
**اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ (1)**

**خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ (2)**

**اقْرَأْ وَرَبُّكَ الْأَكْرَمُ (3) الَّذِي**

**عَلَّمَ بِالْقَلَمِ (4) عَلَّمَ الْإِنْسَانَ**

**مَا لَمْ يَعْلَمْ (5)**

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**(5 - 1) □□□□□□□ :□□□□□□ □□□□□**

# Dedication

Dedicated to
My Wife and My Daughter

# Acknowledgement

I would like to thank all those who supported me, my mother, my father, my brothers, and my sisters. Special thanks are due to my Supervisor/ Prof. Saad Daoud Sulaiman El-Shamma, for his supporting me. I greatly express my thanks to all persons whom supported me in .completing this research

# ABSTRACT

The main objective of this thesis is to simulate and implement two dimensional )2-D) tracking systems .using two DC motion control system

In this thesis an introduction has been given to the importance of 2-D tracking systems and its operation. The system component discussed briefly based on motion control system which is the core of the system. It is specified to use DC motor as actuator. DC motor has been modeled by writing differential equations of its circuit, after that the component of motion control system added one by one until it completed. The motion control system simulated and analyzed using .MATLAB/ SIMULINK

In this thesis the Proportional–Derivative (PD) controller preferred because there was integral component in the forward bath of the system and it gave acceptable .Simulation results

The analysis results have been compared with the system .specification using MATLAB/SIMULINK software

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الهدف الرئيسي من هذه الدراسة هو تصميم نظام تتبع ثنائي الأبعاد بإستخدام نظام للتحكم في الحركة يعمل بمحرك التيار المستمر.

في هذه الدراسة أوضحت المقدمة أهمية نظام التتبع ثنائي الأبعاد وطريقة عملة.

تم شرح مكونات النظام بإختصار إعتماداً على نظام التحكم في الحركة والذي يمثل قلب نظام التتبع.

تم إيجاد المخطط الكتلي لمحرك التيار المستمر وذلك من المعادلات التفاضلية لدائرة المحرك, بعد ذلك تم إضافة مكونات نظام التحكم في الحركة إلى أن إكتمل النظام.

تم محاكاة وتحليل النظام بإستخدام برنامج MATLAB/SIMULINK.

في هذه الدراسة تم تفضيل إستخدام المتحكم التناسبي-التفاضلي على غيره لأنه يوجد مكون تكاملي في المسار الأمامي للنظام.

نتائج التحليل تمت مقارنتها مع مواصفات النظام بإستخدام برنامج MATLAB/SIMULINK ثم مناقشتها وعرضها.

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| Two dimension | D-2 |
| Analog-to-digital converter | ADC |
| Active disturbance-rejection controller | ADRC |
| Brushless direct current motor | BLDC |
| Digital-to-analog converter | DAC |
| Degree of freedom | DOF |
| Digital signal processor | DSP |
| Extended state observer | ESO |
| Light emitting diode | LED |
| A linear variable differential transformer | LVDT |
| Microelectronic mechanical system | MEMS |
| Numerical control | NC |
| Personal computer | PC |
| Proportional- Derivative | PD |
| Proportional integral derivative controller | PID |
| Programmable logic controller | PLC |
| Permanent magnet | PM |
| Permanent magnet direct current | PMDC |
| Process variable | PV |
| Pulse-width modulation | PWM |
| Silicon-controlled rectifiers | SCRs |
| Set point | SP |
| Variable reluctance | VR |

| LIST OF SYMBOLS | |
|---|---|
| Rotor angular velocity | $\omega_m$ |
| Load angular velocity | |
| rotor displacement | $\theta_m$ |
| Load angular acceleration | |
| back-emf constant | |
| back-emf | |
| Proportional gain | $K_P$ |
| Integration gain | $K_I$ |
| Derivative gain | $K_D$ |

| | |
|---|---|
| Voltage across the coil of the armature | $V_a$ |
| Back emf electrical motion force | $E_b$ |
| Armature current | $i_a$ |
| Armature resistant | $R_a$ |
| Armature inductance | $L_a$ |
| Torque constant | $K_t$ |
| Load torque | $T_L$ |
| Motor torque | $T_M$ |
| moment of inertia of the rotor | J |
| damping (friction) of the mechanical system | B |
| System displacement | θ |
| Efficiency | η |
| magnetic flux in the air gap | Φ |
| Reduction ratio | N |
| Rise time | $t_r$ |
| Settling time | $t_S$ |
| Maximum Overshoot | $M_P$ |
| Delay time | $t_d$ |
| steady-state error | $e_{ss}$ |