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An Automatic Intelligent Load Management System to Reduce the Electricity Bill

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Abstract: ***Today the world has become digital. The technology plays a vital role in the society. Demand Side Management will play a significant part later on keen matrix by overseeing loads in a brilliant way. DSM programs, acknowledged by means of Home Energy Management (HEM) frameworks for brilliant urban communities, give numerous advantages; shoppers appreciate power value reserve funds and utility works at lessened pinnacle demand. Demand side management (DSM) is the process of balancing the supply of electricity on the network with adjusting or controlling the electrical load to the power station. In this paper, an automatic intelligent load management system for a smart home is implemented. The maximum power point tracking (MPPT) algorithm is used to design a smart home along with renewable energy source (RES) to utilize the power efficiently there by save the electricity and reducing the electricity bill for consumers.***

Keywords: Demand side management, maximam power point tracking algorithm, Renewable energy sources, Home energy management.

I. INTRODUCTION

Worldwide vitality request is expanding quickly in examination to the relentless development of vitality age and transmission setups. Thusly, broadening the request and supply hole. In customary frameworks, utilities cook this circumstance by expanding the aggregate age limit as a component of pinnacle request. Nonetheless, the came about framework (age and dispersion) by an expansive part is unutilized Renewable energy is one of the energy techniques mainly used to save the electricity. Smart grid is an intelligent device used for two way communication that controls the flow of electricity and the information will be successfully delivered to the network. Smart also used to the industry and observe the part of the system at higher resolution in time and less space. The main aim of the smart grid is to improve energy

Efficiency and reduce the cost and emission the control utilization of keen machines in a house is proposed in view of the ToU evaluating plan. Precise and dependable load administration are a key component of the computerization. Though, computerization of machines is a basic part of vitality administration in the private division, particularly in the brilliant framework condition [1]. the vitality administration issue of a keen home comprising of utility lattice with day-ahead power levy, PV module and home apparatuses with three unique kinds of stack qualities (i.e., interruptible, uninterruptible and time- shifting) is examined. A HEMs is then created to perform the ideal load planning of family machines and the ideal power dispatch of utility matrix progressively, intending to limit the power cost and the holding up time cost required for fulfilling the booked load requests synchronous [2]. The batteries are charged when the cost of power is low, furthermore, they are released to control servers when the cost of power is high. Likewise, the issues of utilizing extraordinary innovations for capacity and of putting stockpiling frameworks at distinctive levels of the power pecking order were broke down broadly. In the above papers, the concentration much of the time was on two particular issues, that is, the lifetimes of UPS batteries and the need to guarantee that the accessibility of the server farm isn't traded off. Likewise, it was shown that a standout amongst the most basic issues engaged with the utilization of UPS frameworks is the connection between permissible charging/ releasing cycles and the profundity of release (DoD). For the most part, lead-corrosive batteries are introduced in UPSs, and the lifetime (i.e. the quantity of cycles) of these batteries diminishes significantly when the DoD increase [3].

A. Block diagram

LDR sensor which is put in the sun powered board will detect the sub light and send the data to the Arduino microcontroller. Relies on this esteem microcontroller turns the stepper engine to alter the course of sun based board. Because of the sun powered board get all the more light and can create more voltages which is put away in the battery. The put away power change the dc to air conditioning power .the following matrix control is the supply voltage. The supply voltage interface the voltage sensor and current sensor to create the power .the data send to the Arduino microcontroller. Relies on this esteem the air conditioner power will be exchanged. At last interface the transfer module to switch the relating load.

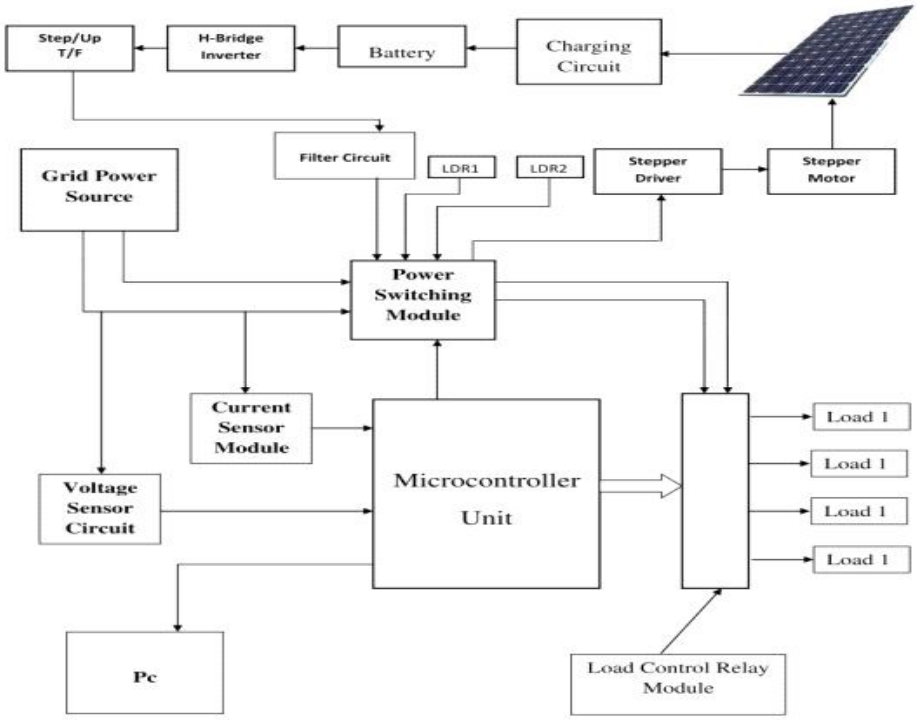

Fig.1.Block Diagram

B. System Implementation

To outline a keen home with sustainable power source sources (RES). This framework executes the programmed task to accomplish low power charge. In this paper MPPT (greatest power point following) calculation is utilized. The improvement vitality is utilized to lessen the power charge and decrease the pinnacle hour.

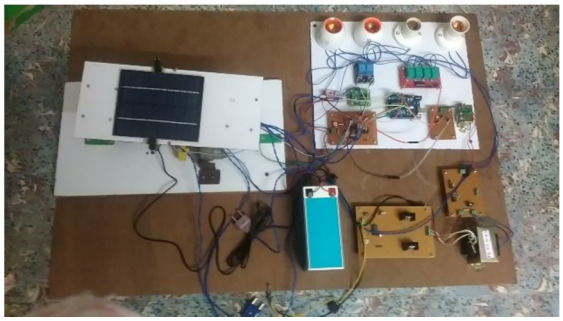

Fig.2 Measurement Circuit

C. MPPT algorithm

Most extreme Power Point Tracking, often alluded to as MPPT, is an electronic framework that works the Photovoltaic (PV) modules in a way that enables the modules to deliver all the power they are prepared to do. MPPT isn't a mechanical following framework that "physically moves" the modules to influence them to point all the more straightforwardly at the sun. MPPT is a completely electronic framework that shifts the electrical working purpose of the modules with the goal that the modules can convey greatest accessible power. Extra power gathered from the modules is then made accessible as expanded battery charge current. MPPT can be utilized as a part of conjunction with a mechanical following framework, however the two frameworks are totally unique.

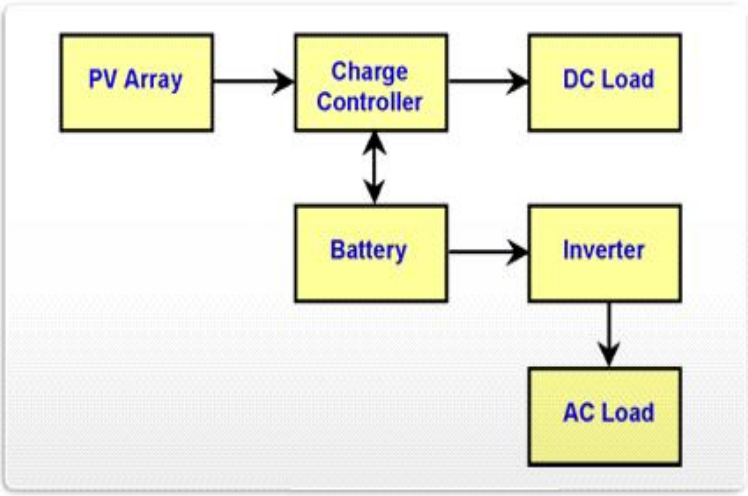

Fig.3: MPPT techniques diagram

D. Hardware Explanation

1) LDR (Light Dependent Resistor): A light ward resistor takes a shot at the rule of photograph conductivity. Photograph conductivity is an optical wonder in which the materials conductivity is expanded when light is consumed by the material. At the point when light having enough vitality strikes on the gadget, an ever increasing number of electrons are eager to the conduction band which brings about vast number of charge bearers. The aftereffect of this procedure is an ever increasing number of current begins streaming through the gadget when the circuit is shut and thus it is said that the protection of the gadget has been diminished.

E. Stepper motor

Stepper engines are DC engines that move in discrete advances. They have various loops that are sorted out in bunches called "stages". By empowering each stage in grouping, the engine will turn, with extra special care. With a PC controlled venturing you can accomplish exceptionally exact situating as well as speed control.

F. Current sensor

A present sensor is a gadget that identifies electric current in a wire, and produces a flag relative to that present. The created flag could be simple voltage or present or even a computerized yield. The created flag can be then used to show the deliberate current in an ammeter, or can be put away for advance examination in an information procurement framework, or can be utilized with the end goal of control.

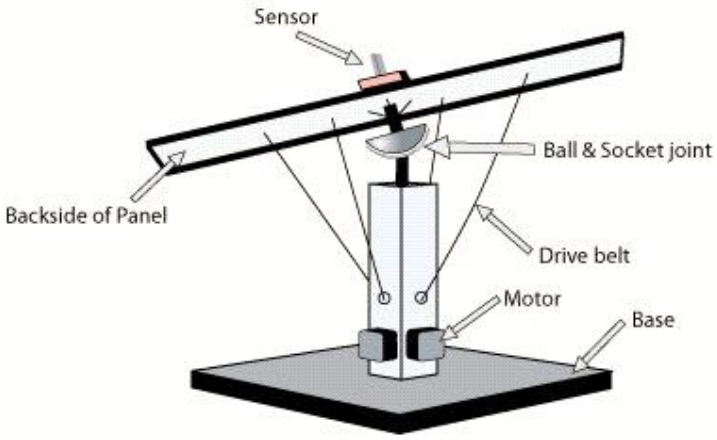

Fig.4: LDR and stepper motor used in solar panel

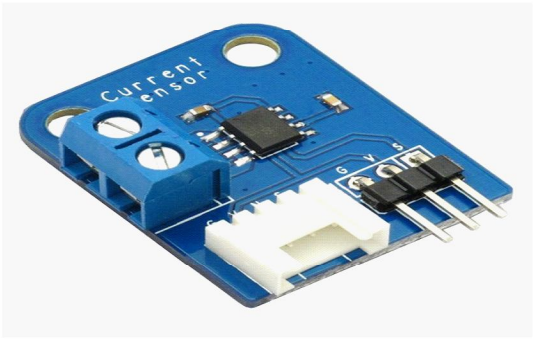

Fig.5: current sensor

G. Voltage sensor

The Voltage Sensor square speaks to a perfect voltage sensor, that is, a gadget that believer's voltage estimated between two purposes of an electrical circuit into a physical flag relative to the voltage. Associations + and – are electrical preserving ports through which the sensor is associated with the circuit.

Fig.6

H. DPST (Double Pole, Single Throw)

The DPST switch comprises of two posts that implies it incorporates two indistinguishable switches situated on next to each other. ... This change is utilized to turn two circuits ON/OFF and it comprises of four terminals to be specific two sources of info and two outputs.

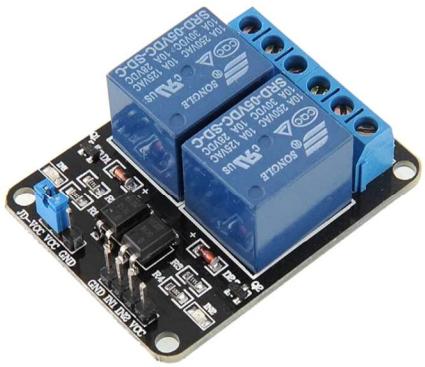

Fig.7: DPST switch

I. Channel relay module

4-Channel Relay Module. The Arduino Relay module permits an extensive variety of microcontroller, for example, Arduino, AVR, PIC, ARM with advanced yields to control bigger burdens and gadgets like AC or DC Motors, electromagnets, solenoids, and glowing lights.

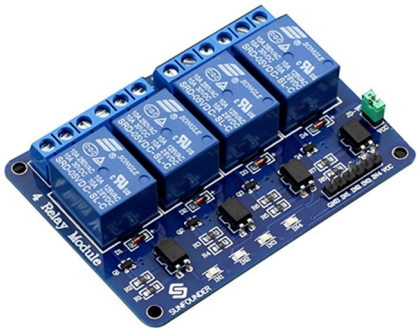

Fig.8: channel relay module

J. Microcontroller

Microcontrollers are utilized as a part of consequently controlled items and gadgets, for example, car motor control frameworks, implantable therapeutic gadgets, remote controls, office machines, apparatuses, control devices, toys and other inserted frameworks. By lessening the size and cost contrasted with an outline that uses a different microchip, memory, and information/yield gadgets, microcontrollers make it temperate to carefully control considerably more gadgets and procedures. Blended flag microcontrollers are normal, coordinating simple segments expected to control non-advanced electronic frameworks.

Fig9: Micro Controller

K. Result

To evaluate the performance of the proposed system, performance comparison of solar power, grid power and battery power is done and the results are listed below.

Solar power	Battery voltage	Supply voltage	Cost
insufficient	No	Yes(all load)	0.00 rs
sufficient	Yes(all load)	No	0.06 rs
Sufficient(1 load)	Yes(1 load)	Yes(2 loads)	0.05 rs

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Sufficent battery voltage & insufficent solar voltage
Battery Voltage = 15V
solar power Switched to load 1

Irms Current = 0.32 , supplyVoltage= 218.15
Battery Voltage = 15V
Real Power= 31.56W
Cost= 0.00 rs

Irms Current = 0.20 , supplyVoltage= 218.72
Battery Voltage = 15V
Real Power= 28.60W
Cost= 0.00 rs

Irms Current = 0.19 , supplyVoltage= 218.55
Battery Voltage = 15V
Real Power= 27.30W
Cost= 0.00 rs

Irms Current = 0.19 , supplyVoltage= 218.55
Battery Voltage = 15V
Real Power= 25.54W
Cost= 0.01 rs

Irms Current = 0.19 , supplyVoltage= 218.45
Battery Voltage = 15V
Real Power= 27.79W
Cost= 0.01 rs

Irms Current = 0.19 , supplyVoltage= 218.55
Battery Voltage = 14V
Real Power= 28.06W
Cost= 0.01 rs

Irms Current = 0.19 , supplyVoltage= 218.48
Battery Voltage = 14V
Real Power= 25.34W
Cost= 0.02 rs

Irms Current = 0.17 , supplyVoltage= 218.58
Battery Voltage = 13V
Real Power= 22.94W
Cost= 0.02 rs

Insufficent Battery volt
Battery Voltage = 10V
AC power Switched to load

Irms Current = 0.19 , supplyVoltage= 218.49
Battery Voltage = 10V
Real Power= 26.00W
Cost= 0.03 rs

Irms Current = 0.26 , supplyVoltage= 218.14
Battery Voltage = 12V
Real Power= 47.93W
Cost= 0.04 rs

Sufficent battery voltage & insufficent solar voltage
Battery Voltage = 13V
sol
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II. CONCLUSION

This paper exhibits an HEM display in light valuing plan with and without RESs. Keeping in mind the end goal to ideally devour lattice and RES vitality, the proposed display utilized MPPT calculation. The outcomes acquired from the reenactments uncovered that cost sparing is accomplished in wording of limited client power charge. By utilizing MPPT calculation, the proposed display fundamentally lessened the power bill and high pinnacles. In future, other enhancement strategies can be explored to lessen the power bills further using enhanced proceed Wes and algorithms

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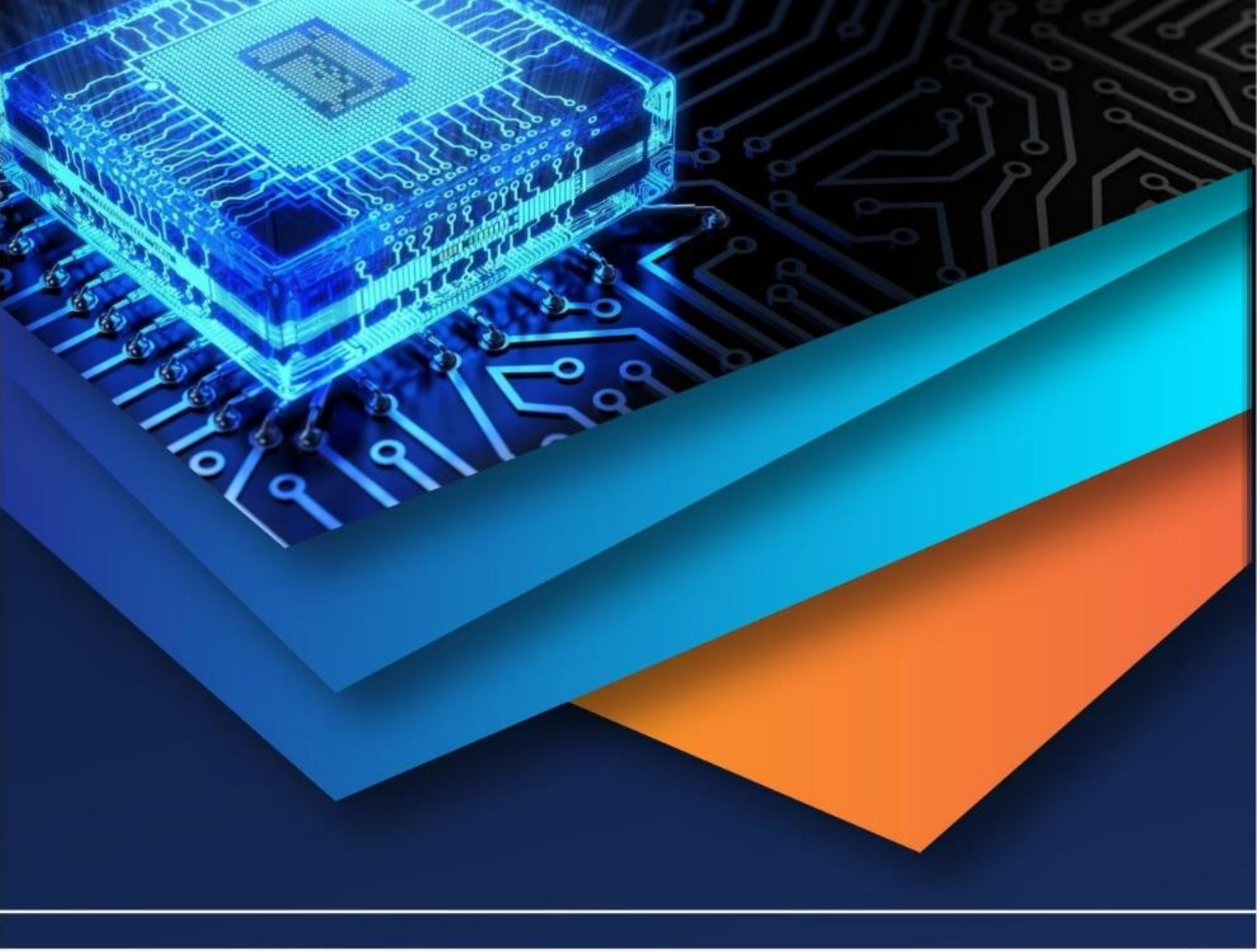

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