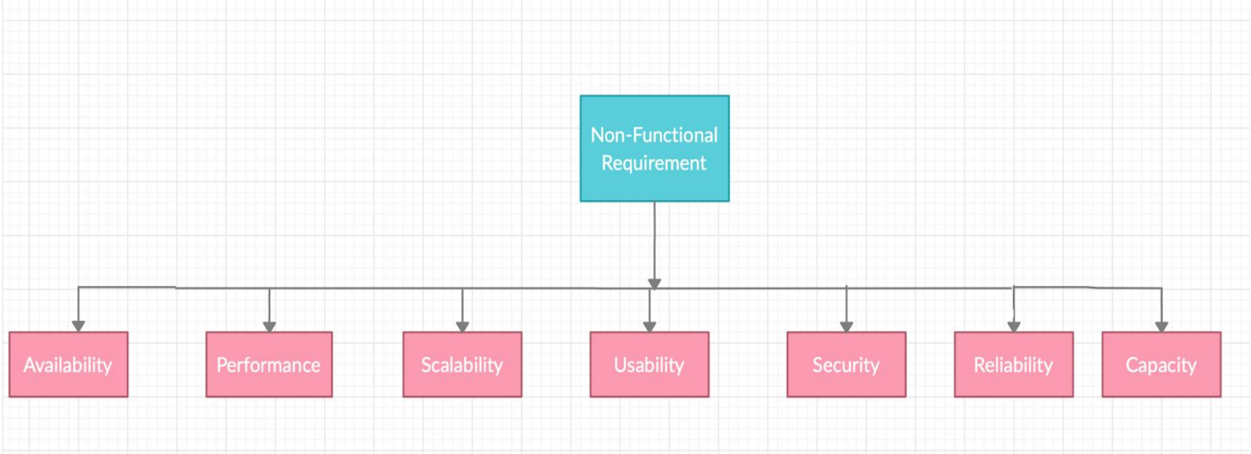
7. Let the user know if two heartbeats are detected in case of pregnancy.
8. Let the user know if only one heartbeat is detected in case of miscarriage.
9. The users must identify themselves with login username & password to access the data.
10. The system will limit access to authorized users.



The non-functional requirements describe how the system works. Therefore,

a. The system should provide remote accessibility.
b. The data should be provided to the users in a timely manner.
c. The system should allow numerous users at a time.
d. The recorded history should be allowed to download by the users.
e. The data should be recorded for each day.
f. “Baby Heart” should be password protected.
g. The system shouldn’t let the mother's heart beat interfere with the baby's heartbeat or vice versa.
h. The system should also provide the help option to guide the users on how to navigate the system.

i. Language translation tools should be included so the system will be useful to a wide variety of population.



Some of the underlying assumptions that can be made in specifying the above user requirements are as follows: the assumptions regarding activity performance, availability and delivery time, budget, etc can be made. The activity performance assumptions arise in the “Baby Heart” system while specifying the non-functional requirements of providing a help tool that will help the users navigate the system. We don’t know how the tool will look or when we’ll need it, but it is expected of the developers to create that tool and the resources are available for the project. The other main assumption is the delivery time, someone expects the developing team to produce certain results and have the product ready by a certain date or a month. Moreover, the assumption to use a limited amount of budget can impact the project such as the budget decides how many people can hour and the work hours, and resources used in creating the product. The time-based assumption can also be impacted by quality factors, and financial limitations.

However, the vague limitations and the assumptions can lead to possibilities because it can shape the project in deliverable ways. It can help in identifying, documenting assumptions , and opening up the conversation between the users or stakeholders and the developing team to clear out the vagueness so there’s no room for errors. The communication helps in figuring out what the assumptions are based on and why they are included. It also prevents delays and waste of resources, as well as the negative impact on the end goal and the quality which can possibly create functionality issues and scope creep.

Use Case:

Use Case Name: Get Visual and Audio of Baby’s heartbeat

Actor: Pregnant Woman

Trigger: The user indicates that she wants to get the audio and video of their unborn baby's heartbeat.

Precondition: A woman is pregnant and the fetus has developed a heart.

Postconditions:

- The user gets the video of the baby's patterned heartbeat.
- The user gets the audio of the baby's heartbeat.
- The user will have the saved history for every milliseconds.
- The system will let the user know if mishaps occur and the heartbeat is lost.

Normal Flow:

1. The user gets the audio and video of her baby's heartbeat during her pregnancy period.
2. The user makes an account and saves her personal information in the app.
3. The system works when the watch which contains the system is worn by the user and the watch is on.
4. The system will provide the manual option to manually let the user input the time of display and turn the system on and off.
5. When the automatic option is clicked, the system works independently.
6. When the audio option is clicked and the watch is touched with the belly, audio of her baby's heartbeat is heard.
7. When the video option is clicked, the video of the baby's heartbeat displays.
8. The history of the data is stored under the history option.
9. The users can get the information on how to use the system under the help manual.
10. The system will indicate a certain message if the heartbeat is not detected.
11. The data can be downloaded and printed by the users.
12. The system stops working when the baby is born.
13. The user will exit the system.

Alternative Flow:

2A: If the username and password doesn't match after creation then the system will exit and ask for reentry.

System Requirement Specification

This section contains the systematic functional and non-functional requirements of the project which is intended to provide more details to the developers to prevent any assumptions.

Thus, the system functional requirements provided by the user requirements include:

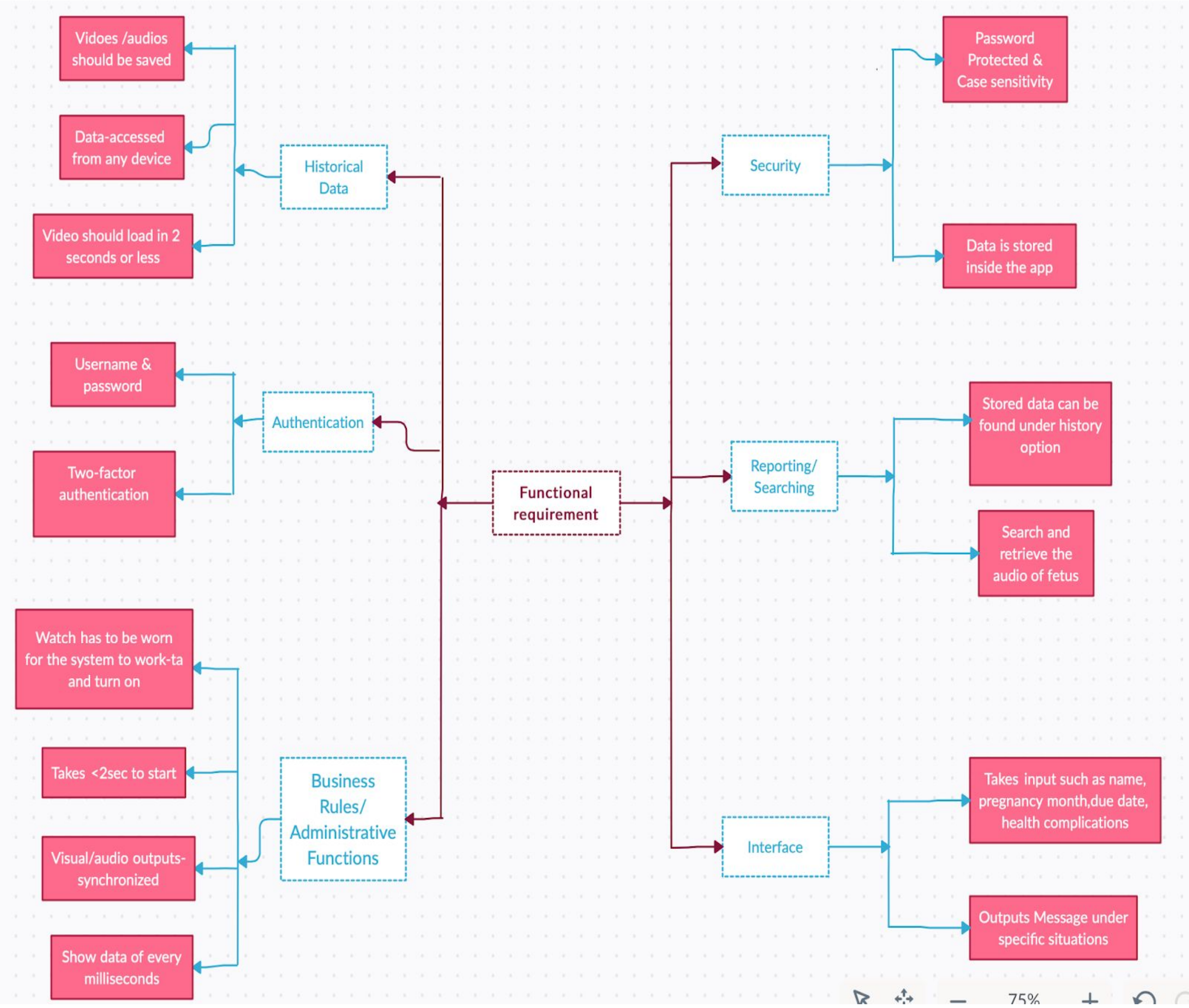
1. The watch that contains the “Baby Heart” system should start working approximately within 3 seconds from the time when the watch is worn by the user and is turned on. The system will stop if the watch is turned off or taken off from the wrist.
2. The system should output the visual and audio of baby’s heartbeats using a transducer and an LED device.

   The audio and video of heartbeats should be synchronized and show the data of every milliseconds.

3. The system should ask the user to input their personal information such as name, age, current pregnancy month, due date given by the health professional, and complications. It will help the user keep the record organized.

   The system will also give the users’ the options to choose between automatic or manual modes. The manual mode will let the users’ the option to turn it on or off or enter the display time as an input. Whereas, under automatic mode, the user will get the display containing their fetus’ heart rate as well as sound using a transducer all the time and changes can’t be made.

4. The system should have daily audio and video recordings of the baby's heart rate from 0:00-24:00 in 24-hour military time.
5. The history of the heartbeats should be recorded in the cloud drive to have access from other devices for later use such as to view the files, print it, etc.
6. Moving the system from one OS to another OS shouldn’t result in system failure or lost files or data.
7. The system outputs a message, “Heartbeat of the Baby,” when a second heartbeat is detected by the LED device, contrasting to the user’s heartbeat.
8. The system outputs a message, “No Baby Heartbeat,” when the second heartbeat isn’t detected for 3 seconds.


Vidoes /audios should be saved
Data-accessed from any device
Video should load in 2 seconds or less
Historical Data
Username & password
Two-factor authentication
Authentication
Watch has to be worn for the system to work-ta and turn on
Takes <2sec to start
Visual/audio outputs-synchronized
Show data of every milliseconds
Business Rules/ Administrative Functions
Functional requirement
Security
Password Protected & Case sensitivity
Data is stored inside the app
Reporting/ Searching
Stored data can be found under history option
Search and retrieve the audio of fetus
Interface
Takes input such as name, pregnancy month,due date, health complications
Outputs Message under specific situations
75%

The systematic non-functional requirements that will help the team developers assure that the user requirements are included on how the system should work includes:

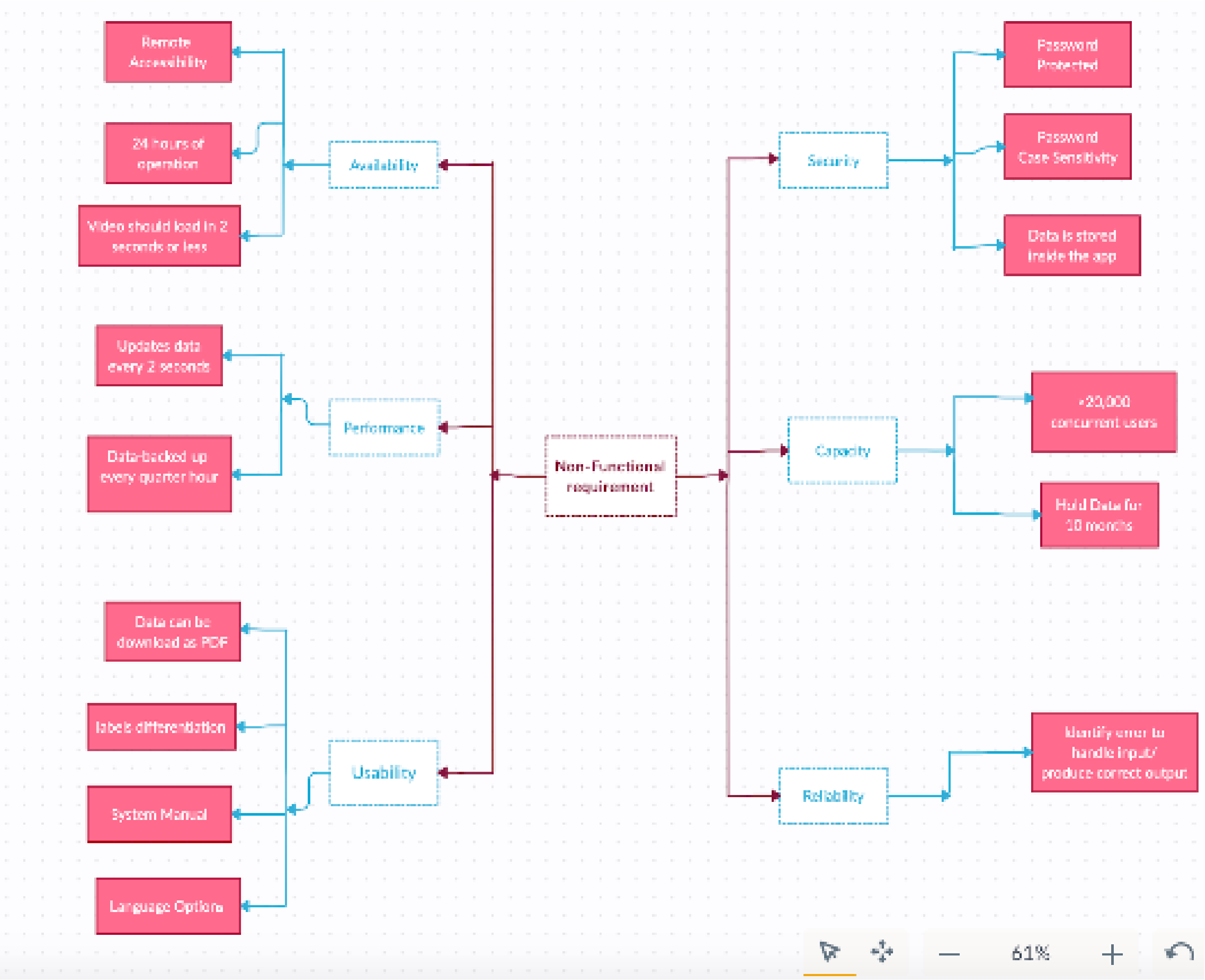
a. The system will be contained in a watch and the recorded history will be accessed from the phone under the health app.
b. All the data should be recorded for every second in the day from 0:00-24:00 and should be updated for the users accessing it within 2 seconds.
c. The system should allow a minimum of 20,000 users at the time without creating any dependability issues.
d. The recorded data should be accessed to the user to download as PDF.
e. The data should be recorded for each day and labeled with specific day, month and a year, and takes up the minimum amount of space as possible.
f. The account must be password protected with case sensitivity to prevent the system from external attacks and to keep the confidentiality of the users' personal information.

g. The heartbeat of the mother and a baby should be labeled to distinguish between the two, and the heartbeat gained by the transducer should be labeled different from the mothers' heartbeat.

   The system will just provide a video of the users' heartbeat. And the Baby's heartbeat will be gained by video, using an LCD, and audio, using a transducer.

h. The help option should be provided by the system including how to use the app including: where to find the recorded data, how to input and save personal information, answer to frequently ask questions, etc.

i. The language, labels, and help option should be available for the system in different languages such as English, Spanish, Hindi, etc.


Remote Accessibility
24 hours of operation
Video should load in 2 seconds or less
Availability
Updates data every 2 seconds
Data-backed up every quarter hour
Performance
Non-Functional requirement
Data can be download as PDF
labels differentiation
System Manual
Language Options
Usability
Security
Password Protected
Password Case Sensitivity
Data is stored inside the app
Capacity
+20,000 concurrent users
Hold Data for 10 months
Reliability
Identify error to handle input/ produce correct output
61%

Platform Requirements Specification

The system will use Java language because it's easier to understand, use, write, debug, compile which will be easier to modify. It has less rigid rules and offers portabiltiy which helps in reduction of the potential errors and doesn't have to be reprogrammed on every single new computer, just JVM needs to be presented on that machine. Thus, will help our embedded system to be ready without scope creep and prevent functionality issues. It also has high stability which will help the software to be useful for a long time and allow code reusability. In addition, Java language can control and access hardware directly without sacrificing the benefits of high-level language.

Furthermore, the software will run on WatchOS, the operating system of apple watch, and the hardware platform will be an apple watch with an LED light and a transducer. The frameworks that will be used in the "Baby Heart" system include: ETL, Embedded Template Library, Libsourcey and Ultimate++. The ETL uses Java for the embedded applications and tests functionality which is necessary for the complex system to prevent later software crashes and damages. The Libsourcey is a collection of cross platforms that provide developing high performance network based p2p and media streaming applications such as real-time video streaming. It is very useful for the "Baby Heart" developing system since it has to provide video and audio of the heartbeats. It also helps to keep the information and restore it.

Moreover, the best software development tool that will be used is NetBeans because it uses C/C++, Java, javascript, etc. It will be helpful because it works on Operating systems like Linux, Windows, and MacOs, which is similar to watchOs, an operating system that will be used for the project. It offers features like Smart Code Editing which helps in editing the code, indents lines, matches words and brackets that makes it easier to write code and compile it without any errors. It also supports bug-free code by providing a findbug tool, easy management process, and quick user interface development.

The system will use the above platform requirements for business competition purposes that will support evolved changes needed in the system because of changes in businesses. It will also provide the characteristics for reusability for future developing systems.