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A PV Powered Solar Water Pumping System Using Microcontroller

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Abstract: ***The efficiency of the irrigation is predicated on the system uses, there are several different forms of irrigation system everywhere the planet however manual irrigations mistreatment motor pump are encountering several issues. Water resource distribution may be an important challenge to enhance crop productions. Tiny scale farmers are in want of an affordable and reliable system to irrigate crops and increase production. Presents PV battery-powered solar water pumping system for irrigation in developing countries. To design a water pumping system for irrigation that uses solar power for its operation. To style a pumping system that minimizes human interventions. To style a facility system that produces irrigation a lot of economical, since it's planning to be operated by mobile phones. Solar battery-powered irrigation system is acceptable different for farmers in gift state of energy disaster automatic system. Planned wet detector primarily based star battery-powered system offers required waterto crop, water is used in good manner, through star panels, and electrical power downside isn't any a lot of.***
Keywords: Automated irrigation's mobile, humidity sensor, Solar Panel

I. INTRODUCTION

In India, a number of the homes use overhead tanks while not controller that causes overflow of water leading to wastage of water furthermore as electricity. A star water pumping system is that the ideal resolution for fulfilling the wants in natural resources technology. With the employment of microcontroller, we have a tendency to management the operation of the solar energy and pump. The quantity and also the rate at that the water is tense by a star water pumping system depends on radiation period in day, the pumping capability of the pump and additionally height or distance .the rate of the water tense is decided by the intensity of the solar power and also the size of the electrical phenomenon array that is employed to convert the solar power into electricity. Electrical phenomenon water pumping systems meets square measure straightforward, reliable, price competitive, and low maintenance [6]. The water battery-powered through pump is used for all family activities. This saves longer and permits the folks to target productive activities. Electrical phenomenon water pumping system may be a fashionable, well-designed, and easy to take care of. This pv powered star water pumping system for irrigation in developing countries. Several people square measure exploitation non renewable energy sources in high amount of their needs. Some minerals square measure exhausting with the high usage, so it's obvious to dependon the renewable sources like star & wind etc. Physical phenomenon (pv) water pumping system has been turning into additional and additional important in remote, isolated, and non-electrified population, where either accessibility to the grid is hard to determine or implementation price is therefore very high.

In such location, pv water pumping application is essential house of interest for property development. Programmed water system framework utilizes elective vitality that drives water pumps to pump water from bore well to a tank and through this technique the outlet valve of tank is after all managed abuse controller. A wet surveyor is utilized to manage the stream of water from the tank to the water system field that upgrades the work of water. Since our nation positions second in farming and it gets daylight consistently, it's educated use sun-based vitality for water system capacities. In order to profit from this type of energy, a special system is required to pump the water. The characteristics of the pumping system, i.e. the solar array, native climate information and soil, should be analyzed [1]. varied tiny size systems involving star batteries exist. These systems have undergone quick and straightforward information measuring and modeling procedures [2]. In some studies involving irrigation, varied analyses are created for modeling, observance systems and their performance analyses [3]. an example of tiny scale irrigation is that the star powered system within the renewable energy park [5]. solar panels have a good array of use in buildings, water pumping, roads, car parks, grid dependentand independent PV systems, PV stations, etc. Thus, variety of works on this subject were performed. the current study aims to develop an electronically controlled automatic irrigation system operated by humidness sensors, placed within the earth. The system was tested in laboratory conditions and favorable outcomes were obtained.

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II. REVIEW OF LITERATURE

1) *Senpinar "Using Photovoltaic Panels for Irrigation", College of Technical Sciences, Department of ElectronicsTechnology, Firat University 23100, Elazig, Turkey*

The aim of this study was to present the benefits of an automatic agricultural irrigation system, operated by current obtained from the Sun. The system may profit the country's economy if it may be extended for use within the large irrigated lands of the east and southeast. With technological advances, the system might provide farmers, worker, water, time and potency blessings. If the system is employed for landscaping in town parks and green areas, it should bring different blessings. With the system, water waste and therefore the would like for human power might be attenuated. The system is economical and simple to use. If future studies can augment it sensible mobile device applications and remote controlled RF systems, it'd be also potential to observe the system on-line.

2) *Shatadru Bipasha Biswas, M Tariq Iqba, "Solar water pumping system control using a low cost ESP32microcontroller" IEEECanadian conference on electronics & computer engineering (CCECE), 1-5, 2018*

This paper presents a low value automatic star water pumping system for irrigation in developing countries. The programmed device module detects the temperature, humidity, soil wetness level and sends the data to ESP32 microcontroller. A water level device additionally observes the water level and sends the information to the microcontroller unit. The ESP32 microcontroller additionally sends results to the net server so the user will see that. The user will operate the irrigation system removed from the sphere by an easy click on a mobile phone. A manual ON/OFF system is additionally incorporated into the projected style, suggested system is additional convenient as a result of it's not necessary for the farmers to go to the fields, this additionally ensures the bottom water wastage and its time saving.

3) *V. B. Shinde and S. S. Wandre, "Solar photovoltaic water pumping system for irrigation: A review", Africanjournal of agricultural research, May 2015*

Photovoltaic systems area unit particularly designed water and irrigation in areas wherever there is not any mains electricity supply. Their main blessings over hand pumps or internal combustion engine pumps area unit their much zero maintenance, their long helpful life, that they don't need fuel, that they don't contaminate, and eventually that they're easy to put in. Another necessary characteristic is that, as they use the sun as their energy supply, the periods of most demand for water coincide with the periods of most radiation. Once compared to diesel supercharged pumping systems, the value of star PV water pumping system with none grant works bent be sixty four.2% of the price of the diesel pump, over a life cycle of 10 years. Star pumps area unit accessible to pump from anyplace within the vary of up to two hundred m head and with outputs of up to 250 m^3/day. In general electrical phenomenon pumps area unit economic compared to diesel pumps up to or so three kwp for village water and to around one kwp for irrigation. Star electrical phenomenon (SPV) sets represent Associate in Nursing environment-friendly, low-maintenance and price effective various to irrigation pump sets that run on grid electricity or diesel. It's calculable that India's potential for solar PV water pumping for irrigation to is nine to seventy million solar PV pump sets, that is, at least 255 billion litres/year of diesel savings. A star irrigation pump system strategies must understand of the reality that demand for irrigation system water can vary throughout the year. Peak demand throughout the irrigation system seasons is usually quite double the typical demand. This means that that star pumps for irrigation area unit under-utilized for many of the year. Attention ought to be paid to the system of irrigation water distribution and application to the crops. The irrigation pump system ought to minimize water losses, while not imposing vital extra head on the irrigation pumping system and be of low value.

4) *S. Babaa, M. Armstrong, "Novel control strategy for photovoltaic systems based on irradiation inInternational Renewable Energy Congress (IREC 2017), 8th IEEE International Conference*

By implementing the projected system there are numerous benefits for the government and therefore the farmers. For the government an answer for energy crisis is projected. By using the automated irrigation system it optimizes the usage of water by reducing wastage and reduces the human intervention for farmers. The surplus energy produced mistreatment solar panels also can tend to the grid with little modifications within the system circuit, which can be a supply of the revenue of the farmer, thus encouraging farming in India and same time giving a solution for energy crisis. Projected system is straightforward to implement and atmosphere friendly resolution for irrigating fields. The system was found to achieve success when enforced for bore holes as they pump over the whole day. Solar pumps conjointly provide clean solutions with no danger of borehole contamination.

The system requires stripped-down maintenance and a focus as they're self-starting. To more enhance the daily pumping rates tracking arrays may be enforced. This technique demonstrates the practicability and application of mistreatment solar PV to supply energy for the pumping necessities for mechanical device irrigation. Even if there's a high capital investment needed for this technique to be implemented, the edges are high and in long run this technique is economic.

III. METHODOLOGY

A solar battery may be a set of solar electrical phenomenon modules electrically connected and mounted on a construction. The planned system is single axis solar tracker used for irrigation system together with GSM. The LDR placed on solar battery (12V, 5W) helps to trace most intensity of daylight and therefore generate a lot of electricity. The electricity made is keep in battery (12V) that is any wont to power the irrigation system. The analog values from LDR and wetness sensing element square measure given to ADC0808 for its digital conversion. The digital values are taken as input by microcontroller AT mega 328p that is interfaced together with 12V DC pump, alphanumeric display and GSM module. With the employment of GSM, farmer will put on and off the pump at his own discretion simply by causing a message. A solar battery may be a set of solar electrical phenomenon modules electrically connected and mounted on a construction. A electrical phenomenon module may be a packaged, connected assembly of solar cells. The solar battery is used as a element of a bigger electrical phenomenon system to get and provide electricity in industrial and residential applications. within the system we have a tendency to use 12V, 5W solar battery.

IV. ARCHITECTURE

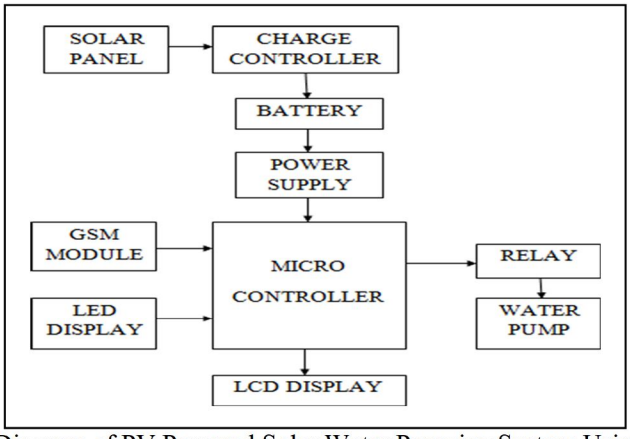


Fig 1: Block Diagram of PV Powered Solar Water Pumping System Using Microcontroller

1) *ATmega328:* It is a complicated Virtual RISC (AVR) microcontroller. It supports 8-bit processing. ATmega-328 has 32KB internal nonvolatile storage. ATmega328 has 1KB Electrically eradicable Programmable read-only storage (EEPROM).
2) *GSM:* This module could be a specialized kind of electronic equipment that accepts a SIM card, and operates over a subscription to a mobile operator, rather like an itinerant. The mobile operator charges for this message causing and receivingas if it had been performed directly on a movable. To perform these tasks, GSM electronic equipment should support an "extended AT command set" for sending/receiving SMS messages.
3) *LCD:* LCD could be a flat panel display, electronic visual show, or monitor that uses the sunshine modulating properties of liquid crystals. In our system we tend to use 16X2 digital displays.
4) *Motors:* This technique uses the 12V DC static magnet motor for the one axis movement of electrical device.
5) *Sensors:* The LDR sensors are placed on the electrical device that helps in tracking most intensity of daylight.
6) *Solar Cell Plate:* Loom solar has launched a mini electrical device of 20-watt for a 12-volt battery that is charged with the assistance of daylight. Being lightweight in weight, this transportable electrical device finds several applications or uses. The panel is specially designed to charge little batteries up to 10 Ah or 10,000 mAh.
7) *Electric DC Water Pump:* To pump water, we use 12-volt submersible pump for this project which has 18-watt motor that can lift water up to 1.7 meters. This pump should be operated only when it is submerged completely in the water for better results, for that we need to keep water in the bucket because if water pump will be operated without water than it will get damaged.

V. ADVANTAGES

1) Zero Fuel prices Less Labor & Maintenance Environmentally Friendly.
2) It is simple to transport and relocate as per the requirement of the farm.
3) Low maintenance needs (3 to five years) sensible performance which implies fewer solar panels to pump identicalquantity of water.
4) A maximization of output energy created by the PV panel, through an optimum positioning executed just for comfortable values of light signal intensity.
5) A guarantee of the panel positioning ranging from any initial position of the PV panel.
6) The elimination of excess movements, at too little intensities of the light signals or at too little variations betweenthe signals received from the 2 LDR sensors.
7) The microcontroller makes system automatic and saves man power and likewise as power & wastage of water.

VI. APPLICATION

1) Water for livestock.
2) Water for crop irrigation Drinking and cookery water.
3) These pumps area unit reliable for regional and remote areas.
4) This can be employed in rural areas wherever electrification having insufficiency
5) To direct irrigation solar pumps will be used pumped-storage which may be used throughout peak hours or oncesolarenergy/grid offer isn't out there.
6) Solar pumps ideally fitted to all our pumping desires as well as drinkable wherever grid offer cannot reachbecause oftough piece of land. Solar pumps may be utilized in water treatment plants.
7) Solar pumps will be used as booster pumps for transporting liquid over long distances.

VII. RESULT AND DISCUSSION

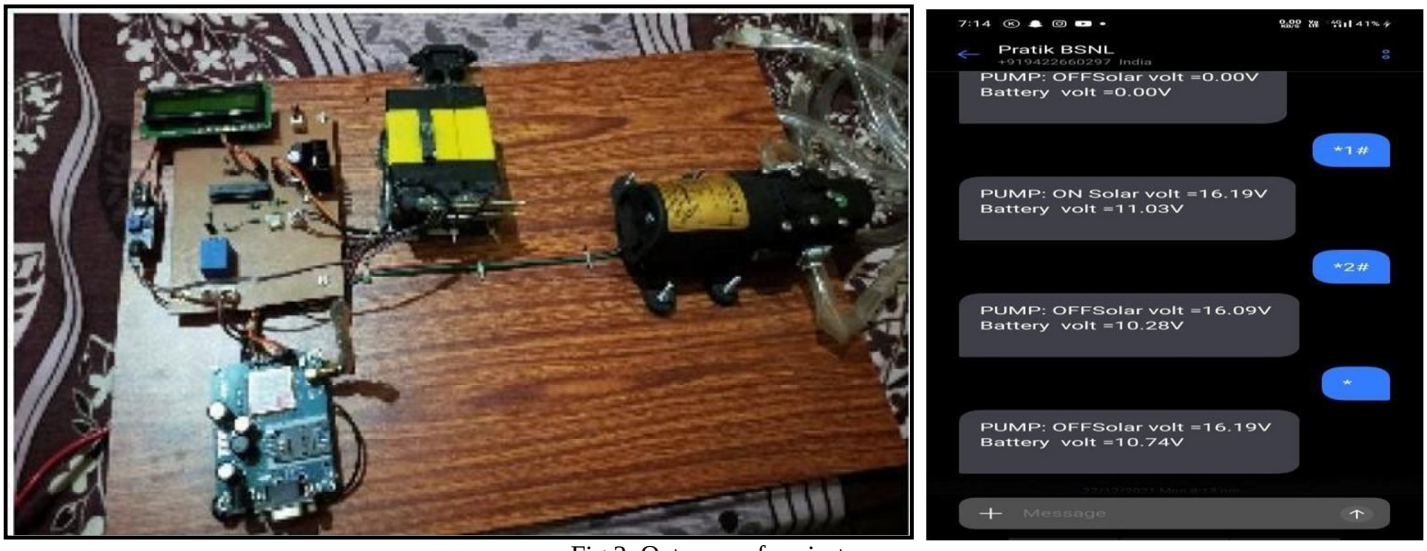


Fig 2: Outcome of project

This system is mistreatment atmega328p microcontroller. It programmed exploitation Arduino ide using c/c++ language. When finishing this method, one needs to connect the sensors to the atmega328p with the assistance of jumper wires. A five - 7-volt dc supply is connected to the microcontroller additionally 12 v is needed for the operating of pump, as a result of they have larger voltage for its operating. The soil wetness detector is connected to the analog pin (a0) of atmega328p. After uploading the program to the atmega328p and providing offer to the elements. The soil wetness detector send signal to the atmega328p. Relay is connected between the atmega328p and therefore the pump. Relay is use to protects the controller circuit from over voltage. One willmanagement the pump by obtaining signals from atmega328p. It's a wi-fi module for communication, by using this module one will send and receive knowledge to the server through the wi-fi.

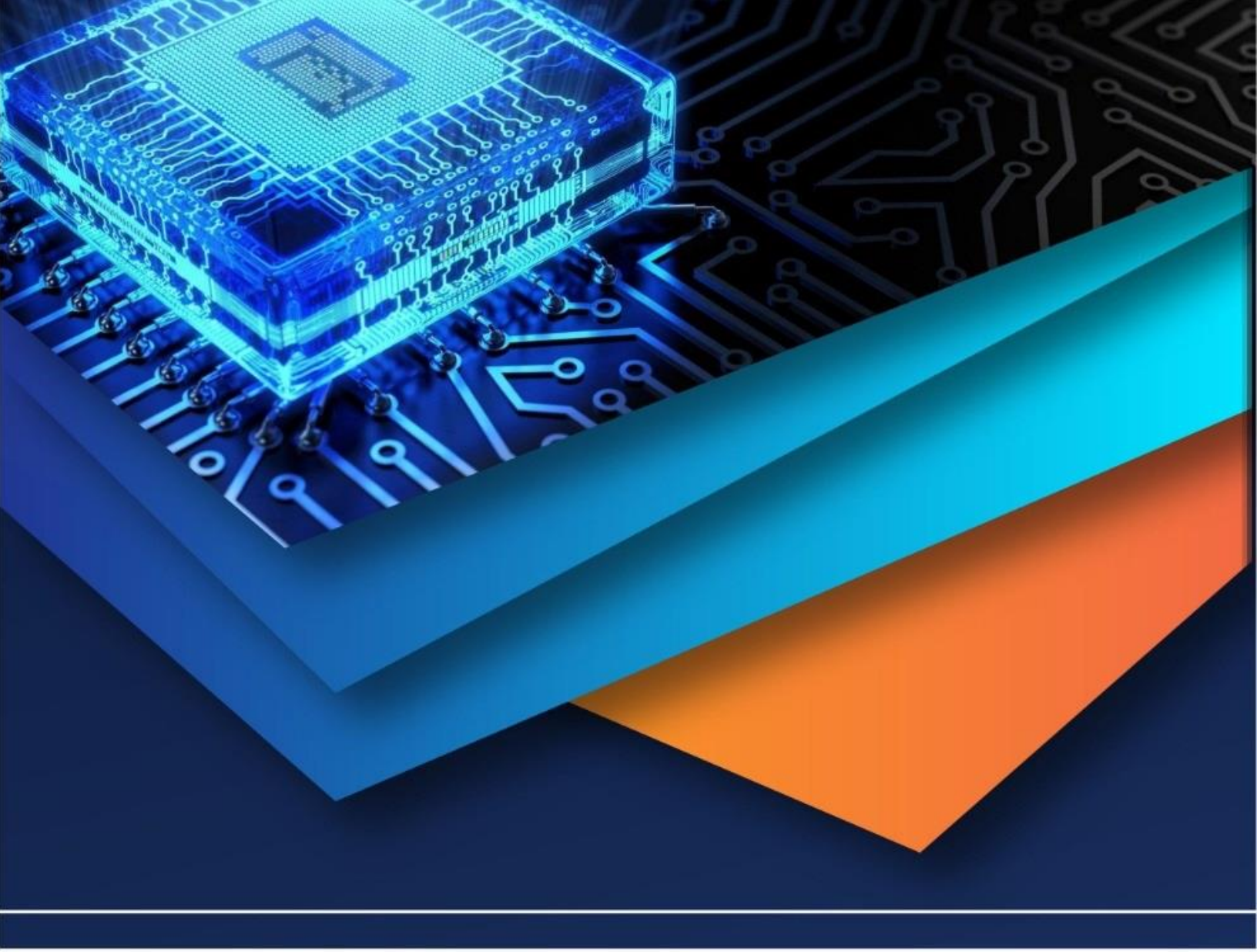
When one places our setup on any farm or in a very garden. The wetness detector incessantly monitors the wetness worth of the soil and sends knowledge to the atmega328p and checks the soil wetness worth is below the edge worth or not. If this worth is below the edge worth. The atmega328p generates the signal for a relay to start out the pump. If the condition is not glad the atmega328p sends the 26 signals to the relay to show off the pump. The irrigation stops when a particular quantity of wetness gain by the soil, during this whole method. The readings of soil wetness, temperature, and humidness area unit taken by the assorted sensors like soil wetness and dht11 area unit send to the server and this knowledge one will see on the smartphone the net the internet in time period. This method is mechanically done by atmega328p. It will work incessantly for 24 hours and 12 months of the year. For irrigation functions, it saves an amazing quantity of water.

VIII. CONCLUSION

Water system has been the inspiration of human progress since man has begun business. Because the era advanced, man created various techniques for water system to provide water to the land. Within the present situation on preservation of water is of high significance. By knowing the standing of moistness and temperature through GSM with the use of moistness and temperature sensors, water stream is controlled by merely communication one thing specific from our transportable. By actualizing this framework, rural, inexperienced grounds, parks, gardens, and fairways is watered. On these lines, this framework is less costly and productive once contrasted with another kind of robotization framework. In large scale applications, high affectability sensors are actual for intensive ranges of rural grounds. A stay by battery or sun-oriented cells is actual that comes into utilization within the event of energy cuts. An optional pump is used as a neighborhood of instance of disappointment of the pump.

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