



# ENERGY MANAGEMENT IN AUTOMATIC SOLAR ENERGY IRRIGATION SYSTEM

**Polam Balanagamani<sup>1</sup>, G. C Handra Reddy<sup>2</sup>**

<sup>1</sup> Pursuing M.Tech (ES) from Nalanda Institute of Engineering and Technology(NIET), Siddharth Nagar, Kantepudi village, SatenepalliMandal, Guntur Dist, AP,(India)

<sup>2</sup>Working as Assistant Professor from Nalanda Institute of Engineering and Technology (NIET),Siddharth Nagar, Kantepudi village, Satenepalli Mandal, Guntur Dist, AP, (India)

## ABSTRACT

India plays major role in agriculture field most of the families in India will be based on agriculture sector only, in agriculture field irrigation is the main concept so we need to provide water to crops in particular times. But at present day's energy considerations the available energy or power insufficient to the irrigation process. So need to save energy from Sun because of sun is the ultimate energy source in the earth, for that process implementing project like "Energy management for automated solar energy irrigation control" This project mainly deals with save energy from sun using solar panels in batteries and irrigation will be controlled through relevant sensors automatically without human interface, and this project can be developed on ARM based controller i.e. ARM 7 LPC 2148 micro controller. This paper provides info concerning development procedure of an embedded system for Off-Grid irrigation system. The look comes on developing an intelligent controlled mechanism basing on soil moisture sensor for very best utilization of resources for irrigation. The farmer (user) will water the fields from any place using GSM technique that provides an acknowledgement message concerning the duty standing. The main advantage of this project is optimizing the ability usage through water resource management and conjointly saving electricity. This proves an efficient and economy manner of irrigation and this may change the agriculture sector. In this project can add additional feature like birds detection over the crops using IR sensors and security alert with high sounds for birds.

**Keywords:** GSM Module, ARM LPC 2148 Microcontroller, Solar Plate, Proximity Sensor, Buzzer.

## I. INTRODUCTION

In general India is developing country through irrigation and here irrigation can play major role, without crops and irrigation nothing here, for that we need water for irrigation the water can be supplied through water pumps/Motors. So we need electricity for that irrigation process. Energy/Electricity is a renewable source for that we generate power source from this project using solar panels. Sun is the ultimate renewable source in this earth, for this we are save power from sun using solar panels and Batteries, and starts irrigation by using solar requirement.

The key concept of this project is to develop solar energy and that solar power is use for irrigation of the system, and another advantage of this project is the water motors used in this project is controlled automatically by basing of moisture conditions of the earth, if the earth is in dry condition the water pumps will be automatically turned on. If else water pumps will turned off automatically by reading of soil conditions of the earth, so we are save power in this project for that wastage of power usage will be wasted.

The overall Irrigation framework circumstance, nevertheless, is depicted by poor execution, extended enthusiasm for higher cultivating effectiveness, decreased availability of water for agribusiness, growing soil saltiness and possible effects of a broad temperature support and ecological change. This methodology now and again eats up more water or now and again the water comes to late in view of which the harvests get dried. Water inaccessibility can block to plants before evident shriveling happens. Obstructed improvement rate, lighter weight normal item takes after slight water insufficiency. This issue can be perfectly revised in case we use modified microcontroller based watering system framework structure in which the watering system framework will happen exactly when there will be extraordinary need of water. As we understand that India is a making country and the critical bit of our GDP improvement rate fits in with agribusiness alone. So we can say that cultivation is the establishment of India and watering framework is known as the assistance. Subsequently, agriculture in India has been the most basic need in the money related change of country since the opportunity. Critical bit of our utilization is spent on agribusiness alone and despite that we not getting obliged yield. In India, there is uneven normal diverse qualities cause, some part experience dry seasons while a couple areas surge, so there is reliably inaccessibility of water available for the watering framework. Agriculturist in provincial locale severally affected by this condition. New developments nearing anyway they are too much excessive for the fundamental agriculturist.

The framework offers a not so much costly but rather more straight forward response for this issue by making automated microclimate watering system framework controllers with remote limit assisted with insignificant exertion remote sensor centers. Like temperature sensor, stickiness sensor, water level sensor which resources the temperature at that domain, soggiess of the Soil, and water level in the territory. The territory or firm is disconnected into microclimatic locale outfitted with sharp showed sensors and consolidated remotely into automated watering framework controller with remote frameworks organization capacity.

## II. LITERATURE REVIEW

In order to complete hardware of this project need to refer some previously developed projects those are discussed in given below

Design optimization of photovoltaic powered water pumping systems: The use of electrical phenomenon's because the power supply for pumping water is one amongst the foremost promising areas in photovoltaic applications. With the inflated use of water pumping systems, additional attention has been paid to their style and optimum utilization so as to attain the foremost reliable and economical operation. This paper presents the results of performance optimisation of a electrical phenomenon hopped-up water pumping system within the Kuwait climate. The direct coupled electrical phenomenon water pumping system studied consists of the PV array, DC motor, pump, a tank that serves the same purpose to battery storage and a most outlet hunter to boost the potency of the system.



The pumped up water is desired to satisfy the domestic desires of three hundred persons during a remote space in Kuwait. Presumptuous a figure of forty l/person/day for water consumption, a volume of twelve money supply ought to be pumped up daily from a deep well throughout the year. A theoretical account program is developed to work out the performance of the planned system within the Kuwait climate. The simulation program consists of a part model for the PV array with most outlet hunter and part models for each the DC motor and also the pump. The 5 parameter model is tailored to simulate the performance of amorphous element cell modules. The dimensions of the PV array, PV array orientation and also the pump–motor–hydraulic system characteristics area unit varied to attain the optimum performance for the planned system. The life cycle value methodology is enforced to gauge the economic feasibleness of the optimized electrical phenomenon hopped-up water pumping system. At the present costs of PV modules, the price of the planned electrical phenomenon hopped-up water pumping system is found to be more cost-effective than the price of the traditional equipment. Additionally, the expected reduction within the costs of electrical phenomenon modules within the close to future can build electrical phenomenon hopped-up water pumping systems additional possible.

**Economic viability of photovoltaic water pumping systems:** A comparison of the economic viability of electrical phenomenon and diesel water pumping systems is given for system sizes within the vary two.8 kilo watts per to fifteen kW p. Actual performance knowledge from put in systems area unit utilized for the bottom case. Sensitivity analysis is dole out to generalize results for alternative locations and conditions. The impact of system oversizing owing to pair of water and demand patterns on the economic viability of PV water pumping system is illustrated supported real knowledge and three-year operational expertise of eight installations. Investment prospects in PV water pumping applications for various terms eventualities of water are investigated.

### III. HARDWARE DESIGN

The Irrigation Control framework utilizing solar board and GSM innovation comprises of distinctive equipment and programming modules. The accompanying square outline demonstrates the diagram of equipment parts incorporated into the framework.

#### 3.1 LPC2148 Microcontroller

The LPC2148 microcontroller load up in light of a 16-bit/32-bit ARM7TDMI-S CPU with continuous copying, 16-bit/32-bit ARM7TDMI-S microcontroller in a little LQFP64 bundle, 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip streak memory; 128-piece wide interface/quicken agent empowers rapid 60 MHz operation, In-System Programming/In-Application(ISP), Single 10-bit DAC gives variable simple yield, Two 32-bit clocks/outer occasion counters (with four catch and four look at channels each), PWM unit (six yields) and guard dog, Low power Real-Time Clock (RTC), Multiple serial interfaces including two UARTs (16C550), two Fast I2C-transport (400 kbit/s), SPI and SSP with buffering and variable information length capacities.

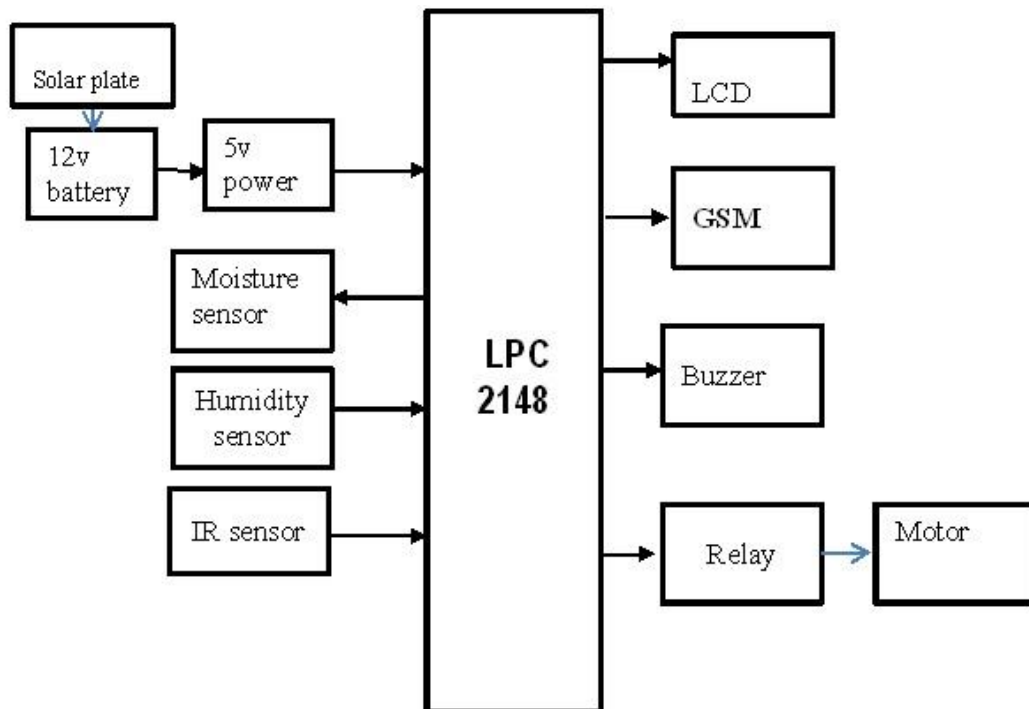


Fig 1: Block Diagram

### 3.2 GSM Modem

A GSM modem is a device which can perform all the module operations like calling, and GPRS system with it. Be that as it may, the fundamental differentiation is the GSM modem is the rough kind of a cell phone which is wanted to use in cutting edge and test applications. The GSM modem uses 900MHz information exchange limit as a piece of India as indicated by the telecom regulatory principles. As we say former it is an unrefined kind of a cell phone, the GSM modem contains a SIM card space, Antenna and a Max 232 driver in it.

### 3.3 LCD (Liquid Crystal Display)

A fluid precious stone presentation or LCD draws its definition from its name itself. It is mix of two conditions of matter, the strong and the fluid. LCD utilizes a fluid precious stone to create a noticeable picture. Fluid gem presentations are super-thin innovation showcase screen that are by and large utilized as a part of Tablet, TVs, phones and compact computer games. LCD's advancements permit showcases to be much more slender when contrasted with cathode beam tube (CRT) innovation.

Fluid precious stone presentation is made out of a few layers which incorporate two enraptured board channels and anodes. LCD innovation is utilized for showing the picture as a part of scratch pad or some other electronic gadgets like small PCs. Light is anticipated from a lens on a layer of fluid gem. This blend of hued light with the greyscale picture of the precious stone (framed as electric current moves through the gem) shapes the shaded picture. This picture is then shown on the screen.

### 3.4 Solar Plate

Solar modules use light-weight energy (photons) from the sun to come up with electricity through the electrical phenomenon impact. The bulk of modules use wafer-based crystalline semiconductor cells or thin-film cells

supported atomic number 48 compound or semiconductor. The structural (load carrying) member of a module will either be the highest layer or the rear layer. Cells should even be protected against mechanical harm and wetness. Most solar modules square measure rigid, however semi-flexible ones square measure offered, supported thin-film cells.

### **3.5 DC Motor**

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

### **3.6 Humidity Sensor**

Humidness is that the presence of water in air. The number of water vapour in air will have an effect on human comfort also as several producing processes in industries. The presence of vapour conjointly influences varied physical, chemical, and biological processes. Humidness activity in industries is crucial as a result of it's going to have an effect on the business price of the merchandise and also the health and safety of the personnel. Hence, humidness sensing is extremely vital, particularly within the management systems for industrial processes and human comfort.

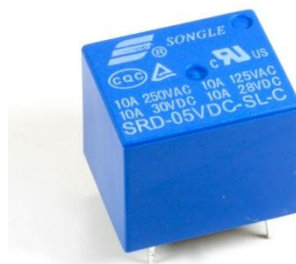
### **3.7 Soil Moisture**

Soil wet sensors live the meter water content in soil. Since the direct measure of free soil wet needs removing, drying, and coefficient of a sample, soil wet sensors live the meter water content indirectly by victimisation another property of the soil, like resistivity, non-conductor constant, or interaction with neutrons, as a proxy for the wet content. The relation between the measured property and soil wet should be graduated and will vary betting on environmental factors like soil sort, temperature, or electrical conduction. Mirrored microwave radiation is full of the soil wet and is employed for remote sensing in geophysical science and agriculture. Moveable probe instruments are employed by farmers or gardeners.

Soil wet sensors generally sit down with sensors that estimate meter water content. Another category of sensors live another property of wet in soils known as water potential; these sensors square measure sometimes cited as soil water potential sensors and embody tension meters and mineral blocks.

### 3.8 Relay

A machine instrument hand-off is a sort institutionalized for mechanical control of machine devices, exchange machines, and other successive control. They are described by an expansive number of contacts (once in a while extendable in the field) which are effectively changed over from ordinarily open to typically shut status, effortlessly replaceable loops, and a structure variable that permits minimalistic ally introducing numerous transfers in a control board. Albeit such transfers once were the foundation of robotization in such commercial enterprises as car gets together, the programmable rationale controller (PLC) for the most part dislodged the machine device hand-off from consecutive control applications. A transfer permits circuits to be exchanged by electrical hardware: for instance, a clock circuit with a hand-off could switch power at a pre-set time. For a long time transfers were the standard strategy for controlling mechanical electronic frameworks. Various transfers could be utilized together to complete complex capacities (hand-off rationale). The rule of transfer rationale depends on transfers which stimulate and de-empower related contacts. Hand-off rationale is the forerunner of step rationale, which is regularly utilized as a part of programmable rationale controllers.



**Fig: 2 Relay.**

### 3.9 12v DC Battery

Car SLI batteries are typically lead-corrosive sort, and are made of six galvanic cells joined in arrangement to give an ostensibly 12-volt framework. Every cell gives 2.1 volts to a sum of 12.6 volts at full charge. Substantial vehicles, for example, roadway trucks or tractors, frequently outfitted with diesel motors, may have two batteries in arrangement for a 24-volt framework or may have arrangement parallel gatherings of batteries supplying 24V. Lead-corrosive batteries are comprised of plates of lead and separate plates of lead dioxide, which are submerged into an electrolyte arrangement of around 38% sulphuric corrosive and 62% water. This reasons a compound response that discharges electrons, permitting them to course through conveyors to deliver power. As the battery releases, the corrosive of the electrolyte responds with the materials of the plates, changing their surface to lead sulphate. At the point when the battery is energized, the concoction response is switched: the lead sulphate changes into lead dioxide and lead with the sulphate coming back to the electrolyte arrangement restoring the electrolyte particular gravity. With the plates restored to their unique condition, the procedure might now be rehashed. Battery reusing of car batteries lessens the requirement for assets required for assembling of new batteries, redirects poisonous lead from landfills, and averts danger of disgraceful transfer.

#### **IV. SOFTWARE DESIGN**

In this proposed framework, as we utilized LPC2148 we have to utilize taking after programming instruments to program for it.

1. KeilVision
2. Flash Magic

The KeilVision is an IDE for Embedded C dialect. In this IDE, we have to import the utilities and libraries as per the controller we are utilizing. This IDE is exceptionally more straightforward and in easy to use way to utilize. It incorporates all the C/C++ compilers, constructing agents, and debuggers in it. It disentangles the procedure of installed reenactment and testing alongside Hex record era.

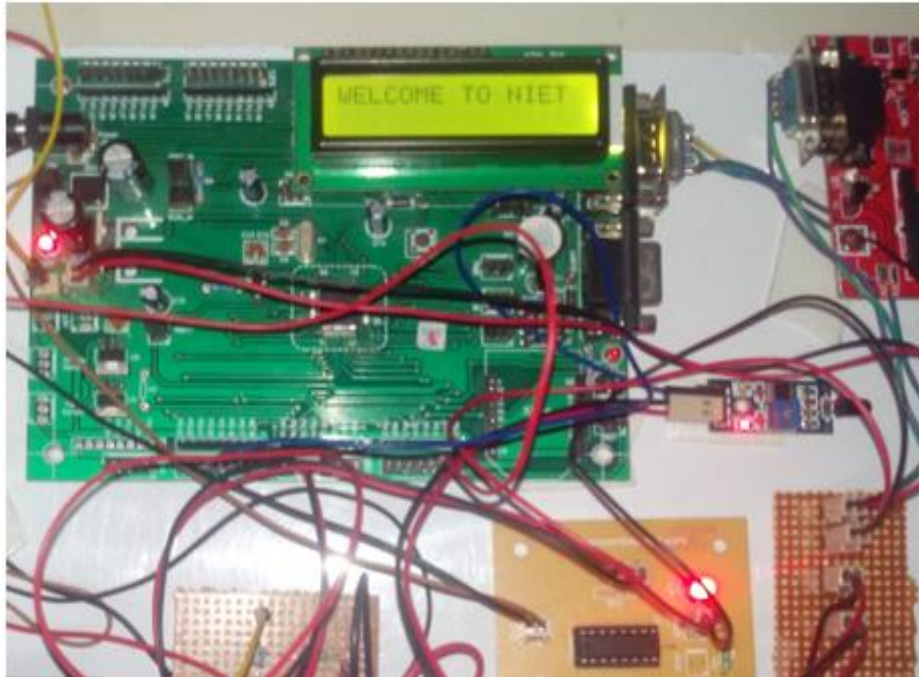
he glimmer enchantment is a programming utility. The C/C++ system written in IDE will be handled into Hex document i.e. in .hex arrangement. It is important to dump the hex record on to the microcontroller.

#### **V. WORKING DESCRIPTION**

In our project we have performed the operation of controlling the devices using wireless technique. In this process we have controlled the motor by using status of the sensor. The kit will be placed in the fields and owner will be somewhere out of the village. The status of the motor, Humidity and will be sent message through GSM modem .We have also placed the humidity sensor in the kit to identify the environment conditions. Its main working process is to identify the rainfall in the place. If it has detected the rain a message is transmitted to the owner that it is raining or have some water content in Air. If IRs detected in form security will be alerted like a continuous buzzer indication to indicate some birds will damage crops.

#### **VI. RESULTS**

We have executed the project by placing the kit in the field and placing the humidity sensor detects sends messages to owner of the crop and moisture detects automatically turn on motor connected to controller through relay. Whenever birds detected around crop IR sensors will be detected from our microcontroller and gives security alert at any time continuously.



**Fig 2: complete system for Automatic irrigation system**

## **VII. CONCLUSION**

Thus we have checked the output on the hardware by placing the kit in the field and checked the working of the project. The system will continuously check the soil moisture condition for turn on/off motor condition. i.e. the earth or soil is in dry state then the water pump will automatically turned on or else motors are in off position. Working of the humidity sensor is also tested by blowing the air at the sensor. If IRs detected in form security will be alerted like a continuous buzzer indication to indicate some birds will damage crops.

## **REFERENCES**

- [1] Kenna, Jeff. and Gillett Bill. "Handbook of Solar water pumping", Sir William Halcrow and Partner and Intermediate Technology Ltd. 1985
- [2] Soteris Kalogirou "Solar Energy Engineering: Processes and System", Elsevier Inc. 2009
- [3] S.R. Wenham M.A. Green M.E. Watt R. Corkish "Applied Photovoltaics" Second Edition, ARC Centre for Advanced Silicon Photovoltaics and Photonics. 2007
- [4] D. A.A. Ghoneim, "Design optimization of photovoltaic powered water pumping systems". Energy Conversion and Management 47 (2006)
- [5] J.L. Davies, "The Design and Optimization of a System using an Induction Motor driven pump, powered by solar panels", 30 April 1992
- [6] P.C SEN, "Principles of Electric Machines and Power Electronics", second edition, 1997, (Pages 197,227-228)
- [7] Odeh, I., Yohanis, Y.G, and Norton, B, Economic viability of photovoltaic water pumping systems. Solar energy, 2006, 80(7), 850-860

- [8] Odeh, I., Yohanis, Y.G, and Norton, B, Influence of pumping head isolation and PV array size on PV water pumping system performance. Solar energy, 2006, 80(1), 51-64.
- [9] Wanjura, D.F., Upchurch, D.R. and W. M. Webb. 1991. An automated control system for studying microirrigation. ASAE Annual International Meeting, Paper No. 91-21
- [10] W. Lawrance, B. Wichert, and D. Hgridge, Simulation And performance of a photo-voltaic pumping system, Power Electronics and Drive System, vol. 1, pp. 513-518, 1995.
- [11] S. Singer and J. Appelbaum, —Starting characteristics of direct current motors powered by solar cells, IEEE Trans. Energy Conversion, vol.8, pp.47–53, 1993.
- [12] Clemmens, A.J. 1990. Feedback Control for Surface Irrigation Management. In: Visions of the Future. ASAE Publication 04-90. American Society of Agricultural Engineers, St. Joseph, Michigan, pp. 255-260.
- [13] Priyanka D. Hande and Prof. S.S. Kulkarni, Microcontroller based Irrigation International Journal of Microcircuits and Electronic. Volume 3, Number 1 (2012), pp. 1-6
- [14] Gonzalez, R.A., Struve, D.K. and L.C. Brown. 1992. A computer-controlled drip irrigation system for container plant production. HortTechnology. 2(3):402-407.
- [15] Ayars, J.E., Phene, C.J., Hutmacher, R.B., Davis, K.R., Schoneman, R.A., Vail, S.S. and Mead, R.M. (1999). Subsurface drip irrigation of row crops: a review of 15 years research at the Water Management Research Laboratory. Agricultural Water Management 42: 1-27

## AUTHOR DETAILS

|                                                                                     |                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Polam Balanagamani, pursuing M.Tech (ES) from Nalanda Institute of Engineering and Technology (NIET), Siddharth Nagar, Kantepudi village, Satenepalli Mandal, Guntur dist, AP, INDIA. |
|  | G Chandra Reddy, working as Assistant Professor from Nalanda Institute of Engineering and Technology Siddharth Nagar, Kantepudi village, Satenepalli Mandal, Guntur dist, AP, INDIA.  |