

Autonomous Mecanum Wheeled Car Equipped With an Aircraft Landing Mechanism

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Abstract

The main objective of this project is to develop an autonomous wheeled vehicle, which is flexible in maneuvering for landing an UAV (Unmanned Aerial vehicle). Therefore, a mecanum wheeled car is used with special designed platform for aiding the UAV to land on the moving car. The car is mechanically developed by the Mechatronics department and the electric department will design and implement its Autonomous control system, which is divided into several subsystems. The mechanical engineering department will provide addition platform to the car which provides 2D balancing system to aid the UAV for landing.

Procedures

- *Motor modeling and control*
- *Wheeled mobile robots modeling and control*
- *Real-time implementation using C programming language on "QNX" platform.*
- *Experimental implementation of a prototype hardware system*
- *Conclusion and discussion*

Keywords: Autonomous wheeled vehicle, UAV, landing

Axial Field Switched Reluctance Drive

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Abstract

The aim for this project is to implement axial field switched reluctance drive (AFSRD).

Procedures

- *Review of special electrical machines.*
- *Review of power electronic DC choppers.*
- *Simulation of axial field switched reluctance drive (AFSRD).*
- *Building of (AFSRD) circuit.*
- *Selection of suitable control system applied for (AFSRD).*
- *Building interface circuit between controller and power electronic driver.*
- *Testing the (AFSRD) and taking the necessary measurements.*

Keywords: Axial field switched reluctance drive, control system



Cathodic Protection System of Oil Pipelines

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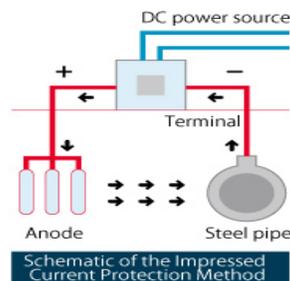
Abstract

A natural phenomenon that has disturbed engineers and scientist a long ago by its catastrophic consequences and financial losses is corrosion. Corrosion not only adds massive cost but also threatens the safety of structures and personnel. Therefore researchers concerned to analyze the corrosion chemically and electrically to reach the best method to control it. Since corrosion is an electro-chemical process, it could be controlled via chemical and electrical methods. Cathodic Protection (CP) is the most sufficient and effective electrical method. It depends on making the metal to be protected as a cathode in the corrosion cell by providing the protection system with a source of electrons and a donor anode. Cathodic protection is mainly used in petroleum pipelines and tanks besides coating and a lot of other application .one of the leading petroleum organization in Egypt that fights corrosion is SUMED since it has a petroleum pipelines of 320 km long in Egypt passing through eastern desert, western desert, rural, and urban areas. It ends at Sidikrir where storage tanks are planted. Hence, the electrical source which is required for the protection system may not be available in some areas. In this project, a CP system is presented to protect the pipelines from corrosion using hybrid solar-wind renewable source.

Procedures

1. Control the corrosion of pipelines used for petroleum substances transportation via a CP method.
2. Using hybrid solar-wind power source as a clean renewable source for the impressed current CP technique.
3. Performance investigation of the proposed system using a MATLAB/Simulink model.
4. Performance verification using a laboratory prototype.

Keywords: Corrosion, Cathodic protection, and hybrid renewable energy source.



Energy Efficient through Smart Building

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Abstract

Climate change and growing shortages of resources are the big challenges of recent time. In addition, many countries around the world are dependent on imported energy. Efficient and sustainable energy usage is therefore an urgent necessity. Heating, cooling and lighting in residential and office buildings make up approximately 40 % of the energy consumed in the industrial nations – a share that leaves a lot of scope for efficient optimization.

Building system engineering supported by intelligent and networked room and building controllers (lighting, sun protection, heating, ventilation and air conditioning, together with energy harvesting and utilization of sustainable energy resources contribute significantly to conservative and requirement-based energy use.

Optimization of energy efficiency in buildings means:-

- Only use energy when it is really required*
- Only use the amount of energy actually required*
- Apply the energy that is used with the highest possible efficiency*

Procedures

- *Review of building automation and management system technologies*
- *Study of different system within recent modern and smart buildings*
- *Energy harvesting and sustainable resources for buildings*
- *Experimental implementation of a prototype hardware system*

Keywords: Energy efficiency, Smart buildings, Automation.



INNOVATIVE SOLAR TREE

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Abstract

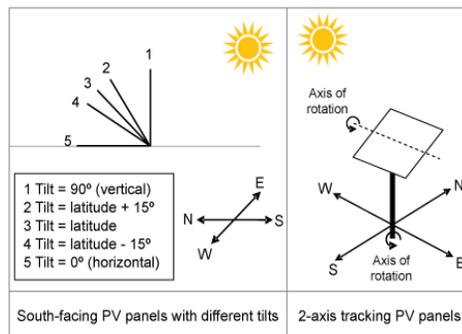
The Solar Tree is a combination of artistic and technological effort which exists as a form of solar artwork. Within the past several years, artistically inclined inventors have strived to envision new methods to gain utility from solar cell technology. This relatively new concept was conceived in an attempt to merge new technology, relating to the absorption and use of solar power, and artistic aesthetic. The inspiration for their organic design has both visually pleasing and pragmatic purposes. Though the instrumental value of the Solar Tree may differ depending on its interpretation, the general form of an organic, tree-like figure utilizing solar panels remains consistent.

The project aims at designing solar tree PV system featuring simultaneous maximum power tracking (MPPT) techniques

Procedures

1. Electronic MPPT, incremental conductance (IncCond) method.
2. Mechanical MPPT, position control of each PV array angle with respect to irradiance
3. Build an industrial system for outdoor usage

Keywords: Solar tree, electronic MPPT, and mechanical MPPT.



Intelligent lighting system

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Abstract

The lighting industry is going through a radical transformation, driven by rapid progress in solid-state lighting and semiconductor technologies as well as by changing societal needs such as sustainability, improved energy efficiency and CO₂ reduction. The main goal of the project is to exploit the full potential of solid-state lighting through breakthrough innovations in non-conventional, energy efficient and intelligent lighting systems, beyond retrofit applications.

The aim for this project is to design a smart lighting system which targets the energy saving and autonomous operation on economical affordable for residential and commercial.

Procedures

- Build an energy saving smart lighting system with integrated sensors and controllers.
- Design a smart lighting system with modular approach design, which makes the system scalability and expandability.
- Design a smart lighting system which compatibility and scalability with other commercial product and automation system, which might include more than lighting systems.

Keywords: Energy saving smart lighting system, sensors, controllers



Intelligent Motor Control Center for Efficient Operation

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Abstract

A Motor Control Centre (MCC) is a grouping of various motor control & distribution devices in one common enclosure, fed from a common bus system. Recent MCC provides many functions for motor protection, control, energy efficient operation. Using mobile facilities could support the workers communications and interactions in different situations. Also energy management with optimal operation can be fulfilled.

Procedures

- *Motor control center within industrial applications*
- *Main functions and components of MCC*
- *Intelligent and automated devices for MCC*
- *Simulation of MCC*
- *Design of power and control circuits with possible mobile facilities is studied*
- *Experimental implementation of a prototype hardware system*
- *Conclusion and discussion*

Keywords: MCC, and Intelligent and automated devices.



Photovoltaic/Fuel-cell Hybrid System

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Abstract

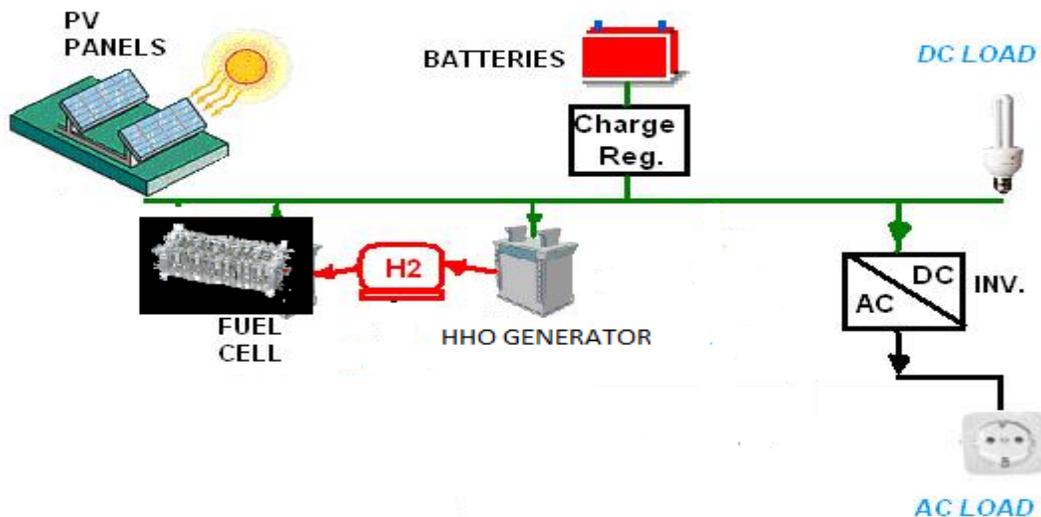
As it is worldwide recorded, the fossil fuel prices are increasing rapidly. Renewable energy utilization especially for the domestic and commercial level is gaining interest in the past decade. For best resource utilization, hybrid renewable energy sources are a promising research aspect.

This project aims at designing a hybrid photovoltaic/fuel cell based generation station for residential applications that supplies DC and AC loads.

Procedures

1. PV MPPT design and implementation.
2. Fuel cell HHO generation and stack operation.
3. DC/DC CONVERTER and high step-up inverter implementation.

Keywords: PV, fuel cell, MPPT, and residential load



Water Pumping for Irrigation of Green Areas and Lighting of Pathways of AAST Using Green Electricity from Photovoltaic Technology

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Abstract

A key advantage of using solar energy for water pumping is that it is a day time load that require no expensive electricity storage, additionally, there is more solar energy available during the summer period, when irrigation requirements are the highest due to increased evaporation and evapo-transpiration. Thousands of water pumping systems have been installed worldwide and have been of great benefit to remote users beyond the conventional power lines. One major disadvantage of this system type, however, is the fact that the pumping system cannot operate at times when solar radiation falls below certain value, which means lost energy and consequently water. A project to supply water and electric energy for lighting the AAST playground using photovoltaic (PV) technology is proposed. The building unit of this proposal is a 3.00 kW of PV modules to drive a 1 KW water pumping system capable of providing all the needed water for irrigation of the field from a water well. The excess power would be stored in a two KWh battery bank for lighting the pathway around the field. It should be noted that a prototype of the controller, which is a crucial component in this project would be developed and build by the group engaged in the project. The work plan of this project includes development energy management controller prototype.

When exposed to sunshine, the PV system generates direct current that will be collected by junction boxes. The power conditioners will convert the DC power into AC power in the specified voltage, frequency and phases to supply the power to the SP. Remote control operation of both the water pumping and the lighting system could be used for supervising and possible evaluation of the operating condition.

The PV generator characteristics and the BB charging condition will be monitored continuously and the loads (SP an LS) operation will be automatically started when the generating characteristics reach a pre-determined value. The system will automatically be stopped when the generating characteristics or the BB charging condition drop below a pre-determined value

Procedures

- 1. Design and Sizing of PV, SP, and LS systems and construction of PV mounting followed by testing.*
- 2. Installation of PV modules and LS fixtures on the mounting structure*
- 3. Installation of the SP and water piping for irrigation system*
- 4. Measurements and characterization of PV systems and components, and performance evaluation*
- 5. Design and fabrication of the variable speed / frequency motor pump controller*
- 6. Interfacing the MC with the PV system and development of the energy management program*
- 7. Installation of BB and light sensors and switches of the LS system.*

Keywords: Renewable Energy, Solar power, Photovoltaic Arrays, Automatic Control, Water Pumping