Agriculture Pump based on Smart Energy Harvesting on Solar System

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Abstract—The Solar panel consists of a number of solar cells and those cells transforms solar energy into electrical energy. Higher efficiency of energy depends upon the position of the solar panel with respect to sun. In this project, a solar pump and solar panel Implementation which tracks the Sun's movement throughout the day is proposed. The inexpensive design of solar panels is focused on the usage of a basic circuit compatible Raspberry pi microcontroller, dc motor, battery, and solar panel. The key goal is to provide energy to farmers according to their needs. Solar energy-based farming encourages farmers to efficiently use solar energy on farm and sell the energy excess. In our project, we are saving solar energy using solar panel and pass to the main storage server and then passing it to other farmers as per their requirement.

1. Introduction
The harvesting of solar resources is capable of producing even a negligible sum of electricity, so it also provides just a limited amount of energy storage. Therefore, new technology is needed to manage the battery-related energy. It is particularly important to manage the transmission interval, because smart energy harvesting is the level of energy consumption during solar pump use in solar system based on agriculture pump. This received energy from the Sun is enormous in quantity and inexhaustible. The mother earth receives approximately 1.8 * 1011 MW of power. This is a requirement many thousands of times of our present day. Proper harnessing of this energy is very important [1-3], and the day's need. The sun has the ability [4-8] to give continuous energy to current and potential generations. That makes it one of the most interesting, unconventional energy sources. The other two considerations in solar energy flavors are: First, unlike fossil fuels, it is environmentally very friendly energy source [8] and does not produce some sort of emissions. Second, it's free; available in abundance and huge in quantity [1-5] in nearly every part of the world where people live.

2. Problem Statement
The harvesting of solar energy is capable of harvesting only a trivial amount of energy, but only a small amount of energy storage is currently available. Therefore new technology is needed to manage the battery-related energy. The main aim is to encourage farmers to efficiently use solar energy on-farm and sell the energy excess or unrequired energy to another farmer.

3. System Architecture

The system architecture consists of

3.1. Hardware Requirements
1. Raspberry Pi
2. Solar panel
3. Relay
4. Motor pump
5. Charging unit
6. Battery

3.2. Software Requirements
1. Operating System: Windows XP, Windows 7 and Newer.
2. Internet Browser: Google Chrome, Mozilla.
3. Back End: SQL
4. Database: - MySQL Server 2008

![System Architecture Diagram]

**Figure 1.** System Architecture

System Architecture diagram is self-explanatory and shows that Microcontroller Raspberry Pi is connected to a power supply and a server which is used for storing all details of farmers’ buying and selling of energy. Raspberry Pi is also connected with relay which passes current between both batteries. The batteries are charged by charging circuit connected to solar panel.

4. Hardware Used
4.1. Raspberry pi
An SD card acts as the hard drive for the Raspberry Pi when it is inserted into the slot present on the board. This is operated by USB, so you can connect the display output up to a conventional RCA TV box, a more modern computer, or even a PC utilizing the HDMI connector. That gives Raspberry pi all of a normal computer's basic capabilities. Raspberry pi's power usage is incredibly small, up to 3 watts. We could run over 30 Raspberry Pi's in place of a standard light bulb with this amount of power consumption[10].

![Raspberry Pi](image)

**Figure 2.** Raspberry pi

4.2. Solar panel:
Solar panel is the device which has the ability to covert solar energy into electrical energy, it absorbs the solar energy from sun rays for conversion of energy[11]. A solar panel is made up of silicon and has numerous solar cells or photovoltaic cells which are in a grid like pattern on the surface of solar panel. These cells are used to absorb solar energy from the sun and then directly converts solar energy into electrical energy by an effect which is called as photovoltaic effect. Figure 3 showing a 100w solar panel.

![Solar Panel](image)

**Figure 3.** Solar panel

5. Advantages
1. Saves money on energy bills.
2. Usage of Renewable energy source.
3. Low maintenance cost.
4. Pollution free.
5. Faster actions.

5.1. Limitations
1. Depends on weather, like in rainy season the amount of solar energy production is less.
2. Requires large amount of memory space.

6. Conclusion
Here, smart energy harvesting system is designed by using various hardware like raspberry pi, solar panel, relay, charging circuit, batteries and software like SQL, browser and operating system. It is observed that power extracted from the solar panel depends on irradiance and on the temperature change. Since, solar energy is used, this system is environment friendly.

7. Reference
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