

# **POSITION BASED FRICTION ESTIMATION FOR PRECISE MOTION CONTROL**

 **University of Moratuwa, Sri Lanka**  
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Department of Electrical Engineering

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Thesis submitted in partial fulfillment of the requirements for the degree Master  
of Science of Engineering

Department of Electrical Engineering

University of Moratuwa

Sri Lanka

July2014

**DECLARATION**

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**ABSTRACT**

Friction is often neglected in DC servomotor applications. It is valid if the servo motor is small and the frictional torque elements are small when compared to the motor torque. Fixed friction and viscous friction are the main constituents of the friction. For precise motor control applications, friction could not be neglected. In many applications, researchers have attempted to estimate an average for a whole rotation. In the first stage of this research work frictional components have been estimated using constant angular velocity motion test and by the use of disturbance observer. Disturbance observer based friction compensator has been modeled and developed model was subjected to stability analysis and further evaluated using simulation results and implemented in hardware setup. Estimated average friction values have been used in modeled disturbance observer based friction compensator and verification of the estimated values was done by practical results.

However even these estimation values are not valid for applications when it is having rotor wide frictional distribution. Friction is depending on the material in contact, surface of the contact plane and the normal contact force. These factors are continuously changing due to the relative motion between rotor and the stator. Frictional values are subjected to change with the orientation of the rotor and the direction of rotation. Magnitude of the frictional values could expect to be repeated for forthcoming rotations also for one direction. This research attempts to estimate the friction around  $360^{\circ}$  degrees of rotation in the second stage. Disturbance Observer is used as the torque measurement tool. Results show the estimated frictional values using the proposed method.

## Table of Contents

|  |      |
|--|------|
| DECLARATION.....   | i    |
| ACKNOWLEDGEMENTS.....  | ii   |
| ABSTRACT.....  | iii  |
| List of figures.....   | vi   |
| List of tables.....  | viii |
| 1 INTRODUCTION.....  | 1    |
| 1.1 Friction.....  | 1    |
| 1.2 Motor Friction.....  | 2    |
| 1.3 Available Methods for Friction Compensation and Drawbacks.....                 | 3    |
| 1.4 Objectives.....  | 3    |
| 1.5 Originality.....   | 4    |
| 1.6 Content of the thesis.....   | 5    |
| 2 MODELING.....  | 7    |
| 2.1 DC motor modeling.....   | 7    |
| 2.2 Disturbance observer.....  | 10   |
| 3 Hardware SETUP.....  | 18   |
| 3.1 Hardware Experimental System.....  | 18   |
| 3.2 Control Board.....   | 19   |
| 3.3 Motor Control Board.....   | 21   |
| 3.4 Current sensor.....  | 25   |
| 3.5 DC Motor.....  | 28   |
| 3.6 Encoder.....   | 30   |
| 3.7 Hardware modification of QEI module.....                                       | 31   |
| 3.8 Coupling Motor and Encoder.....  | 33   |
| 3.9 Power Supply Unit.....   | 34   |
| 3.10 SD Card Module.....   | 35   |
| 4 FRICTION COMPENSATION.....   | 37   |
| 4.1 Estimating average values for friction.....                                    | 37   |
| 4.2 Friction compensation methods.....   | 38   |
| 4.2.1 Using disturbance observer and reaction torque observe (Method A).....       | 38   |
| 4.2.2 Simplified and most effective block for friction compensator (Method B)..... | 40   |
| 4.3 Stability Analysis.....  | 41   |
| 4.4 Simulation Results.....  | 43   |
| 4.5 Practical Results.....   | 46   |
| 5 POSITION BASED FRICTION ESTIMATION.....  | 51   |
| 5.1 Disturbance observer based position controller.....                            | 51   |
| 5.2 Homing the motor control system.....   | 52   |

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|       |   |    |
|-------|---|----|
| 5.3   | Autonomous position based static friction torque estimation .....     | 53 |
| 5.4   | Rotor wide viscous friction estimation .....                          | 56 |
| 5.5   | Results of rotor wide friction variation .....                        | 58 |
| 5.5.1 | Rotor wide static friction variation .....                            | 58 |
| 5.5.2 | Rotor wide viscous friction variation .....                           | 62 |
| 5.5.3 | Overall rotor wide friction variation .....                           | 65 |
| 6     | CONCLUSION.....   | 70 |
|       | REFERENCE LIST .....  | 72 |
|       | APPENDIX A: POSITION BASED STATIC FRICTION ESTIMATION ALGORITHM ..... | 76 |
|       | APPENDIX B: POSITION BASED TOTAL FRICTION ESTIMATION ALGORITHM.....   | 84 |



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**List of figures**

|   |    |
|---|----|
| FIGURE 2-1: ELECTRICAL MODEL OF A DC MOTOR.....   | 7  |
| FIGURE 2-2: DC MOTOR MODEL.....   | 9  |
| FIGURE 2-3: DETERMINATION OF DISTURBANCE TORQUE.....  | 14 |
| FIGURE 2-4: BLOCK DIAGRAM OF THE DISTURBANCE OBSERVER .....   | 15 |
| FIGURE 2-4: ESTIMATION OF DISTURBANCE TORQUE USING DOB .....  | 16 |
| FIGURE 2-4: ESTIMATION OF REACTION TORQUE USING RTOB .....  | 17 |
| FIGURE 3-1: HARDWARE SETUP .....  | 18 |
| FIGURE 3-2: HARDWARE FUNCTIONAL BLOCK DIAGRAM.....  | 19 |
| FIGURE 3-3: MBED PIN CONFIGURATION .....  | 20 |
| FIGURE 3-3: CONTROL BOARD CIRCUIT DIAGRAM .....   | 21 |
| FIGURE 3-5: MOTOR CONTROL BOARD WITH DRV 8432 DRIVER .....  | 22 |
| FIGURE 3-6: DRV 8432 MOTOR DRIVER IC.....   | 22 |
| FIGURE 3-7: DIAGRAM FOR FULL BRIDGE MODE OPERATION OF DRV 8432 DRIVER .....   | 23 |
| FIGURE 3-7: EFFICIENCY VERSUS SWITCHING FREQUENCY CURVE .....   | 24 |
| FIGURE 3-7: OUTPUT DUTY CYCLE VERSUS INPUT DUTY CYCLE CURVE.....  | 24 |
| FIGURE 3-10: METHOD OF CURRENT MEASUREMENT FROM THE CURRENT SENSOR .....  | 25 |
| FIGURE 3-11: ACS712T 5A CURRENT SENSOR .....  | 26 |
| FIGURE 3-12: CURRENT MEASURING CIRCUIT .....  | 26 |
| FIGURE 3-13: OUTPUT RESPONSE OF THE MOTOR CURRENT TRANSDUCER .....  | 27 |
| FIGURE 3-14: OUTPUT RESPONSE OF THE CURRENT MEASURING CIRCUIT .....   | 27 |
| FIGURE 3-15: OUTPUT RESPONSE OF THE CURRENT WITH TUNED PID .....  | 28 |
| FIGURE 3-16: ELECTROCRAFT E240 DC MOTOR .....   | 29 |
| FIGURE 3-17: DIMENSIONS OF THE MOTOR.....   | 30 |
| FIGURE 3-18: H25D BEI ENCODER.....  | 30 |
| FIGURE 3-19: DIMENSIONS OF THE ENCODER.....   | 31 |
| FIGURE 3-20: HARDWARE MODIFICATION CIRCUIT DIAGRAM .....  | 32 |
| FIGURE 3-21: HARDWARE MODIFICATION OF QEI MODULE .....  | 32 |
| FIGURE 3-22: MOTOR: ENCODER COUPLER .....   | 33 |
| FIGURE 3-23: POWER FLOW DIAGRAM.....  | 34 |
| FIGURE 3-24: POWER CIRCUIT CONFIGURATION.....   | 35 |
| FIGURE 3-25: SD CARD MODULE.....  | 36 |
| FIGURE 4-1: RESPONSE OF THE CONSTANT ANGULAR VELOCITY MOTION TEST.....  | 38 |
| FIGURE 4-2: SIMPLIFIED VERSION OF DOB AND RTOB FRICTION COMPENSATOR .....   | 38 |
| FIGURE 4-3: FRICTION COMPENSATOR BLOCK DIAGRAM USING DOB AND RTOB METHODS .....   | 39 |
| FIGURE 4-4: SIMPLIFIED FRICTION COMPENSATOR BLOCK DIAGRAM USING DOB AND RTOB METHODS .....  | 40 |
| FIGURE 4-5: SIMPLIFIED VERSION OF FRICTION COMPENSATOR BLOCK DIAGRAM .....  | 41 |
| FIGURE 4-6: ROOT LOCUS PLOT FOR THE CONTROL BLOCK DIAGRAM .....   | 42 |
| FIGURE 4-7: EXTERNAL TORQUE VARIATION 1(A PULSE).....   | 43 |
| FIGURE 4-8: MOTOR RESPONSE 1(ROTATING SPEED VARIATION) .....  | 44 |
| FIGURE 4-9: MOTOR RESPONSE 1(ROTATING SPEED VARIATION) .....  | 44 |
| FIGURE 4-10: EXTERNAL TORQUE VARIATION 2 (TWO WAY PULSES).....  | 45 |
| FIGURE 4-11: MOTOR RESPONSE 2(ROTATING SPEED VARIATION) .....   | 45 |
| FIGURE 4-12: ROTOR CHARACTERISTICS WITHOUT FRICTION COMPENSATOR- SINGLE EXTERNAL TORQUE PULSE.....  | 46 |
| FIGURE 4-13: MOTOR CHARACTERISTICS WITH METHOD A FRICTION COMPENSATOR-SINGLE EXTERNAL TORQUE PULSE (BOTH F AND B $\theta$ HAVE BEEN COMPENSATED)..... | 47 |



|   |    |
|---|----|
| FIGURE 4-14: MOTOR CHARACTERISTICS WITH FRICTION COMPENSATOR-SINGLE EXTERNAL TORQUE PULSE (ONLY F HAS BEEN COMPENSATED) .....                                   | 47 |
| FIGURE 4-15: MOTOR CHARACTERISTICS WITH FRICTION COMPENSATOR-SINGLE EXTERNAL TORQUE PULSE (FOR DIFFERENT VELOCITY VALUES).....                                  | 48 |
| FIGURE 4-16: ROTOR VELOCITY CHARACTERISTICS WITHOUT FRICTION COMPENSATOR-TWO WAY CONTINUOUS EXTERNAL TORQUE PULSE SERIES.....                                   | 49 |
| FIGURE 4-17: ROTOR VELOCITY CHARACTERISTICS WITH FRICTION COMPENSATOR-TWO WAY CONTINUOUS EXTERNAL TORQUE PULSE SERIES (BOTH F AND B HAVE BEEN COMPENSATED)..... | 50 |
| FIGURE 5-1: DISTURBANCE OBSERVER BASED POSITION CONTROLLER .....  | 51 |
| FIGURE 5-2: RESPONSE OF THE POSITION CONTROLLER FOR COMMANDED POSITION $180^{\circ}$ .....  | 52 |
| FIGURE 5-3: PROCESS FLOW DIAGRAM OF MOVING TO THE INDEX POSITION .....  | 53 |
| FIGURE 5-4: AUTONOMOUS STATIC FRICTION ESTIMATION ALGORITHM .....   | 54 |
| FIGURE 5-5: DISTURBANCE OBSERVER BASED VELOCITY CONTROLLER .....  | 56 |
| FIGURE 5-6: RESPONSE OF THE VELOCITY CONTROLLER FOR COMMANDED VELOCITY 100 RPM AND RAMP TIME 3 SECONDS .....  | 57 |
| FIGURE 5-7: ROTOR WIDE STATIC FRICTION VARIATION FOR CLOCKWISE DIRECTION FOR TWO CONSECUTIVE ROTATIONS .....  | 58 |
| FIGURE 5-8: ROTOR WIDE STATIC FRICTION VARIATION FOR CLOCKWISE ROTATION.....  | 59 |
| FIGURE 5-9: ROTOR WIDE STATIC FRICTION VARIATION FOR ANTICLOCKWISE DIRECTION FOR TWO CONSECUTIVE ROTATIONS .....  | 60 |
| FIGURE 5-10: ROTOR WIDE STATIC FRICTION VARIATION FOR ANTICLOCKWISE .....   | 61 |
| FIGURE 5-11: ROTOR WIDE VISCOUS FRICTION COEFFICIENT VARIATION .....  | 62 |
| FIGURE 5-12: ROTOR WIDE VISCOUS FRICTION COEFFICIENT VARIATION (FILTERED) .....   | 63 |
| FIGURE 5-13: ROTOR WIDE TOTAL VISCOUS FRICTION VARIATION .....  | 63 |
| FIGURE 5-14: ROTOR WIDE TOTAL FRICTION VARIATION.....   | 66 |



**List of tables**

TABLE 4-1: PARAMETERS OF THE USED DC MOTOR.....42



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