

A Study on Solar Power Systems in Robotics

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Abstract

Automation and artificial intelligence have improved product accuracy, quality, and processing time during the previous couple of decades due to huge advancements in robotics technology. The shortage of energy supplies for global demand is currently the most critical aspect in the modern world. Electrification is a clear propensity to improve the performance and sustainability of the transportation system due to environmental concerns and regulatory pressures. Robots provide significant benefits in a wide range of applications. The introduction of robots into industrial environments and other applications leads in a significant increase in efficiency and productivity. Solar photovoltaic technology is a key research topic for converting solar energy into usable electricity. Solar robots use electrical energy stored in batteries to power their mechanical, electrical, and electronic equipment, which execute a variety of activities for both industrial and commercial purposes. Robots can function in dangerous environments for extended periods without human assistance and with excellent precision.

Keywords: Renewable sources • Solar power • Solar energy application • Solar robots model

Introduction

The world is currently facing an energy shortage since fossil fuels and uranium are the only conventional energy resources accessible, whereas uranium is mostly employed in nuclear power generation and hence requires special attention. As a result, the primary sources of energy accessible are fossil fuels such as petroleum, coal, and natural gas. Combustion byproducts of fossil fuels contain a variety of hazardous gases such as carbon dioxide and carbon monoxide. These gaseous byproducts cause ozone layer degradation in the earth's atmosphere and contribute to global warming [1]. Internal combustion engine technology is the most frequently utilized technology in the present transportation system, and as the world population and energy consumption grows, vehicle emissions dominate environmental challenges such as air, land, and water pollution [2]. Renewable energy resources such as biomass production, wind kinetic energy, geothermal energy, and solar cell technology are gaining popularity owing to their non-polluting nature, eco-friendliness, and environmental safety merits [3].

To combat the sophistication connected with engine and carbon emission challenges, the automobile industry is witnessing a revolution in building new electrical platforms for automobiles. Electronic drives not only solve the pollution problem, but the addition of more electric controls imparts accuracy and precision in power and vehicle management. By combining an electric drive system, such as

an electric motor, the car industry produced hybrid electric vehicles to reduce the need for combustion engines. This technique has a good impact on the environment and produces no pollutants [4]. AGVs (Autonomous Guided Vehicles) are robots that utilize an intelligent system to transport materials and items from one pick-up point to another drop-off point in warehouses, manufacturing systems, and hospitals, among other places. In reality, AGVs are cutting-edge electric vehicles that emit zero emissions at the end of their journey (Figure 1) [5].



Figure 1. A Robotic system made of solar panels.

Solar energy may be stored in batteries in solar robots (Figure 1), and electric motors are the best way to transform this stored energy into a meaningful technical effort to propel the vehicle. The most

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significant innovation in robotics and automation is robots that use solar energy photovoltaic innovation. These robots are self-generating (i.e., they generate their energy) and save a lot of energy. However, using solar energy in robots has its own set of drawbacks. Solar power is erratic, necessitating the use of big panels to generate little amounts of energy. The applicability of solar robotics systems is discussed in this article.

Literature Review

Review of solar robots: The following are summaries of several robots that used solar electricity to do multiple roles:

- P.E. Glaser represents a Satellite Solar Power Station (SSPS) design based on photovoltaic conversion technology to address future energy requirements in space [6].
- M. Stella, et al. reported the design and performance study of Mars exploration rovers with solar arrays to collect excessive dust during the mission [7].
- S. Lukic, et al. introduced an autonomous solar auto-rickshaw with an electrical actuator to push the vehicle and batteries charged by renewable solar energy that works in an eco-friendly manner to replace traditional auto rickshaws powered by LPG and CNG [8].
- T. Deor and Y.S. Angal reported the design and implementation of an improved Li-Po battery charging system for a VANTER robotic exploration vehicle using tracked solar panels [9].
- F.G. Cordova and A.G. Gonzalez suggested an intelligent guidance system for an autonomous beneath water vehicle driven by solar sustainable power to monitor physicochemical parameters of water quality inspection over extended distances on specified courses [10].
- N. Riaz, et al. described the design and manufacture of an autonomous personal mobility vehicle (wheelchair) with retractable solar panels to assist handicapped people [11].

Discussion

In today's world, robots are intelligent devices that use various combinations of technology to reduce human effort and offer optimal output for the work at hand. Autonomous Guided Vehicles (AGVs) are mobile robots that automatically deliver needed equipment or parts to improve logistic system automation.

Conclusion

To address environmental challenges such as global warming and climate change, electric energy-powered cars are gaining traction in substitute of traditional fuel-based transportation systems. Solar energy, which is plentiful in the environment, is amongst the most reliable alternative energy sources. Combining these two principles,

several solar-powered robots are examined and appraised in this work.

Conflict of Interest

The authors have declared no conflict of interest.

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