BE Project
CE Department
Project ID: BUKC-CE-2020-07
June 2021

Bahria University
Discovering Knowledge

Customized Pattern & Wall Painting Robot

Bushra Arif
Ushina Rabab
M. Mannan Shafique

Department of Computer

Engineering Bahria University,
Karachi Campus

Submission Performa

Name:

(1) (Bushra Arif)

(2) (Ushina Rabab)

(3) (M. Mannan Shafique)

Address:

(1) (R-54 Street#3 Gulshan-e-Sadique Akbar Society Malir City Near Anwar Baloch Hotel Karachi)

(2) (H. No. A-43 Block H North Nazimabad Karachi)

(3) (CPO 11 123 Hanif S. R. E Karsaz Karachi)

Title: Customized Pattern & Wall Painting Robot

Project Supervisor's Namr: Engr. Usra Sami

This report is submitted as required for the Project in accordance with the rules laid down by the Bahria University as part of the requirements for the award of the degree of Bachelor of Engineering. I/We declare that the work presented in this report is my/our own except where due reference or acknowledgement is given to the work of others.

Signatures of students	**Date**
(1) Bushra	1-July-2021
(2) Ushina	1-July-2021
(3)	1-July-2021

Signature of Supervisor	**Date**
	1/7/2021

Bahria University
Discovering Knowledge

Intellectual Property Right Declaration

This is to declare that the work done under the supervision of **Engr. Usra Sami** having title "**Customized Pattern & Wall Painting Robot**" carried out in partial fulfillment of the requirements of Bachelors of Engineering in Computer Engineering, is the sole property of Bahria University and is protected under the Intellectual Property right laws and conventions. Bahria University asserts legal and beneficial ownership rights over all Intellectual Property developed as a result of support either directly from or channeled through Bahria University, or created at the request or direction of Bahria University, or developed as a result of utilization of Bahria University Resources including copyright in any material. It can only be considered/ used for purposes like extension for further enhancement, product development, adoption for commercial/organizational usage, etc., with the permission of the university and in adherence to its policies.

The above statements apply to all students and faculty members.

Date: 1-July-2021

Author(s):

Name: Bushra Arif Signature:

Name: Ushina Rabab Signature:

Name: M. Mannan Shafique Signature:

Supervisor(s):

Name: Engr.Usra Sami Signature:

Bahria University
Discovering Knowledge

Anti-Plagiarism Declaration

This is to declare that the above publication produced under the supervision of **Engr. Usra Sami** having title "**Customized Pattern & Wall Painting Robot**" is the sole contribution of the author(s) and no part here of has been reproduced illegally (cut and paste) which can be considered as Plagiarism. All referenced parts have been used to argue the idea and have been cited properly. I/We will be responsible and liable for any consequence if violation of this declaration is proven.

Date: 1-July-2021

Author(s):

Name: Bushra Arif Signature:

Name: Ushina Rabab Signature:

Name: M. Mannan Shafique Signature:

Acknowledgments

Acknowledgment and gratitude are express through this document by us to all persons whom have been worked and associated with our project and by their help we made our project worthy and gained well experience.

First of all, all thanks to Allah (S. W. T) for giving us capabilities and strength to develop skills so that we understand how to make Painting Project worthy. More importantly, we might want to express gratitude towards Almighty Allah who made all things conceivable

After that we want to express our gratitude to our Project Manager **Dr. Rizwan Iqbal** for helping us in every difficult time of building Li-Fi. Also we want to express our sincere and generous thanks to Head of CE department **Dr. Shoaib Mughal** making us to do better every single time. And lastly we want to show our genuine and sincere thanks and pleasure to our supervisor **Engr. Usra Sami** for her monitoring, support and guidance during our developing period of project. It was a great experience to work with all above people.

Abstract

The project's main purpose is to design, develop and implement Customize Wall & Pattern Painting Robot that supports achieving low-cost equipment for painting. Although robots have advanced and are extensive in applications, inner wall painting has not much in common in research. The chemicals used in painting can damage human painters such as difficulties with the eyes and respiratory systems. It also takes on boring, time and effort due to the nature of the painting process that involves repetitive work and hand raises. If construction employees and robots are correctly integrated into building jobs, it is possible to better manage the complete construction process and to save time and effort. It would also provide the potential to limit or eliminate human exposure to harsh and harmful settings which, with several operations simultaneous, would address most security-related difficulties. The creation of an automated robotic painting system motivates these reasons.

In each chapter we will be covering details starting from the background of project, covering its literature review, highlighting hardware and software requirements and the requirements that is needed to design the system. Furthermore, it covers the implementation of the system. Highlights the implementation factors in detail and its testing. Lastly, it gives us the results and future work of Customize Wall & Pattern Painting Robot.

Customize Wall & Pattern Painting Robot proved to be a test for our team in utilizing knowledge by reading into different books and different research papers. It helps us to utilize the all the academics and realistic facts of most of the course we have studied throughout our bachelors.

Table of Contents

1 INTRODUCTION 1
1.1 PURPOSE OF THE PROJECT 1
1.2 PROBLEM STATEMENT 2
1.3 OBJECTIVES OF THE PROJECT 2
1.4 SCOPE OF PROJECT 3
1.4.1 INCLUDES 3
1.4.2 DOES NOT INCLUDE 3
1.5 PURPOSE OF THE DOCUMENT 3
1.6 OVERVIEW OF THE DOCUMENT 4
2 BACKGROUND AND LITERATURE REVIEW 5
2.1 EXISTING SYSTEM 5
2.1.1 EXISTING SYSTEM DESCRIPTION 5
3 SYSTEM ANALYSIS 7
3.1 INTRODUCTION 7
3.2 WORK ANALYSIS 7
3.2.1 HARDWARE WORK ANALYSIS 7
3.2.2 HARDWARE WORK FLOW 9
3.2.3 SOFTWARE WORK ANALYSIS 10
3.2.4 SOFTWARE WORK FLOW 11
3.2.5 INTEGRATED SYSTEM WORK ANALYSIS 12
3.3 PROJECT MANAGEMENT 13
3.3.1 GANTT CHART 13
3.4 PERFORMANCE OF ACTIVITY BY GROUP MEMBERS 16
3.5 FLOW CHART 17
3.6 PLAN OF THE SYSTEM 19
3.7 SYSTEM REQUIREMENT 19
4 SYSTEM DESIGN 21
4.1 INTRODUCTION 21
4.2 SYSTEM REQUIREMENTS 21
4.3 RESOURCE REQUIREMENTS 22
4.4 DATA REQUIREMENTS 22
4.5 NON-FUNCTIONAL REQUIREMENTS 23
4.5.1 USABILITY REQUIREMENTS 23
4.5.2 RELIABILITY REQUIREMENTS 23
4.5.3 SECURITY REQUIREMENTS 23

4.5.4 PERFORMANCE REQUIREMENT 23
4.5.5 MAINTAINABILITY REQUIREMENT 24
4.6 DESIGN CONSTRAINTS 24
4.6.1 HARDWARE AND SOFTWARE ENVIRONMENT 25
4.7 END-USER CHARACTERISTICS 25
4.8 ARCHITECTURAL STRATEGIES 26
4.9 HARDWARE AND SOFTWARE MODULE 27
5 IMPLEMENTATION 28
5.1 DETAILED COMPONENTS DESCRIPTION 28
5.2 CIRCUIT DIAGRAM 40
5.3 HARDWARE IMPLEMENTATION 41
5.3.1 ROBOT BLUETOOTH BASE CONNECTIONS 42
5.3.2 SPRAY GUN CONNECTIONS 43
5.3.3 CUTTER PLOTTER CONNECTIONS 44
5.3.4 STENCIL MOLD 45
5.4 SOFTWARE IMPLEMENTATION 46
5.5 ARDUINO CODING 46
5.5.1 BLUETOOTH BASE CODING AND SPRAY GUN CODING 46
5.5.2 CUTTER PLOTTER AND SPRAY GUN CODING 49
5.6 ANDROID APPLICATION 50
6 TESTING 57
6.1 INTRODUCTION 57
6.2 FUNCTIONAL TESTING 58
6.2.1 TEST RISK/ ISSUES 58
6.2.2 ITEMS DONE AS TESTED 58
6.2.3 TEST APPROACHES 59
6.2.4 TEST REGULATION / MANDATE CRITERIA 59
6.2.5 TEST PASS/ FAIL CRITERIA 59
6.2.6 TEST ENTRY/EXIT CRITERIA 59
6.2.7 TEST DELIVERABLES 60
6.2.8 TEST SUSPENSION / RESUMPTION CRITERIA 60
6.3 PERFORMANCE TESTING 60
6.3.1 LOAD TESTING 60
6.4 SYSTEM TESTING 62
6.4.1 TEST RISK/ISSUES 62
6.4.2 TEST APPROCHES 63
6.4.3 TEST REGULATION / MENDATE CRITERIA 63
6.4.4 DELIVERABLES 63

6.4.5 TEST ENVIRONMENT / TRANNING NEEDS....63
7 RESULTS AND DISCUSSION....64
7.1 INTRODUCTION....64
7.2 RESULTS OF CUTTER PLOTTER....64
7.3 RESULTS OF SPRAY GUN....64
7.4 APPLICATIONS OF CUTTER PLOTTER....65
7.5 APPLICATIONS OF SPRAY GUN....65
7.6 ADVANTAGES AND DISADVANTAGES OF PAINTING ROBOT....65
8 CONCLUSIONS AND FUTURE WORK....66
8.1 CONCLUSIONS....66
8.2 FUTURE WORK....66
9 REFERENCES....67
10 APPENDICES....68
10.1 RENT/BUY ROBOT APP SCREEN CODE....68
10.2 BLUETOOTH CONNECTION DISCOVERY CODE....70
10.3 BLUETOOTH ROBOT BASE CONTROL SCREEN CODE....70