CONTENTS

ACKNOWLEDGEMENT

ABSTRACT

Chapter 1 : INTRODUCTION

1.1 Introduction

1.2 Robotic arm definition

1.3 Literature Review

1.4 Project Overview

Chapter 2 : HARDWARE DESIGN AND DESCRIPTION

2.1Hardware Requirements

2.2Accelerometer

2.3Servo Motors

2.4ATmega32 Microcontroller

2.4.1 USART Interface

2.4.2 Analog to Digital Converter (ADC)

2.5ATmega640 Microcontroller

2.5.1 Timer

2.5.2 USART Interface

2.616x2 LCD Module

2.7 Hardware Design

Chapter 3 : SOFTWARE DESCRIPTION

3.1Software Requirements

3.2Software for programming and dumping on the microcontrollers

3.3Software for Signal Processing and Actuation of the servo motors

3.4 Software Design

Chapter 4 : IMPLEMENTATION

4.1 Implementation

4.2 Data Acquisition, Processing and Calibration

4.2.1 Data Acquisition

4.2.2 Data Processing

4.2.3 Calibration of the Servo Motors

Chapter 5 : CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

5.2 Future Scope

BIBLIOGRAPHY

LIST OF FIGURES

Fig1. Block Diagram Representation of the Proposed Robotic Arm System

Fig2. Simplified Accelerometer Functional Block Diagram

Fig3. Pin Configuration of ATmega32

Fig4. Pin Configuration of ATmega640

Fig5. LCD PinConfiguration and Connections

Fig6. Circuit diagram for the data acquisition from the sensor via ATmega32

Fig7. Circuit diagram for the control of servo motors via ATmega640

Fig8. Screenshot of AVR Studio 4 running on Windows 7 platform

Fig9. Screenshot of SinaProg 2.0 running on Windows 7 platform

Fig10. Screenshot of MATLAB v7.6 (R2012a) running on Windows 7 platform

Fig11. Block Diagram of the implemented system with signal information

Fig12. (a) Physical Implementation of the system; (b) Robotic Arm Only

Fig13. (a) Implementation of the Shoulder to Elbow Joint; (b) Implementation of the

Elbow to Wrist Join

Fig14. Shoulder Joint Motors (M1 and M2)

Fig15. Elbow Joint Motors (M3, M4 and M5)

Fig16. (a) ATmega32 (b) ATmega640 Development Board

Fig17. (a) Real time plot when accelerometer is kept constant; (b) Real time plot

when accelerometer is in rotation in both anti clockwise and clockwise

direction.

Fig18. Original Input Plot of accelerometer data

Fig19. Smoothened Output Plot of accelerometer data when N = 5

Fig20. Smoothened Output Plot of accelerometer data when N = 10

Fig21. Smoothened Output Plot of accelerometer data when N = 15

LIST OF TABLES

Table1. Table containing the Timer Register Values for the reference positions taken

during calibration.