Design of an Automatic Solar Tracking System used for Fish Farming and Irrigation

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Abstract- This paper presents the hardware design and implementation of a system that ensures a perpendicular profile of the solar panel with the sun in order to extract maximum energy falling on it renewable energy is rapidly gaining importance as an energy resource as fossil fuel prices fluctuate. The unique feature of the proposed system is that instead of taking the earth as its reference, it takes the sun as a guiding source. Its active sensor constantly monitors the sunlight and rotates the panel towards the direction where the intensity of sunlight is maximum. The light dependent resistor's do the job of sensing the change in the position of the sun which is dealt by the respective change in the solar panel's position by switching on and off the geared motor the control circuit does the job of fetching the input from the sensor and gives command to the motor to run in order to tackle the change in the position of the sun. With the implementation the proposed system the additional energy generated is around 25% to 30% with very less consumption by the system itself. In this paper, an improvement in the hardware design of the existing solar energy collector system has been implemented in order to provide higher efficiency at lower cost.

Keywords:- Design, automatic solar tracking system, fish farming, irrigation.

I. INTRODUCTION

The generation of power from the reduction of fossil fuel is the biggest challenge for the next future centuries. Energy crisis is the most important issue in today's world. Conventional energy resources is not only limited, but also the prime culprit for the environmental pollution. Renewable energy sources are getting priorities in the whole world to lessen the dependency on conventional resources.

In remote areas, the sun is the cheapest source of electricity. Because instead of hydraulic generators, it uses sun to produce electricity. In order to avoid energy crisis and to obtain energy from non – conventional resources the most popular pollution free energy source is solar energy. Solar energy is rapidly gaining the focus as an important means of expanding renewable energy uses. Solar cells those converts sun's energy into electrical energy are costly

and inefficient. The idea of converting solar energy into electrical energy using photovoltaic panels holds its place in the front row compared to other renewable sources. But the continuous in the relative angle of the sun with reference to the earth reduces the watts delivered by the panel. In order to overcome this disadvantage, the best alternative to efficiency of photovoltaic panel, automatic solar tracking system evolved.

II. AUTOMATIC SOLAR TRACKER

Renewable energy sources are becoming now very popular. Maximizing output from solar system increases efficiency, this could be achieved by automatic solar tracker. Maintaining vertical direction between light and panel maximizes efficiency. It is worth for the cost of installation and operation is obtained with high reliability. The drive will have to position a photo voltaic panel to the best angle of

exposure to sunlight for the collection of solar energy.

Fig 1. Automatic Solar Tracker.

III. FISH FARMING AND IRRIGATION

The collection of solar energy by the solar automatic solar tracker as much higher efficiency as compared to that of fixed solar tracker. The power obtained by the solar tracker is employed here for fish farming and irrigation. The mechanism of this is totally controlled by ATmega8535 microcontroller.
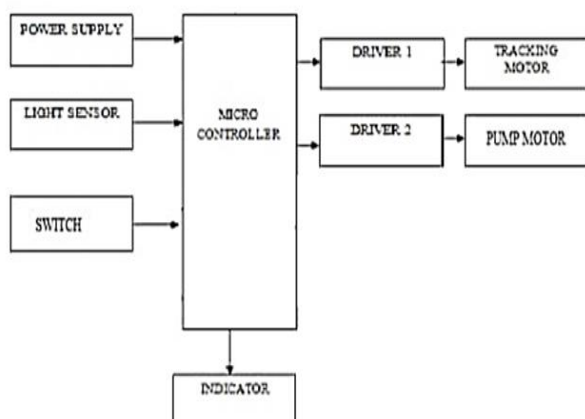

Fig 2. Block diagram.

The aurdino uno, servo motor and light sensors are employed for detection of direction of sunlight. If the sunlight is detected the signal from the sensor is given to the controller which controls the servo

motor which gives the rotating movement to the solar panel. After obtaining maximum power through the automatic solar tracker it gets stored into the battery for further use. The stored energy here, is employed by the dc motor which pumps the water to the fish farming and irrigation purposes.

IV. AT MEGA 8535

The features are AT Mega 8535 is are,

- High-performance, Low-power AVR 8-bit Microcontroller
- Advanced RISC Architecture
- 130 Powerful Instructions-Most Single Clock Cycle Execution
- 32*8 General Purpose Working Registers
- Fully Static Operation
- Up to 16 MIPS Throughout at 16 MHZ
- On-chip 2-cycle Multiplier
- Non-Volatile Program and Data Memories
- 8K Bytes of In –System Self-Programmable Flash
- Endurance :10,000 Write/Erase Cycles
- Optional Boot Code Section With Independent Lock Bits

Fig 3. AT Mega 8535 configuration.

The AT Mega 8535 provides the following features: 8K bytes of in system programmable flash with read/write capabilities, 512 bytes EEPROM, 512 bytes SRAM, 32 general purpose INPUT/OUTPUT lines, 32 general purpose working registers, 3 flexible Timer/Counter With compare modes, internal and external interrupts a serial programmable USART, a byte oriented Two Wire Serial Interface an 8-channel, 10-byte ADC with optional differential input stage

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with programmable gain in TQFP package, programmable Watechdog Timer with Internal Oscillator, SPI serial port, and six software selectable power saving modes.

The ideal mode stops the CPU while allowing the SRAM, Timer/Counter SPI port and interrupt system to continue functioning. The ATmega8535 AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/ simulators, in-Circuit Emulators and evaluation kits.

V. CONCLUSION

Solar tracking system today offer an innovative method to track the solar isolation and provide economic compatibility of the generation of electric power where grid connections are little complex.

The proposed system is mainly used to improve to the efficiency of the solar panel. The mentioned tracking system for irrigation is most suitable for today's need. In this paper an automatic solar tracker was implemented. Which generates approximately 25 to 30% more power than compared to the conventional fixed type panel. High efficiency can be obtained, so that the power production was rapid.

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