A close up of a building

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University of Petra

faculty of Information technology

graduation project

planning and requirements

smart hospital bed

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# **2.PROJECT PLANNING AND REQUIREMENTS**

## **2.1 PLANNING**

### **2.1.1 SCOPE INITIATION(WBS)**

SHB Project Plane is built to be managed, Controlled and monitored using Scrum Methodology, where the Software process model followed for this project is Spiral. The bellow work breakdown structure illustrates how the work is being done among the team members.

A screenshot of text

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Figure 1.1 wbs

A screenshot of a cell phone

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Figure 2wbs

Figure 3wbs

A screenshot of a cell phone

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Figure 4wbs

### 2.1.2 GANTT CHART

Gannt Chart is one way to support time management, activities definition and sequencing.

A screenshot of text

Description generated with very high confidenceThe following Gantt chart represent the activities in which SHB has been through to be accomplished.

Figure 5 Ganttchart

A close up of a map

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Figure 6 Ganntchart

A screenshot of a social media post

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Figure 7 Ganntchart

### 2.1.3 RESOURCE PLANNING SCHEDULING AND RESOURCE DISTRIBUTIN

A screenshot of a computer

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Figure 8resource planning

A screenshot of a computer screen

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A screenshot of a map

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A screenshot of a computer

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### 2.1.4 SYSTEM DEVELOPMENT REQUIRMENT

|  |  |
| --- | --- |
| Resource Group | Resource Name |
| Software | * Microsoft Project Management pro 365 2016 * Microsoft word 365 2016 * Microsoft Visio pro 365 2016 * Phpstrom 2018.1 * Arduino ide 1.8.5 |
| Hardware | * Chassis [1]. * Dc motors [6]. * Ultrasonic sensor [2]. * Line tracking sensor [2]. * Arduino mega [1]. * Arduino Uno [1]. * Arduino lily [1]. * Gyroscope mpu5060 [2]. * Bluetooth [1]. * Motor shield [1]. * scissor jack [1]. * Power supply [3]. * Solar Panel [1]. * Servo motor [1]. * LDR module [2]. * Encoder [2]. * LED light [8]. |

### 2.1.5 COST ESTIMATING AND BUDGETING.

By inserting the estimated resources value to the Microsoft project management tools, the following cost has been estimated for SHB Project.

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A screenshot of a cell phone

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### 2.1.6 RISK LIST (RISK ANALYSIS).

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## 2.2 REQUIRMENTS

### 2.2.1 Requirement elicitation techniques

SHB is a Project that is going to be used by Hospitals, Patients and Employees inside the Hospital and that has been taken in consideration and in order to make it convenience for all parts, two elicitation techniques haven been used in order to collect requirements.

1 Observation

The process of transferring the patient from bed to bed and what the nurses go through will dragging the normal hospitals bed has been observe.

2 Questioner

Two forms of questioner have been formed for patient and hospital employee.

### 2.2.2 LIST OF FUNCTIONAL AND NON- FUNCTIONAL REQUIRMENTS

#### 2.2.2.1 FUNCTIONAL REQUIREMENTS.

SBH functional requirements:

1. The system shall allow the user to move SHB one cycle forward.
2. The system shall allow the user to move SHB one cycle backward.
3. The system shall allow the user to move SHB one cycle to the left.
4. The system shall allow the user to move SHB one cycle to the right.
5. The system shall allow the user to steer SHB forward by gesture movement.
6. The system shall allow the user to steer SHB backward by gesture movement.
7. The system shall allow the user to steer SHB left by gesture movement.
8. The system shall allow the user to steer SHB right by gesture movement.
9. The system shall steer autonomy to Operations room by user order.
10. The system shall steer autonomy to patient room by user order.
11. The system shall allow the user to lift the jack up.
12. The system shall allow the user to lift the jack down.
13. The system shall allow the user to transfer the patient form his bed to SHB.
14. The system shall allow the user to transfer the patient from SHB to his bed.
15. The system shall stop in case of obstacles.
16. The system shall adjust its movement in case of safety line detection.

Smart Solar-Panel Functional requirements:

1. The system shall move the panel toward lights.

Website functional requirements:

1. The system shall provide the full Documentation of SHB.
2. The system shall provide tips to troubleshoot problems.
3. The system shall provide support information.
4. The system shall allow the user to enter patient personal information.
5. The system shall allow the user to enter the patient night shift reads.

#### 2.2.2.2 NON-FUNCTIONAL REQUIREMENTS.

SHB non-Functional requirements:

* System Reliability

The reliability that the system will react in the right way according to the sensor reads.

* System Performance  
  The system should response and perform the right action in less than a second.
* System Testability   
  Test environments should be built for the system to allow testing of the system different.

functions.

Smart Solar-Panel non-functional requirements:

Website non-functional requirement:

* website extendibility  
  The website should be easy to extend and add new functions.
* Readability  
  the code should contain enough comments.

### 2.2.3 Use Case Specifications

#### 2.2.3.1 Use Case Specifications for SHB.

Use case name: move SHB one cycle forward.

Preconditions: the SHB should be completely stopped.

Interested Stakeholders: nurses.

Flow of Events:

1. The user makes sur that SHB is in idle mood.
2. The user clicks on forward button.
3. The front LED lights turn on.
4. The system moves one cycle forward.

Post Conditions:

SHB stops and the front LED lights are off.

Use case name: move SHB one cycle backward.

Preconditions: the SHB should be completely stopped.

Interested Stakeholders: nurses.

Flow of Events:

1. The user makes sur that SHB is in idle mood.
2. The user clicks on backward button.
3. The back-LED lights turn on.
4. The system moves one cycle backward.

Post Conditions:

SHB stops and the back-LED lights are off.

Use case name: move SHB one cycle to the left.

Preconditions: the SHB should be completely stopped.

Interested Stakeholders: nurses.

Flow of Events:

1. The user makes sur that SHB is in idle mood.
2. The user clicks on left button.
3. The left-LED lights turn on.
4. The system moves one cycle to the left.

Post Conditions:

SHB stops and the left-LED lights are off.

Use case name: move SHB one cycle to the right.

Preconditions: the SHB should be completely stopped.

Interested Stakeholders: nurses.

Flow of Events:

1. The user makes sur that SHB is in idle mood.
2. The user clicks on right button.
3. The right-LED lights turn on.
4. The system moves one cycle to the right.

Post Conditions:

SHB stops and the right-LED lights are off.

Use case name: steer SHB forward by gesture movement.

Preconditions: the user wear the controlling glove.

Interested Stakeholders: nurses.

Flow of Events:

1. The user activates control glove by turning on the switch on the glove.
2. The system stops the autonomous control.
3. The system activates the gesture control mode.
4. The user leans his hand downward.
5. SHB start moving forward.

Post Conditions:

SHB stops and the front-LED lights are off.

Use case name: steer SHB backward by gesture movement.

Preconditions: the user wear the controlling glove.

Interested Stakeholders: nurses.

Flow of Events:

1. The user activates control glove by turning on the switch on the glove.
2. The system stops the autonomous control.
3. The system activates the gesture control mode.
4. The user leans his hand upward.
5. SHB start moving backward.

Post Conditions:

SHB stops and the back-LED lights are off.

Use case name: steer SHB to the left by gesture movement.

Preconditions: the user wear the controlling glove.

Interested Stakeholders: nurses.

Flow of Events:

1. The user activates control glove by turning on the switch on the glove.
2. The system stops the autonomous control.
3. The system activates the gesture control mode.
4. The user leans his hand to the left.
5. SHB start moving to the left.

Post Conditions:

SHB stops and the left-LED lights are off.

Use case name: steer SHB to the right by gesture movement.

Preconditions: the user wear the controlling glove.

Interested Stakeholders: nurses.

Flow of Events:

1. The user activates control glove by turning on the switch on the glove.
2. The system stops the autonomous control.
3. The system activates the gesture control mode.
4. The user leans his hand to the right.
5. SHB start moving to the right.

Post Conditions:

SHB stops and the right-LED lights are off.

Use case name: steer autonomy to Operations room by user order.

Preconditions: the user makes sure that the SHB will start next to the patient bed.

Interested Stakeholders: nurses.

Flow of Events:

1. The user press on operation room button.
2. The system start moving according to sensors reads.
3. The system reaches operation room.
4. System stops.
5. LED lights are off.

Post Conditions:

SHB stops and the LED lights are off.

Use case name: steer autonomy to patient room by user order.

Preconditions: SHB is in operation room.

Interested Stakeholders: nurses / Doctors.

Flow of Events:

1. The user press on patient room button.
2. The system starts moving according to sensors reads.
3. The system reaches patients room.
4. System stops.
5. LED lights are off.

Post Conditions:

SHB stops and the LED lights are off.

Use case name: allow the user to lift the jack up.

Preconditions: SHB is in idle mode.

Interested Stakeholders: nurses / Doctors.

Flow of Events:

1. The user press and hold on up button.
2. The system start lifts the jack up one cycle per 0.5 second.
3. The user releases up button.

Post Conditions:

Jack LEDs are off.

Use case name: allow the user to lift the jack down.

Preconditions: SHB is in idle mode.

Interested Stakeholders: nurses / Doctors.

Flow of Events:

1. The user press and hold on down button.
2. The system start lifts the jack down one cycle per 0.5 second.
3. The user releases down button.

Post Conditions:

Jack LEDs are off.

Use case name: allow the user to transfer the patient form his bed to SHB.

Preconditions: SHB is in idle mode and side by side to the patient’s bed.

Interested Stakeholders: nurses / Doctors.

Flow of Events:

1. The user makes sure that the SHB in the right position where the slider is perfectly fit under the mattress.
2. The user press on the slider button.
3. The system starts to move the slider under the mattress.
4. The user locks the safety lock.
5. The user presses the slider button again.
6. The system starts to drag the mattress toward the SHB.

Post Conditions:

The patient mattress is over the SHB.

Use case name: allow the user to transfer the patient from SHB to his bed.

Preconditions: SHB is in idle mode and side by side to the patient’s bed.

Interested Stakeholders: nurses / Doctors.

Flow of Events:

1. The user makes sure that the SHB in the right position where the slider is perfectly fit next to the patient bed.
2. The user press on the slider button.
3. The system starts to move the slider over the patient’s bed.
4. The user unlocks the safety lock.
5. The user presses the slider button again.
6. The system releases the mattress over the patient bed.

Post Conditions:

The patient mattress is over the patient bed.

Use case name: stop in case of obstacles.

Preconditions: SHB is in movement.

Interested Stakeholders: nurses / Doctors/patient / crossers.

Flow of Events:

1. The ultrasonic sensors detect a nearby obstacle.
2. The sensors send the reads to the mega board.
3. The mega board send an order to stop all DC motors.

Post Conditions:

The SHB starts to move again.

Use case name: shall adjust its movement in case of safety line detection.

Preconditions: SHB is in movement.

Interested Stakeholders: nurses / Doctors/patient / crossers.

Flow of Events:

1. The IR sensors detect the safety line.
2. The sensors send the reads to the mega board.
3. The mega board send an order adjust the movement.

Post Conditions:

The SHB starts to move forward again.

#### 2.2.3.2 Use Case Specifications for website

Use case name: provide full Documentation of SHB.

Preconditions: open SHB website.

Interested Stakeholders: anyone interested in the bed.

Flow of Events:

1. The user opens the website
2. The user clicks on documentation from navbar
3. The system displays a page with full documentation of the SHB project.

Post Conditions:

.

Use case name: provide tips to troubleshoot problems

Preconditions: open SHB website.

Interested Stakeholders: anyone interested in the bed.

Flow of Events:

1. The user opens the website
2. The user clicks on documentation from navbar
3. The system displays a page with full documentation of the SHB project.
4. The user clicks on troubleshoot button at the bottom of the page.
5. The system displays Q&A page.

Use case name: provide support information

Preconditions: open SHB website.

Interested Stakeholders: anyone interested in the bed.

Flow of Events:

1. The user opens the website
2. The user clicks on developers button from navbar
3. The system display developers and their contact information to contact with.

post condition

…

Use case name: allow the user to enter patient personal information.

Preconditions: login using nurse account.

Interested Stakeholders: nurse.

Flow of Events:

1. The user login in using nurse account.
2. The user chooses patient list.
3. The system displays list of patient’s names.
4. The user chooses patient from the list
5. The user chooses to edit personal information
6. The user enters the personal information
7. The user clicks on save
8. The system saves the data in the database

post condition

confirmation message.

Use case name: allow the user to enter the patient night shift reads.

Preconditions: login using nurse account.

Interested Stakeholders: nurse.

Flow of Events:

1. The user login in using nurse account.
2. The user chooses patient list.
3. The system displays list of patient’s names.
4. The user chooses patient from the list
5. The user chooses to add night shift reads
6. The user enters the night-shift reads
7. The user clicks on save
8. The system saves the data in the database

post condition

confirmation message.

Use case name: allow the user to enter the patient night shift reads.

Preconditions: login using nurse account.

Interested Stakeholders: nurse.

Flow of Events:

1. The user login in using nurse account.
2. The user chooses patient list.
3. The system displays list of patient’s names.
4. The user chooses patient from the list
5. The user chooses to add night shift reads
6. The user enters the night-shift reads
7. The user clicks on save
8. The system saves the data in the database

post condition

confirmation message.

### 2.2.4 Domain Object Diagram

A screenshot of a cell phone

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Figure 9 SHB Domain Object Diagram

A screenshot of a social media post

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Figure 10 website Domain Diagram

## 2.3 Appendix

A picture containing screenshot

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Figure patient answers

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A screenshot of a cell phone

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A screenshot of a cell phone

Description generated with high confidence

A screenshot of a cell phone

Description generated with very high confidenceNurse Answers of Questionnaire

Figure Nurses Answer

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Description generated with high confidence

A screenshot of a cell phone

Description generated with very high confidence