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## **WARM Wireless ECG Monitor Requirements Specifications**

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1. Introduction.....	1
1.1 Purpose.....	1
1.2 Scope.....	1
1.3 Definitions, Acronyms and Abbreviations .....	1
1.3.1 Definitions.....	1
1.3.1.1 Application.....	1
1.3.1.2 Use Case.....	2
1.3.1.3 Use Case Diagram.....	2
1.3.1.4 Class Diagram.....	2
1.3.1.5 Sequence Diagram .....	2
1.3.1.6 Activity Diagram .....	2
1.3.1.7 User .....	2
1.3.1.8 Patient .....	2
1.3.1.9 Wireless ECG Monitor .....	2
1.3.1.10 Analog Circuit.....	2
1.3.1.11 Doctor .....	2
1.3.2 Acronyms and Abbreviations .....	2
1.3.2.1 ECG.....	2
1.3.3 UML.....	2
1.3.3.3 J2ME.....	2
1.3.3.4 SMS.....	2
1.3.3.5 SMTP .....	2
1.5 Overview.....	3
2. Overall Description.....	3
2.1 Product Perspective.....	3
2.1.1 System Interfaces .....	4
2.1.1.1 Cell Phone.....	4
2.1.1.2 Analog Circuit.....	4
2.1.1.3 Microcontroller .....	4
2.1.1.4 Bluetooth Module .....	4
2.1.2 User Interfaces .....	5
2.1.2.1 Logical Characteristics.....	5
2.1.2.1.1 Home Screen.....	5
2.1.2.1.2 Settings Screen.....	6
2.1.2.1.5 Baseline Parameters Input Screen.....	9
2.2 Required Functions .....	13
2.2.1 Initialization .....	13
2.2.1.1 Emergency Contacts .....	13
2.2.1.2 Bluetooth.....	13
2.2.2 Alert System.....	14
2.2.2.1 SMS.....	14
2.2.2.2 Message Failure .....	14

2.2.3 Settings.....	14
2.2.3.1 Emergency Contacts .....	14
2.2.3.2 Bluetooth Settings.....	15
2.2.3.3 Baseline Parameters Input.....	15
2.2.4 ECG Data.....	15
2.2.4.1 Readings.....	15
2.2.4.2 Base.....	16
2.2.5 Communication Protocol .....	16
2.3 User Characteristics .....	16
2.4 Constraints .....	16
2.4.1 Hardware limitations.....	16
2.5 Assumptions and Dependencies .....	17
3. Specific Requirements .....	17
3.1 External Interfaces .....	17
3.1.1 Input / Output.....	17
3.1.2 Events.....	20
3.2 Functional Requirements .....	20
3.2.1 Use Case Specifications.....	21
3.2.1.1. Home Menu View.....	21
3.2.1.1.1 Use Case: Home Menu View.....	21
3.2.1.1.1.1 Activity Diagram: Select Settings.....	22
3.2.1.1.1.1.1 Select Settings Specification.....	22
3.2.1.1.1.1.2 Activity Diagram: Select ECG Data .....	23
3.2.1.1.1.1.2.1 Select ECG Data Specifications.....	23
3.2.1.1.1.1.3 Activity Diagram: Select Help Button .....	24
3.2.1.1.1.1.3.1 Select Help Button Specifications .....	24
3.2.1.1.1.1.4 Activity Diagram: Select Exit Button.....	25
3.2.1.1.1.1.4.1 Select Exit Button Specifications.....	25
3.2.1.2. Settings Menu View.....	25
3.2.1.2.1 Use Case: Settings Menu View.....	26
3.2.1.2.1.1 Activity Diagram: Select Emergency Contacts Button .....	26
3.2.1.2.1.1.1 Select Emergency Contacts Button Specifications .....	27
3.2.1.2.1.1.2 Activity Diagram: Select Bluetooth Settings Button .....	27
3.2.1.2.1.1.2.1 Select Bluetooth Settings Button Specifications.....	28
3.2.1.2.1.1.3 Activity Diagram: Select Baseline Parameters Button .....	28
3.2.1.2.1.1.3.1 Select Baseline Parameter Button Specifications .....	28
3.2.1.3 Emergency Contacts View.....	29
3.2.1.3.1 Use Case: Emergency Contacts View.....	29
3.2.1.3.1.1 Activity Diagram: Save Contacts.....	30
3.2.1.3.1.1.1 Save Contacts Specification.....	30
3.2.1.3.1.1.2 Activity Diagram: Cancel .....	31
3.2.1.3.1.1.2.1 Cancel Specification .....	31

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3.2.1.4. Bluetooth Settings View .....	31
3.2.1.4.1 Use Case: Bluetooth Settings View .....	32
3.2.1.4.1.1 Activity Diagram: Select Device .....	32
3.2.1.4.1.1.1 Select Device Specification .....	33
3.2.1.5. Baseline Parameters Settings View .....	33
3.2.1.5.1 Use Case: Baseline Parameters View .....	34
3.2.1.5.1.1 Activity Diagram: Save Parameters .....	34
3.2.1.5.1.1.1 Save Parameters Specification .....	35
3.2.1.6. ECG Data View .....	35
3.2.1.6.1 Use Case: ECG Data View .....	35
3.2.1.6.1.1 Activity Diagram: Get ECG Data .....	36
3.2.1.6.1.1.1 Get ECG Data Specification .....	36
APPENDIX A: Software Documentation .....	37
Figure 1 Use Case Diagram of the System .....	4
Figure 2 Application Home Menu. ....	5
Figure 3 Application Settings Menu .....	6
Figure 4 Application Emergency Contacts Menu .....	7
Figure 5 Application Bluetooth Setting Menu .....	8
Figure 6 Application Baseline Parameters Menu .....	9
Figure 7 Application ECG Data Menu .....	10
Figure 8 Application Help Menu .....	11
Figure 9 Application Alert Menu .....	12
Figure 10 Use Case for Home Menu View .....	21
Figure 11 Activity Diagram: Select Settings .....	22
Figure 12 Activity Diagram: Select ECG Data .....	23
Figure 13 Activity Diagram: Select Help Button .....	24
Figure 14 Activity Diagram: Select Exit Button .....	25
Figure 15 Use Case: Settings Menu .....	26
Figure 16 Activity Diagram: Select Emergency Contacts Button .....	26
Figure 17 Activity Diagram: Select Bluetooth Settings Button .....	27
Figure 18 Activity Diagram: Select Baseline Parameters Button .....	28
Figure 19 Use Case Diagram: Emergency Contacts View .....	29
Figure 20 Activity Diagram : Save Contacts .....	30
Figure 21 Activity Diagram: Cancel .....	31
Figure 22 Use Case Diagram: Bluetooth Settings View .....	32
Figure 23 Activity Diagram: Select Device .....	32
Figure 24 Use Case Diagram: Baseline Parameters View .....	34
Figure 25 Activity Diagram: Save Parameters .....	34
Figure 26 Use Case Diagram: ECG Data View .....	35
Figure 27 Activity Diagram: Get ECG Data .....	36

Table 1 .....	19
Table 2. Events.....	20

## **1. Introduction**

The ECG monitor system is a device comprised of three interconnected subsystems. The device will monitor a patient's ECG heart signal and given certain parameters detect any problem or anomaly. In the event of an anomaly the system will trigger an alert and send a message to the pertinent entities. The system is composed of an analog signal acquiring circuit, a signal processing microcontroller, a Bluetooth module, and a cell phone.

### **1.1 Purpose**

The purpose of this document is to specify the software requirements for the cell phone software. The document presents a detailed view of functions included in the system and its expected behavior. UML diagrams (Use Case, Class, and Sequence diagrams) were included as part of the specifications.

### **1.2 Scope**

The cell phone application serves as the user interface between the user and our product. It allows the user to configure all the settings comprising the system, access help documentation related to the whole system and to get feedback from the system.

The cell phone application is also responsible for the messaging alert in case of a heart problem. This application doesn't analyze or process the heart data, it only detects emergency signal from the system and sends an emergency message to the appropriate entities.

### **1.3 Definitions, Acronyms and Abbreviations**

The following section explains in more detail definitions and acronyms that are used in the document to avoid confusion in the reader.

#### **1.3.1 Definitions**

**1.3.1.1 Application** – Refers to the software running in the cell phone.

**1.3.1.2 Use Case** - describes a sequence of actions that provide something of measurable value to an actor and is drawn as a horizontal ellipse in a Use Case Diagram.

**1.3.1.3 Use Case Diagram** – Presents the system's use cases and their interaction represented as a diagram.

**1.3.1.4 Class Diagram** – Shows the classes of the system, their interrelationships (including inheritance, aggregation, and association), and the operations and attributes of the classes.

**1.3.1.5 Sequence Diagram** – Represents behavior in terms of interactions.

**1.3.1.6 Activity Diagram** – Represent the operational work flows of a system.

**1.3.1.7 User** – Refers to any person who interacts with the system.

**1.3.1.8 Patient** – Refers to a person that uses the system as a heart monitoring device.

**1.3.1.9 Wireless ECG Monitor** – Refers to the system as a whole including the analog circuit, microcontroller, Bluetooth module, and the cell phone application.

**1.3.1.10 Analog Circuit** – Refers to the system that acquires the electrocardiogram heart signal.

**1.3.1.11 Doctor** – A medical licensed doctor who is capable of defining the appropriate baseline heart parameters.

## **1.3.2 Acronyms and Abbreviations**

**1.3.2.1 ECG** – Electrocardiogram.

**1.3.3.2 UML** – Unified Modeling Language.

**1.3.3.3 J2ME** – Java 2 Micro Edition.

**1.3.3.4 SMS** – Short Message Service.

**1.3.3.5 SMTP** – Simple Mail Transfer Protocol.

## 1.5 Overview

The rest of this document presents a detailed description of the application. Section 2 presents a brief description of the application and its functionality. It presents the system architecture and the description of the required functions. Section 3 is the core of the document and it will describe all the inputs and outputs of the product as well as the Use Case, Class and Sequence diagrams.

## 2. Overall Description

This section provides a general description of the product. The system architecture, required functions, and constraints of our product are specified. Also the assumptions and dependencies of our product are discussed in this section as well.

### 2.1 Product Perspective

In this section the architecture of the system is specified. The actors, external interfaces and other processes which are relevant to our system have been identified. On the following sections, the different system interfaces are detailed and explained.

The following list contains the different identified components. Also an UML diagram showing the architecture of the system (See Figure 1) is shown.

**Actor** - Represents any user that can interact with the system. This user can be a patient, a doctor, or a technician.

**Cell Phone** – The application being developed that interacts with the user.

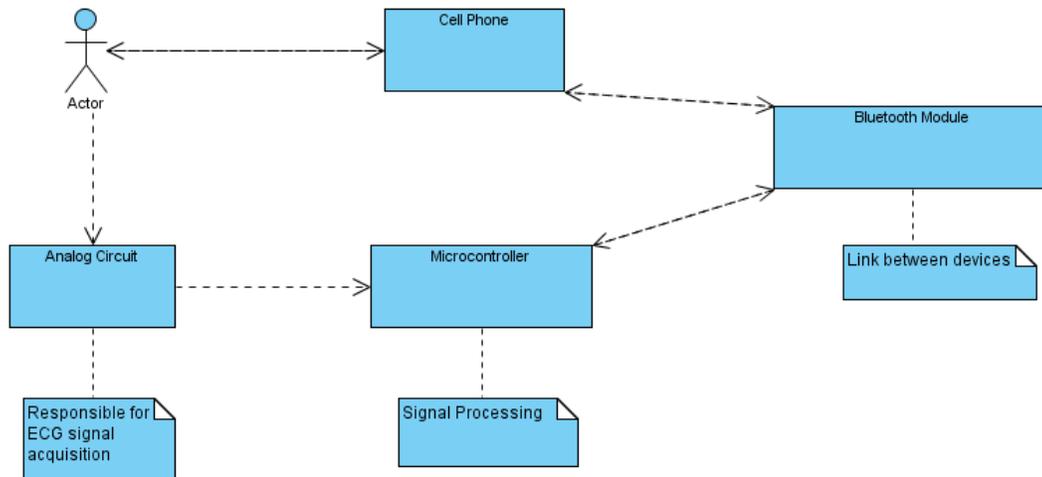


Figure 1 Use Case Diagram of the System

## 2.1.1 System Interfaces

This section describes all the system interfaces (user, hardware, software, and communications) that are part of the system but not necessarily part of the cell phone application. All of them have an indirect interaction with the application

**2.1.1.1 Cell Phone** – Mobile instrument used as a portable computer, originally used as a mobile phone, today its capabilities go far beyond having even specialized operating systems like the ones seen on desktop computers. This is where the application being developed will run.

**2.1.1.2 Analog Circuit** – Acquires the heart signal from the patient and filters it.

**2.1.1.3 Microcontroller** – Analyzes the signal acquired by the analog circuit and triggers an alert in case of a heart anomaly.

**2.1.1.4 Bluetooth Module** – Serves as the communication link between the cell phone and the microcontroller.

## 2.1.2 User Interfaces

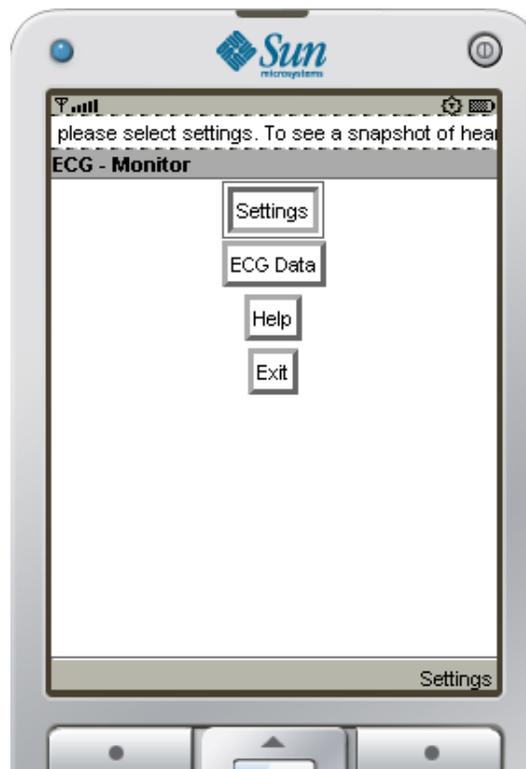
This section describes the user interfaces of the application. It is divided in the logical and optimization aspects of it.

### 2.1.2.1 Logical Characteristics

This section describes in detail the purpose of screens, menus, and reports of the application.

#### 2.1.2.1.1 Home Screen

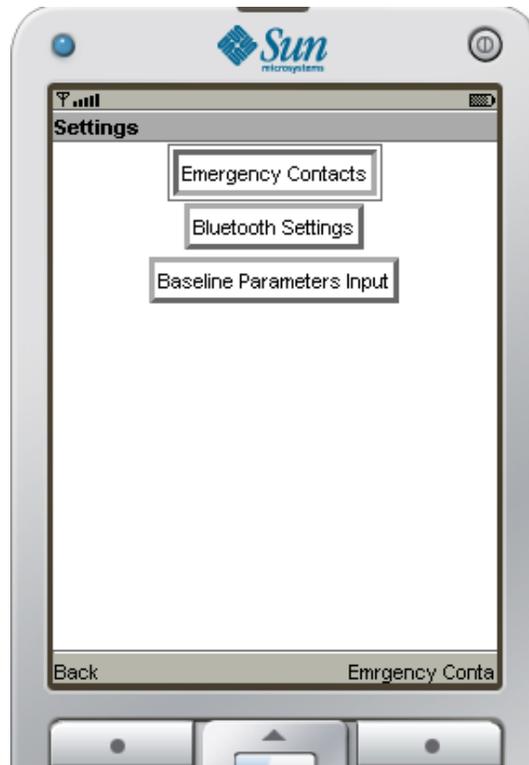
This screen is the initial interface for the user. It shows the home menu which are used to give the user access to the different features of the application.



*Figure 2 Application Home Menu.*

### 2.1.2.1.2 Settings Screen

This screen shows all the possible configurations for the application. From here a specific setting can be accessed by choosing one of the buttons.



*Figure 3 Application Settings Menu*

### 2.1.2.1.3 Emergency Contacts Screen

This screen shows three emergency contacts. The user can specify the phone number along with the carrier of at least one and at most three contacts. After setting the contacts the user can save the contacts, cancel the modifications, or test if the emergency alert system is working. The test feature will send an SMS message to all the contacts saved.

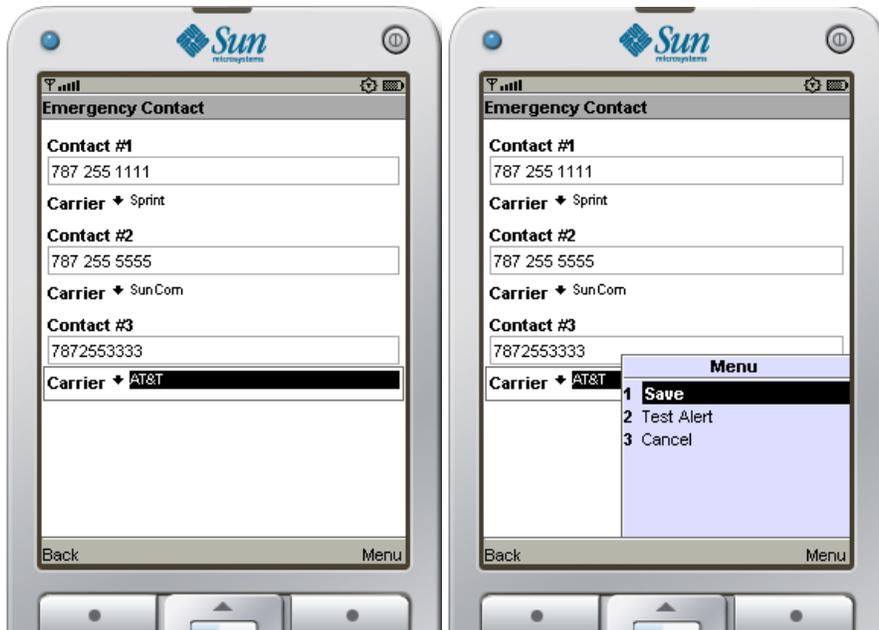
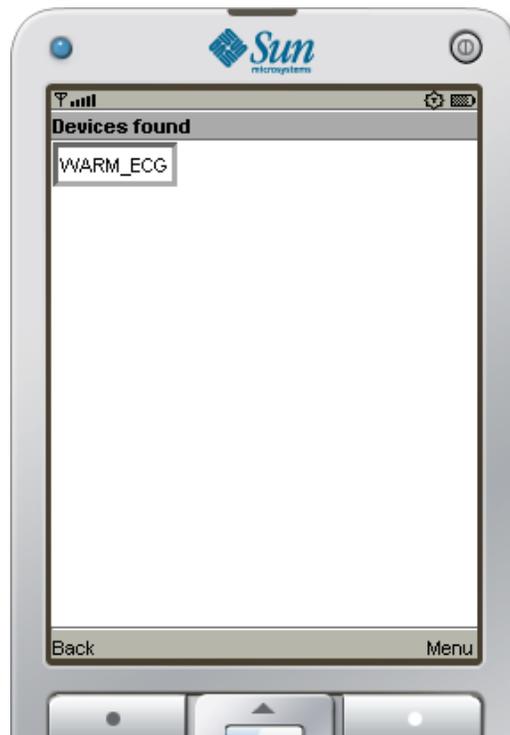


Figure 4 Application Emergency Contacts Menu

#### 2.1.2.1.4 Bluetooth Settings Screen

The Bluetooth Settings screen shows a list of the available Bluetooth devices that are in the premises of the cell phone. The Wireless ECG Monitor identifies itself as WARM\_ECG. Upon selection of the desired Bluetooth device the cell phones proceeds to connect to it.



*Figure 5 Application Bluetooth Setting Menu*

### 2.1.2.1.5 Baseline Parameters Input Screen

This screen allows the doctor to define the patient's specific baseline parameters. These parameters are later sent to the microcontroller to be used as a threshold measure to detect heart anomalies.



Figure 6 Application Baseline Parameters Menu

### 2.1.2.1.6 ECG Data Screen

This screens provides the user the capability of requesting to the Wireless ECG Monitor a current reading of the hear parameters. The readings are displayed along with the base parameters set by the doctor.

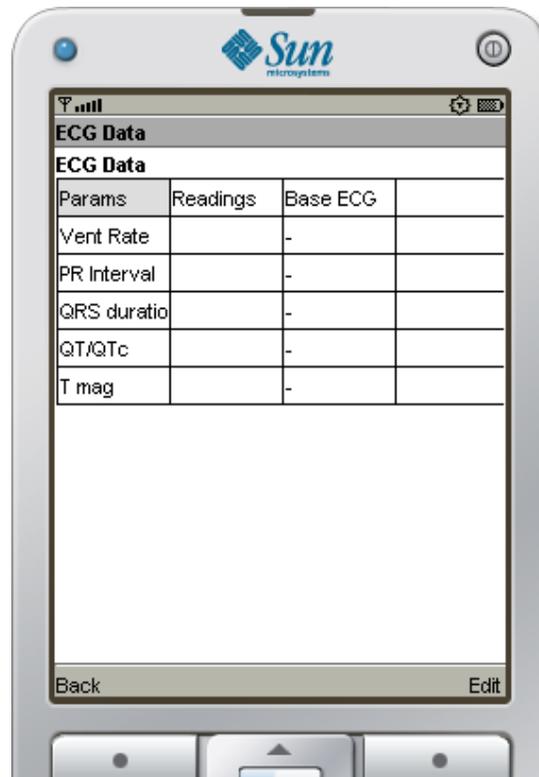
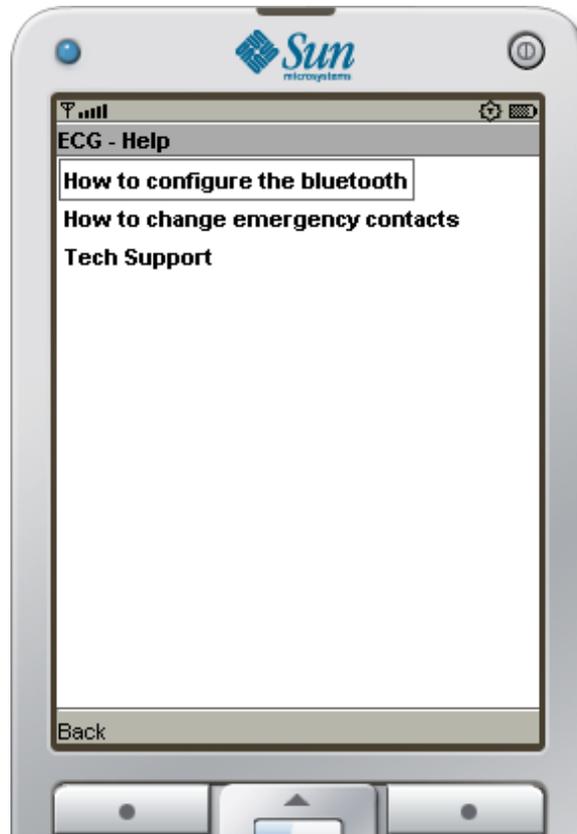


Figure 7 Application ECG Data Menu

### 2.1.2.1.7 Help Screen

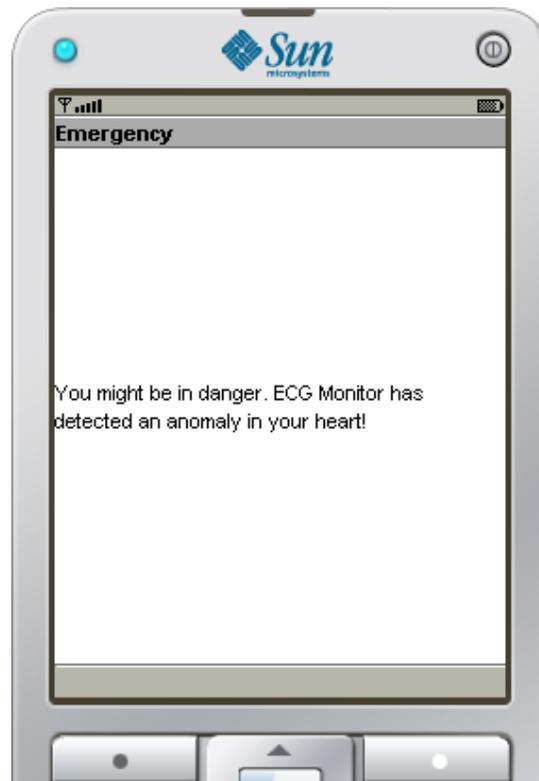
From this screen a user can access several help documentations related to the whole system.



*Figure 8 Application Help Menu*

### *2.1.2.1.8 Alert Screen*

In the event that the Wireless ECG Data detects an anomaly with the heart, the cell phone application will prompt the user with an alert screen. The alert screen will inform the user of the current parameters measured that caused the alert and inform that an alert message is being sent to the emergency contacts.



*Figure 9 Application Alert Menu*

## **2.2 Required Functions**

All the user accessible functions are mainly shown in the home menu. The user should be able to access help documentation that would provide him with a comprehensible explanation of how the features of the Wireless ECG Monitor works. There are functions that enable the user to configure the different settings of the application. The user also has access to the data currently being monitored through the ECG Data function. The application is also provides the function of sending an alert message through SMS messaging to a predefined list of contacts. To ensure the proper work of the system an initialization function ensures that everything is configured correctly before starting the application.

### **2.2.1 Initialization**

The main purpose of the system is to alert the appropriate entities in case of an emergency so that the patient can get a faster medical attention. It extremely important for this goal to be accomplish that the emergency contacts are configured before using the device. The cell phone application doesn't monitor the patient's heart. This is done by the microcontroller which sends an alert to the application in case of emergency. The cell phone application receives this command through the Bluetooth connection, to ensure that the alert message is sent this link must be in place before using the device. To ensure that the main purpose is accomplished an initialization process is done when the application starts checking that the needed configurations are already set.

#### **2.2.1.1 Emergency Contacts**

At least one contact must be configured before the application can run normally. For this the software check if there is no contact saved in the application, in such case it redirects the user to the emergency contacts setting menu (Figure 4).

#### **2.2.1.2 Bluetooth**

In order to be able to receive an alert command from the microcontroller the cell phone and the microcontroller must be connected through a Bluetooth link. In the initialization process the software checks if the Bluetooth settings are already configured and if a connection can be done. If it fails it redirects the user to the Bluetooth setting menu where the user can set these configurations (Figure 5).

## **2.2.2 Alert System**

When the cell phone application receives an alert command the software displays an onscreen alert and then proceeds to message all the emergency contacts. The messaging is done through the SMS service better known as text messaging. This service is provided by the cell phone carriers to their customers and might be enabled or disabled depending on the service plan. In order for it to work the user must be sure that all the emergency contacts he configured can receive SMS messages.

### **2.2.2.1 SMS**

In order to send the SMS message the application relies on the SMTP protocol. This protocol is the same used to send emails. In order for it to work the cell phone device being used must have the capability to create internet connections. The J2ME virtual machine must also have access to it. The application uses a freely available open source SMTP library that sends the alert message to the emergency contact. For the SMS message to work the carrier of the contact must be supported by our application as different carrier have different configuration for their SMS service.

### **2.2.2.2 Message Failure**

A situation might arise where an alert event is trigger and the cell phone doesn't have signal reception to send the message. In such case the applications keeps trying to send the message until it gets sent successfully.

## **2.2.3 Settings**

The user can access the several setting functions that allow him to configure the several features that the application provides.

### **2.2.3.1 Emergency Contacts**

The application allows the user to save up to three emergency contacts. To set up each contact the user must provide the cell phone number of the contact and its carrier. These contacts can be later modified and saved. This function also allows the user to test the alert message

function. By selecting the test alert function the application will send an SMS message to all the saved contacts with a test alert message.

### **2.2.3.2 Bluetooth Settings**

In order for the system to work the cell phone and the microcontroller must connect to each other through a Bluetooth connection. This function allows the user to search nearby Bluetooth devices, showing him a list of Bluetooth devices. The user then chooses the Wireless ECG Monitor to establish the connection.

### **2.2.3.3 Baseline Parameters Input**

In order for the microcontroller to detect anomalies in the analyzed data it needs some threshold to compare it to. These thresholds are user specific and defined by a medical doctor. The baseline parameters input function allows the medical doctor to configure the Wireless ECG Monitor to work within user specific threshold. These parameters can be reconfigured by setting the parameters again through this function. The parameters the doctor sets are Vent Rate, PR interval, QRS complex, QT duration, QTc, and T magnitude.

## **2.2.4 ECG Data**

The cell phone itself doesn't analyze the ECG signal, this analysis is done by the microcontroller, still the user might find used full to be able to see the ECG parameters being monitored. For this the user can access the ECG Data function which will send a command to the microcontroller to send the current analyzed parameters.

### **2.2.4.1 Readings**

A column displaying the current parameters is displayed. The parameters being analyzed are Vent Rate, PR interval, QRS complex, QT duration, QTc, and T magnitude. All these parameters might not make sense to the user since they are medical terminology, to help him make more sense of these data a base column displayed.

### **2.2.4.2 Base**

The Base column displays the base parameters set by the doctor for the user. It gives a range of values between which the current readings should be.

### **2.2.5 Communication Protocol**

The cell phone needs to communicate with the microcontroller to be able to transfer data between each other. This data is comprised of the heart parameters and some strings. The communication protocol is comprised of seven commands. They provide the ability to the cell phone and microcontroller to request parameters, send lower and upper bound threshold parameters, echo the command, and return an error command.

### **2.3 User Characteristics**

Users of the application should have a basic level of understanding about how their cell phone works. Launching applications varies from model to model and the same applies on how the key mapping works for the software navigation.

### **2.4 Constraints**

In this section, constraints that limit the developer's options are presented.

#### **2.4.1 Hardware limitations**

The application will only run under cell phones that are capable of running J2ME java applications, have Bluetooth access, and data access. The J2ME virtual machine of the cell phone has to be able to access the Bluetooth device and also the internet network connection.

## **2.5 Assumptions and Dependencies**

No assumptions or dependencies have been made about the product. Hardware or Software applications needed in some way for the development or work of the product appear in section 2.1.1.

## **3. Specific Requirements**

### **3.1 External Interfaces**

#### **3.1.1 Input / Output**

Following we list the inputs and outputs of cell phone application. It is in alphabetical order and each one is described in function of their type of element, a brief description, the source, the destination, interface associated with it.

Name	Description	Input/Output	Element Type	Producer Entity	Consumer Entity	Interface Elements
backButtonPressed	Returns to the previous display.	Both	Button	User	User	
settingsButton	Directs to the Settings display.	Both	Button	User	User	Home Screen
ecgDataButton	Directs the User to the ECG Data screen.	Both	Button	User	User/Microcontroller	Home Screen
helpButton	Directs the User to the Help screen.	Both	Button	User	User	Home Screen
exitButton	Exits the program.	Both	Button	User	User	Home Screen
emergencyContactsButton	Directs the User to the emergency contacts settings menu.	Both	Button	User	User	Settings Screen
bluetoothSettingsButton	Directs the User to the Bluetooth settings menu	Both	Button	User	User	Settings Screen
baselineParametersButton	Directs the User to the baseline parameters settings menu.	Both	Button	User	User	Settings Screen
telephoneTextBox	Sets the value of the phone number.	Input	Text Box	User		Emergency Contacts Screen
carrierDropDownMenu	Shows the list of available cell phone carriers for SMS messaging.	Input	Drop Down Menu	User		Emergency Contacts Screen
btDeviceButton	Connects to that device via Bluetooth.	Both	Button	User		Bluetooth Settings Screen
parameterTextBox	Sets the value of one of the parameters.	Input	Text Box	User		Baseline Parameters Screen
saveParametersButton	Saves and sends the threshold parameters to the microcontroller.	Both	Button	User	User/Microcontroller	Baseline Parameters Screen
ecgDataTable	Display the current and base ECG parameters.	Output	Table	User	User	ECG Data Screen
helpLink	Display documentation related to the selected help category.	Both	Link	User	User	Help Screen
testAlertButton	Sends an SMS test message to all emergency contacts	Both	Button	User	User	Emergency Contacts Screen

<b>saveContactButton</b>	<b>Saves the emergency contacts.</b>	<b>Both</b>	<b>Button</b>	<b>User</b>		<b>Emergency Contacts Screen</b>
<b>cancelButton</b>	<b>Discard any changes in the contact settings.</b>	<b>Both</b>	<b>Button</b>	<b>User</b>	<b>User</b>	<b>Emergency Contacts Screen</b>
<b>alertPopUp</b>	<b>Alerts the user that an anomaly has been detected and an SMS message is going to be sent.</b>	<b>Output</b>	<b>PopUp</b>	<b>Microcontroller</b>	<b>User</b>	

*Table 1*

### 3.1.2 Events

This is the list of events of our system.

<b>Name</b>	<b>Description</b>	<b>Producer Entity</b>	<b>Consumer Entity</b>
alertEvent	The Event occurs when the the microcontroller detects an anomaly.	Microcontroller	
testAlertEvent	The Event occurs when the user presses the testAlertbutton.	User	
saveParametersEvent	The Event occurs when the user presses the saveParameters button	User	

*Table 2. Events*

### 3.2 Functional Requirements

Functional Requirements are a set of rigid guidelines that every system follows. They describe the expected and required interaction between the system and its environment in an implementation independent way.

What follows are the Use Case diagrams that represent the functional requirements of the system. Each scenario conveys how the system should interact with the customer, external actors, or other systems to achieve a specific goal.

The functional requirements are classified according to functional characteristics or features of the system. Each section represents a feature of the product and subsequent subsections present a use case for each feature view. There is also an activity diagram for each use case.

### 3.2.1 Use Case Specifications

This section presents the use case diagrams of the functional requirements.

#### 3.2.1.1. Home Menu View

The use case diagram for the “Home Menu View” will focus on describing the interaction between the end-user and the “System” application.

The user is provided with a list of buttons that will direct them to a specific submenu of the system.

##### 3.2.1.1.1 Use Case: Home Menu View

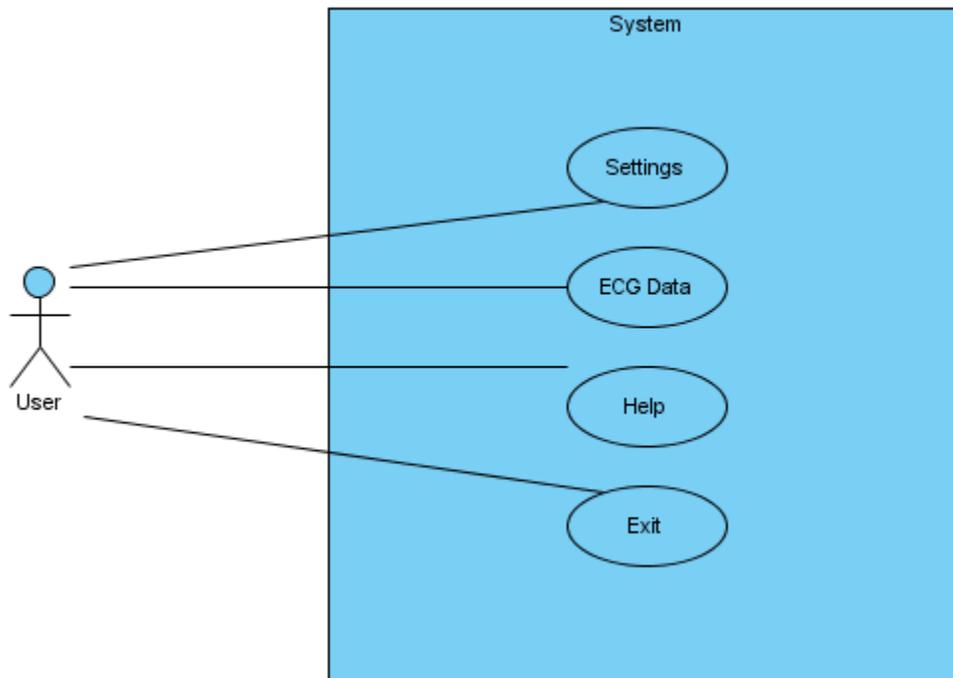


Figure 10 Use Case for Home Menu View

### 3.2.1.1.1 Activity Diagram: Select Settings

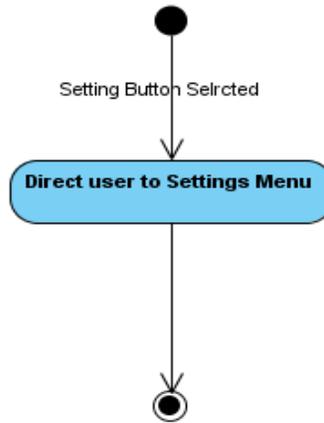


Figure 11 Activity Diagram: Select Settings

#### 3.2.1.1.1.1 Select Settings Specification

<i>Use case name</i>	Select Settings
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell phone
<i>Entry</i>	1. Settings Button
<i>Entry condition</i>	1. Current display in "Home Menu".
<i>Flow of events</i>	1. Display Settings Menu Screen
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

### 3.2.1.1.1.2 Activity Diagram: Select ECG Data

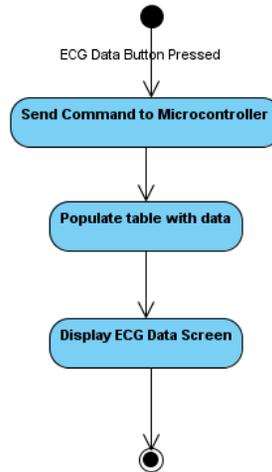


Figure 12 Activity Diagram: Select ECG Data

#### 3.2.1.1.1.2.1 Select ECG Data Specifications

<i>Use case name</i>	Select ECG Data
<i>Priority</i>	Optional
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone, Microcontroller
<i>Entry</i>	1. ECG Data Button
<i>Entry condition</i>	1. Current display in "Home Menu". 2. The Base Parameters Must has been set.
<i>Flow of events</i>	1. Send command to microcontroller. 2. Populate the ECG Table.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

### 3.2.1.1.3 Activity Diagram: Select Help Button

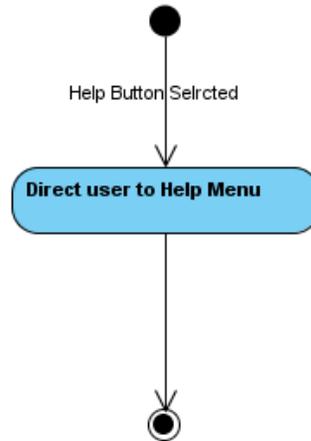


Figure 13 Activity Diagram: Select Help Button

#### 3.2.1.1.3.1 Select Help Button Specifications

<i>Use case name</i>	Select Help Button
<i>Priority</i>	Optional
<i>Participating actors</i>	Initiated User
<i>System interface</i>	Cell Phone
<i>Entry</i>	1. Help Button
<i>Entry condition</i>	Current display in "Home Menu".
<i>Flow of events</i>	Display the Help Menu Screen.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

### 3.2.1.1.1.4 Activity Diagram: Select Exit Button

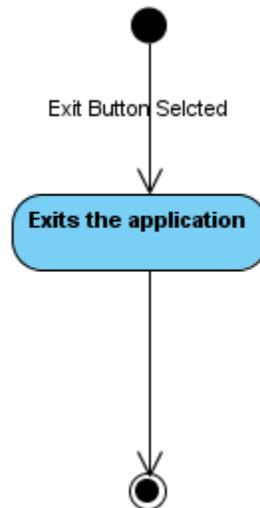


Figure 14 Activity Diagram: Select Exit Button

#### 3.2.1.1.1.4.1 Select Exit Button Specifications

<i>Use case name</i>	Select Exit Button
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell phone
<i>Entry</i>	1. Exit Button
<i>Entry condition</i>	1. Current display in "Home Menu".
<i>Flow of events</i>	1. Stop running application.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

### 3.2.1.2. Settings Menu View

The use case diagram for the "Settings Menu View" will focus on describing the interaction between the end-user and the "System" application for accessing various sub-settings.

### 3.2.1.2.1 Use Case: Settings Menu View

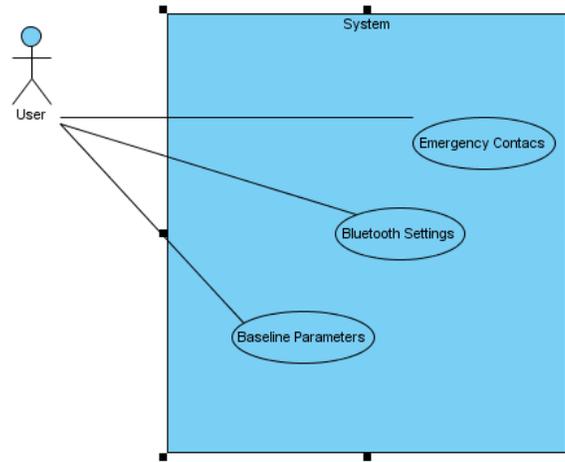


Figure 15 Use Case: Settings Menu

#### 3.2.1.2.1.1 Activity Diagram: Select Emergency Contacts Button

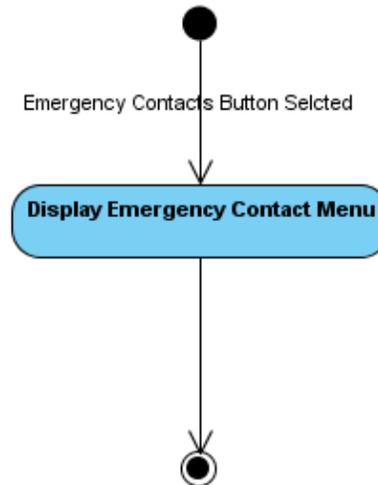


Figure 16 Activity Diagram: Select Emergency Contacts Button

### 3.2.1.2.1.1 Select Emergency Contacts Button Specifications

<i>Use case name</i>	Select Emergency Contacts Button
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone
<i>Entry</i>	1. Emergency Contact Button
<i>Entry condition</i>	1. Current display in “Settings Menu”
<i>Flow of events</i>	1. Direct user to Emergency Contact Menu.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	.
<i>Special requirements</i>	

### 3.2.1.2.1.2 Activity Diagram: Select Bluetooth Settings Button

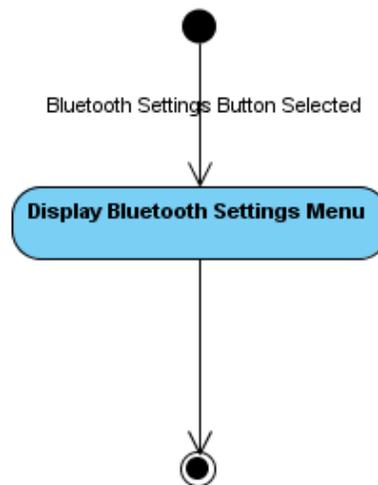


Figure 17 Activity Diagram: Select Bluetooth Settings Button

### 3.2.1.2.1.2.1 Select Bluetooth Settings Button Specifications

<i>Use case name</i>	Select Bluetooth Settings Button
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone
<i>Entry</i>	1. Bluetooth Settings Button
<i>Entry condition</i>	1. Current display in “Settings Menu”
<i>Flow of events</i>	1. Direct user to Bluetooth Settings Menu.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

### 3.2.1.2.1.3 Activity Diagram: Select Baseline Parameters Button

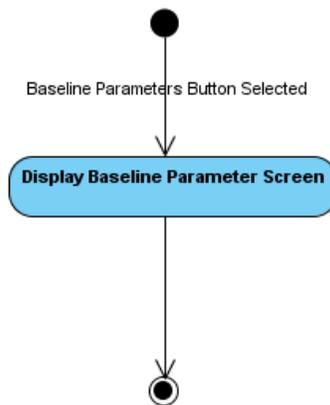


Figure 18 Activity Diagram: Select Baseline Parameters Button

### 3.2.1.2.1..3.1 Select Baseline Parameter Button Specifications

<i>Use case name</i>	Select Baseline Parameter Button
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User

---

<i>System interface</i>	Cell Phone
<i>Entry</i>	1. Baseline Parameters Button
<i>Entry condition</i>	1. Current display in “Settings Menu”
<i>Flow of events</i>	1. Direct user to the Baseline parameter Screen.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

---

### 3.2.1.3 Emergency Contacts View

The use case diagram for the “Emergency Contacts View” will focus on describing the interaction between the end-users with the “System” when the end-user wants to set or modified a contact. It also describes the interaction between the end-user and the test alert function.

#### 3.2.1.3.1 Use Case: Emergency Contacts View

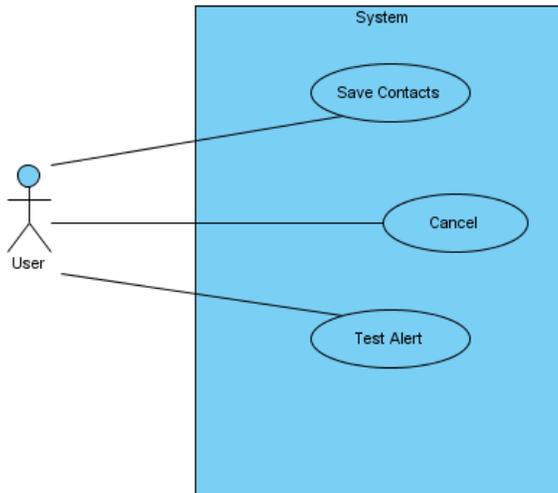


Figure 19 Use Case Diagram: Emergency Contacts View

### 3.2.1.3.1.1 Activity Diagram: Save Contacts

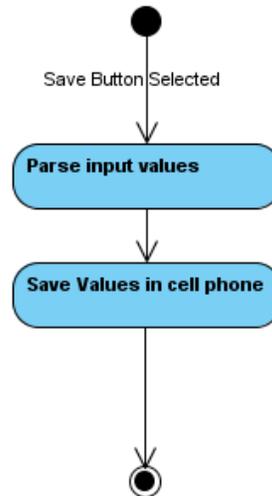


Figure 20 Activity Diagram : Save Contacts

#### 3.2.1.3.1.1.1 Save Contacts Specification

<i>Use case name</i>	Save Contacts
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone
<i>Entry</i>	1. Save
<i>Entry condition</i>	1. Current display in “Emergency Contacts Menu”. 2. At least one contact must be configured.
<i>Flow of events</i>	1. Parse contact values. 2. Save in cell phone memory.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	1.Invalid values entered
<i>Special requirements</i>	1. The input values must be number

### 3.2.1.3.1.2 Activity Diagram: Cancel

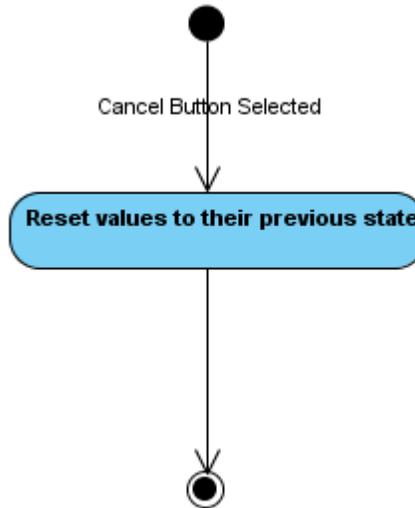


Figure 21 Activity Diagram: Cancel

#### 3.2.1.3.1.2.1 Cancel Specification

<i>Use case name</i>	Cancel
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone
<i>Entry</i>	1. Cancel
<i>Entry condition</i>	1. Current display in “Emergency Contacts”.
<i>Flow of events</i>	1. Reset values to their previous state
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	
<i>Special requirements</i>	

### 3.2.1.4. Bluetooth Settings View

The use case diagram for the “Bluetooth Settings Views” will focus on describing the interaction between the end-user and the “System” for selecting Bluetooth device and initializing a connection.

### 3.2.1.4.1 Use Case: Bluetooth Settings View

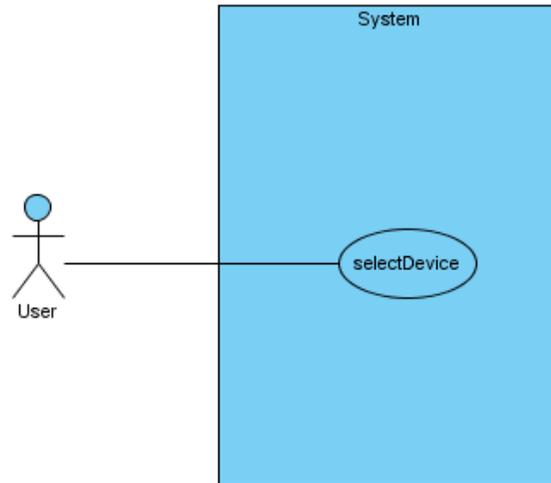


Figure 22 Use Case Diagram: Bluetooth Settings View

#### 3.2.1.4.1.1 Activity Diagram: Select Device

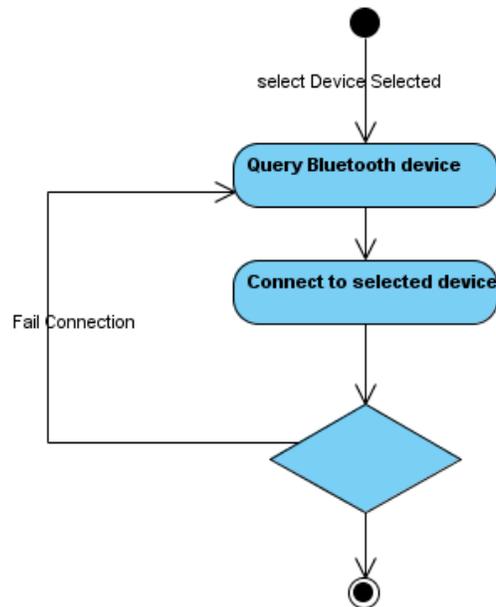


Figure 23 Activity Diagram: Select Device

### 3.2.1.4.1.1 Select Device Specification

<i>Use case name</i>	Select Device
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone, Bluetooth Device
<i>Entry</i>	1. btDevice Button
<i>Entry condition</i>	1. Current display in “Bluetooth Settings”. 2. Bluetooth Device enabled.
<i>Flow of events</i>	1. Query Bluetooth for a list of nearby devices. 2. Display available devices. 3. Connect to selected device
<i>Exit</i>	
<i>Exit condition</i>	1.Connected
<i>Exceptions</i>	1. No signal reception 2. No device found
<i>Special requirements</i>	

### 3.2.1.5. Baseline Parameters Settings View

The use case diagram for the “Baseline Parameters Views” will focus on describing the interaction between the end-user and the “System” for setting the threshold parameters for the ECG analysis.

### 3.2.1.5.1 Use Case: Baseline Parameters View

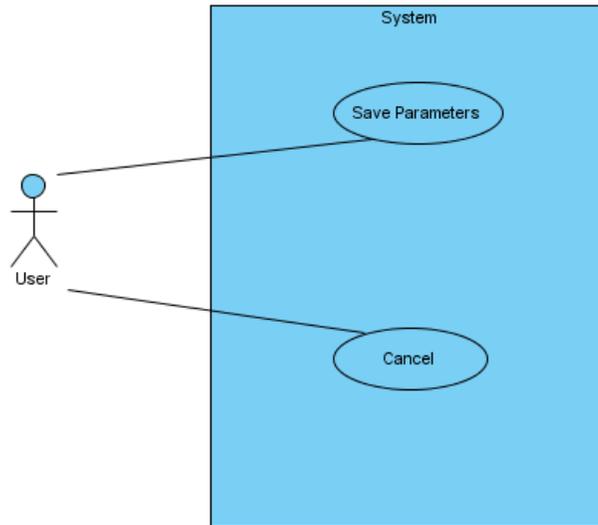


Figure 24 Use Case Diagram: Baseline Parameters View

#### 3.2.1.5.1.1 Activity Diagram: Save Parameters

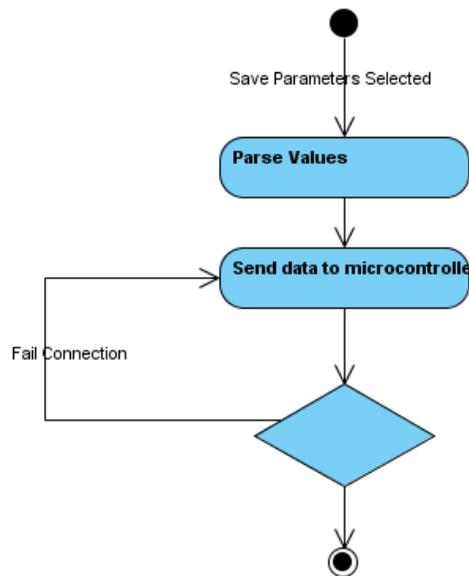


Figure 25 Activity Diagram: Save Parameters

### 3.2.1.5.1.1 Save Parameters Specification

<i>Use case name</i>	Save Parameters
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone, Microcontroller
<i>Entry</i>	2. saveParameters
<i>Entry condition</i>	3. Current display in “Baseline Parameters”.
<i>Flow of events</i>	4. Parse Values 5. Send data to microcontroller.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	No Bluetooth connection
<i>Special requirements</i>	

### 3.2.1.6. ECG Data View

The use case diagram for the “ECG Data Views” will focus on describing the interaction between the end-user and the “System” for obtaining the current data being analyzed.

#### 3.2.1.6.1 Use Case: ECG Data View

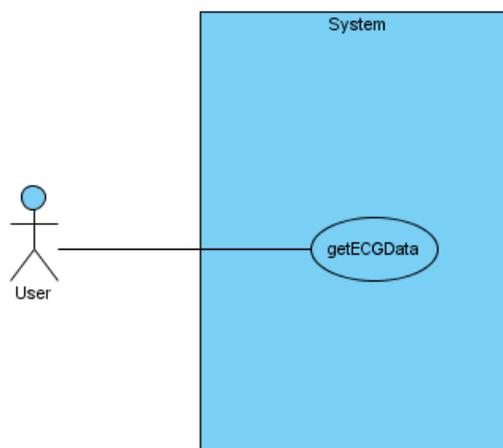


Figure 26 Use Case Diagram: ECG Data View

### 3.2.1.6.1.1 Activity Diagram: Get ECG Data

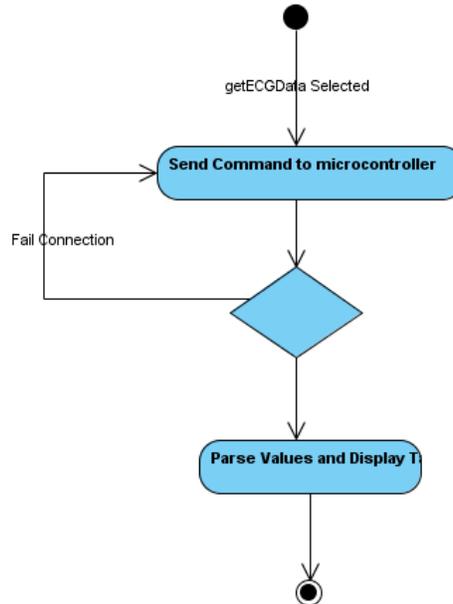


Figure 27 Activity Diagram: Get ECG Data

#### 3.2.1.6.1.1.1 Get ECG Data Specification

<i>Use case name</i>	Get ECG Data
<i>Priority</i>	Essential
<i>Participating actors</i>	Initiated by User
<i>System interface</i>	Cell Phone, Microcontroller
<i>Entry</i>	3. getECGData
<i>Entry condition</i>	4. Current display in “ECG Data”.
<i>Flow of events</i>	6. Send command to microcontroller to acquire the data 7. Parse Values 8. Display them in the ECG Table.
<i>Exit</i>	
<i>Exit condition</i>	
<i>Exceptions</i>	No Bluetooth connection
<i>Special requirements</i>	

## **APPENDIX A: Software Documentation**