**الآيـــة :**

اللَّهُ الَّذِي خَلَقَ السَّمَوَاتِ وَالْأَرْضَ وَمَا بَيْنَهُمَا فِي سِتَّةِ أَيَّامٍ ثُمَّ اسْتَوَى عَلَى الْعَرْشِ مَا لَكُمْ مِنْ دُونِهِ مِنْ وَلِيٍّ وَلَا شَفِيعٍ أَفَلَا تَتَذَكَّرُونَ (4) يُدَبِّرُ الْأَمْرَ مِنَ السَّمَاءِ إِلَى الْأَرْضِ ثُمَّ يَعْرُجُ إِلَيْهِ فِي يَوْمٍ كَانَ مِقْدَارُهُ أَلْفَ سَنَةٍ مِمَّا تَعُدُّونَ (5) ذَلِكَ عَالِمُ الْغَيْبِ وَالشَّهَادَةِ الْعَزِيزُ الرَّحِيمُ (6) الَّذِي أَحْسَنَ كُلَّ شَيْءٍ خَلَقَهُ وَبَدَأَ خَلْقَ الْإِنْسَانِ مِنْ طِينٍ (7) ثُمَّ جَعَلَ نَسْلَهُ مِنْ سُلَالَةٍ مِنْ مَاءٍ مَهِينٍ (8) ثُمَّ سَوَّاهُ وَنَفَخَ فِيهِ مِنْ رُوحِهِ وَجَعَلَ لَكُمُ السَّمْعَ وَالْأَبْصَارَ وَالْأَفْئِدَةَ قَلِيلًا مَا تَشْكُرُونَ (9)

صدق الله العظيم

سورة السجدة الآيات ( 4-9)

**Dedication:**

To our families

To our parents

To our brothers, sisters, friends and colleagues

## Acknowledgement:

Firstly we thank Allah, the lord of the worlds, for His mercy and limitless help and guidance. May peace and blessings be upon Mohammed the last of the messengers.

Secondly, we want to express our appreciations to our supervisor, Giddani Osman Adlan for giving us support not only in technical problems solving, but also moral support from the beginning of the project until the accomplishment of the project.

Finally, we would like to thank all colleagues for their help through the tough aspects of our project. We feel so grateful to have friends like them because they willing to help us directly or non-directly. Their enthusiasms have driven us to accomplish this project so that we all can graduate on time together.

## Abstract:

In present time, the need of energy increases each and every day. Anew way to cover this increasing by using solar energy. The solar energy convert solar irradiation to power that can be used in common electric appliances. However, the angle of the sun is proportional to the energy converted. If the sun is 90° vertical to the solar panel, the energy received is maximum compare to other angles. In this case, stepper motors used to track the solar during the movement of the sun from morning till night. The ASTS (Automated Solar Tracking System) is developed by moving the solar panel during anytime of the day that the sun is available and the motor will move the panel to a 90° vertical angle directly to the sun. The system is controlled by Arduino Uno controller which will process data from the sensor and convert it to output for the motor movement. As the result, a prototype of Automated Solar Tracking System is operated and able to achieve the objective of this project.

المستخلص :

في الوقت الحاضر يزداد الاحتياج للطاقة بشكل يومي ولتغطية الطلب المتزايد تم اللجوء الي استخدام الطاقات المتجددة ومنها الطاقة الشمسية.ويتم استخدامها عن طريق تحويل اشعة الشمس الى طاقة يمكن استخدامها في التطبيقات الكهربائية المختلفة.ولكن هذه الطاقة تتناسب مع زاوية سقوط اشعة الشمس وتعطي اقصى طاقة عند تعامد الاشعة مع اللوح الشمسي وللمحافظة على هذا الوضع يتم استخدام محركات الخطوة لتحريك اللوح تبعاً لحركة الشمس.

وتم استخدام نظام(نظام تتبع الشمس التلقائي) ASTS(Automated Solar Tracking System) لتحريك اللوح الشمسي تبعاً لموقع الشمس خلال اليوم .وهذا النظام يتم التحكم فيه عن طريق استخدام متحكم اوردوينو اونو (Arduino UNO)الذي يستقبل البيانات من المحسسات ويعالجها ويحولها الى خرج للتحكم في حركة المحرك للموضع المطلوب وكنتيجة لذلك تم تصميم نموذج تجريبي لنظام التحكم التلقائي لتحقيق هدف المشروع .

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| | |
|---|---|
| ASTS | Automated Solar Tracking System |
| LDR | Light Depended Resistor |
| W | Watt |
| PPS | Pulse Per Second |
| IC | Integrated Circuit |
| VR | Variable Reluctance |
| PM | Permanent Magnet |
| CW | Clock Wise |
| CCW | Counter Clock Wise |
| DC | Direct Current |
| AC | Alternative Current |
| GPS | Global Positioning System |
| PV | Photo Voltaic |
| TTL | Transistor-Transistor Logic |
| PWM | Pulse Width Modulation |
| USB | Universal Serial Bus |
| ICSP | In-Circuit Serial Programming |
| SRAM | Static random-access memory |
| EEPROM | Electrical Erasable Programmable Read Only Memory |
| PID | Proportional-Integral-Derivative controller |

# LIST OF SYMBOLES

| | |
|---|---|
| μ | micro |
| β | Step angle |
| Nr | Number of rotor teeth |
| Ns | Number of stator teeth |
| Ω | ohm |