



FINAL YEAR PROJECT REPORT

IMAGE PROCESSING OF SORTING ROBOT

In fulfillment of the requirement
For degree of
BEE (Electronics)

By

| | |
|-----------------------|-------------------------------|
| AFTAB AHMED | 30957 BEE(ELECTRONICS) |
| ATTA-UR-REHMAN | 30971 BEE(ELECTRONICS) |
| NAEEM KHALID | 25423 BEE(ELECTRONICS) |
| HASEEB AHSAN | 30986 BEE(ELECTRONICS) |

SUPERVISED

BY

ENGR. BURHAN AHMED

BAHRIA UNIVERSITY (KARACHI CAMPUS)
2012-2016

ACKNOWLEDGEMENTS

We would like to thank everyone who had contributed to the successful completion of this project. We would like to express our gratitude to our project supervisor, Mr. Burhan Ahmed for his invaluable advice, guidance and his enormous patience throughout the development of the project.

We are also thankful to our **H.O.D. Dr. Haroon Rasheed** for approving our project and his great support and encouragement which lead us to complete our project successfully.

We also express our utmost gratitude to **Engr. Zaryab Qazi** for his helpful knowledge, kindness and his generous attitude. He helped us a lot in shaping our project and guided us in a lot of aspects.

Last but not the least, we would also like to express our gratitude to our beloved parents, teachers and friends who helped us and became a source of encouragement for us.

IMAGE PROCESSING FOR SORTING ROBOT

ABSTRACT

The project aims to create a proto-type robotic pick and place system which includes mechatronics sorting system solution with the application of image processing for pick and place mechanism. It synchronizes the movement of robotic arm to pick the objects moving on a conveyor belt. It aims in classifying the objects which are coming on the conveyor by picking and placing the objects in their respective pre-programmed places. An image processing algorithm that distinguishes the objects with the help of camera from captured image of an object. The captured image of that object placed on the conveyor belt is saved and fed into the computer. Then processing algorithm in PROCESSING IDE software processes the image type and sends respective commands to the Arduino microcontroller which then controls the robotic arm. The Robotic arm picks the sorted objects and places them on their respective pre-programmed places.

Thus a cost effective Mechatronics system becomes convenient using the simplest concepts and efficient results can be achieved and determining real time and highly accurate characteristics of small objects in a fast flowing stream would open new directions for industrial sorting processes.

TABLE OF CONTENTS

| | |
|-------------------------|------|
| DECLARATION | ii |
| APPROVAL FOR SUBMISSION | iii |
| ACKNOWLEDGEMENTS | vi |
| ABSTRACT | vii |
| TABLE OF CONTENTS | viii |
| LIST OF FIGURES | xiii |

CHAPTER

| | | |
|----------|---|----------|
| 1 | INTRODUCTION | 1 |
| | 1.1 Background | |
| | 1.2 Aim and Statement of Problem | 1 |
| | 1.3 Scope of Project | 2 |
| 2 | LITERATURE REVIEW | 3 |
| | 2.1 Robotic Arm Theory | 3 |
| | 2.2 Components of Robotic Arm | 5 |
| | 2.3 Degree of Freedom (DOF) | 6 |
| | 2.4 Law of Robotics | 9 |
| | 2.5 Robot Control Loop | 9 |
| | 2.6 Advantages of Pick and Place Robots | 10 |
| | 2.7 Arduino UNO | 12 |
| | 2.8 Conveyer belt | 13 |
| | 2.9 DC Gear Motor | 14 |
| | 2.10 Servo Motor | 16 |
| | 2.11 Power Supply | 17 |
| | 2.12 Relay | 19 |
| | 2.13 Ultrasonic Sensor | 20 |
| | 2.14 Logitech Webcam | 21 |

| | | |
|----------|---|-----------|
| 3 | ANALYSIS DESIGN AND METHODOLOGY | 22 |
| 3.1 | Defects in current system | 22 |
| 3.2 | Advantages of our proposed system | 22 |
| 3.3 | Image Processing Benefits | 23 |
| 3.4 | Blockdiagram of Proposed system | 24 |
| 3.5 | Robotic arm designing | 25 |
| 3.6 | List of Hardwares used | 26 |
| 3.7 | List of Softwares used | 26 |
| | | |
| 4 | IMPLMENTATION | 27 |
| 4.1 | Manual testing of robotic arm | 27 |
| 4.2 | Sensors and Motors testing | 28 |
| 4.3 | Image capture and Image Processing | 29 |
| 4.4 | Conveyer belt controlling | 32 |
| 4.5 | Serial Interface of Processing with Arduino | 33 |
| 4.6 | Integration of complete project | 33 |
| | | |
| 5 | RESULTS AND DISCUSSIONS | 34 |
| 5.1 | Reults | 34 |
| 5.2 | Discussions | 34 |
| | | |
| 6 | CONCLUSION AND RECOMMENDATIONS | 35 |
| 6.1 | Conclusion | |
| 6.2 | Applications | |
| 6.3 | Future Work and Recommendations | 37 |
| | | |
| | REFERENCES | 38 |
| | | |
| | APPENDICES | 39 |