Monitoring and Control of Solar Based Irrigation System Using IOT and Labview

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Abstract: The monitoring and control of different soil parameters are necessary in agriculture. The main objective of this paper is to design an efficient and easy system to monitor soil parameter and accordingly control system in balanced condition. The proposed methodology monitor the changes occured in soil parameters like temperature, moisture, humidity, air quality and also control the system whenever any factor of soil parameter goes higher or lower. A mechanism using ARDUINO and LabVIEW is introduced in this proposed methodology, which will monitor the change in soil parameter and IOT based application is introduced to control the pump and fan to drive system accordingly. Thus through this project we try to prove that control of pump and fan can be easy with the help of mobile application and the monitoring of system parameter.

Keywords: Arduino, LabVIEW, android application.

I. INTRODUCTION

Irrigation is an interior part of world architecture. It is responsible for all the aspects of energy that we get from food and its surveillance. Farmers are the small tokens of this huge field of agriculture. The problem of water scarcity, degrading crops, losing of vitamins and minerals in soil and improper use of available resources has increased difficulties of framers to huge level.

Here on we come up with an idea to comfort farmers that has its some amount of solution for this complication. The remedies can be an automatic and smart system. That knows the amount of resources to be given and vitamin to be extract from the soil.

In [2], Authors have used acoustics technique to detect soil moisture. The measurement is based on water saturation and sound speed in soil. Authors in [4] used microcontroller and used solar supply to design model keeping all sensors in field. The sensors give the result to farmer. Cellular phone is used by farmer to control the water supply without going into field. Motor will be off automatically having the judgement of certain level [4]. Cellular phone and solar panel can be a change leading to automatic irrigation system [7]. Arm for monitoring in real time basis and GPRS model can provide a bigger scope for irrigation [8]. Zigbee and internet things can be prosperous in controlling automation [9]. Microcontroller is used for controlling purpose of water level. The microcontroller based programming is done and it operates the system [10].

This paper main objective is to take input from soil, soil parameters (temperature, moisture, humidity) and few safety parameters (water flow, object estimation and gas extension) by the use of various sensors that create a link between physical and virtual world. This sensor provides sense value of various soil parameters which are given to Arduino board at multiple pins. We will be observing the numeric value of data on the output screen. Meanwhile for better understanding for an illiterate farmer they can experience it on LabVIEW software and have the knowledge about the content in graphical manner. This will give them a better understanding.

Considering an example of temperature of the land sensor provides the exact reading and graphical data. Seating somewhere in comfort farmer decides to operate the pump. So here a farmer can simply operate an application installed on the phone for switching on and off this application as an image of IOT. That would be connected with the cloud computing. A Wi-Fi module requires to increase range. Android app sends an authentication code and this code is a unique identification of combine system of Arduino and server. This on and off signal operate the relay recognise for the proper functioning of pump. The concentration is also given to use alternative source of energy (solar energy). Pump is been powered by this solar energy and grid can be used as backup for supply if required. We provide a voltage sensor to fulfil this requirement. Later on the pump working will let the water to flow into field. Flow sensor can installed on the pipe and will sense the flow of water. This sense output will be again showed on the big

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screen. This way we can create a closed atmosphere where farmer save resources efforts and fell comfort.

Fig 1: Flow chart of the system

II. SYSTEM AND COMPONENTS

- **SENSOR DESIGN**

TYPE OF SENSORS	SENSOR NAME	MEASURING UNIT	SENSOR RANGE	QUANTITY
TEMPERATURE SENSOR	DHT 11	CELSIUS	At 25°C ±2°C	1
MOISTURE SENSOR	YL 69	PERCENTAGE	±100%	1
GAS SENSOR	MQ 135	PPM	±100	1
FLOW SENSOR	YF S201	LT/HR	1-30	1
ULTRASONIC SENSOR	HC SR04	CM	2-80	1

Table 1: Sensor specification

- **LABVIEW**
  LabVIEW which is Virtual Instrumentation Software by which we can monitor different sensors using only single computer. ARDUINO board had been providing us the input signals. We started looking for literature and research papers. Hence we came up with an idea of INTERFACING LabVIEW WITH ARDUINO along LIFA which was cheaper. The concept of IOT allows us to control the pump through our own ANDROID PHONE application**.** As this project is helpful in different applications like in Irrigation and green energy, Garden and many more,
- **ARDUINO**
  it is a basic kit, open source computer hardware and software for building device result, permitting by the manufacturer.
  Specifications
  - **Board type:** microcontroller ATMEGA 328
  - **I/O pin:** 14 digital pin, 6 PWM output, 6 analog pin
  - **USB connection**
  - **Power pack**
  - **Reset button**
  - **16 MHz ceramic resonator**
  - **CPU:** Atmel AVR (8 bit), ARM Cortex MO+ (32 bit), ARM
    Cortex M3 (32 bit), Intex Quark (x86) (32 bit)
  - **Storage:** EEPROM, Flash

  USB cable is used as a connectivity link between computer and board. It is a main body of project as input is taken from ARDUINO UNO and they are taken further as per requirement to either LabVIEW or for Cloud Computing.
- **BLYNK APP**

Blynk app is a platform where you can work along IOS, ARDUINO and various link to operate and perform the parameter of our project. It has various features and operations to build your graphical interface by impulse dragging and dropping of widgets. It is very simple set up and can require only five minutes for operation. It works on ARDUINO and Raspberry-pie. It can be connected to Wi-Fi Ethernet or by other sources. It will provide you an authentication token that will be an unique identification of your board and application, this means you enters into Cloud Computing and are online now. You are ready to operate your creation by Internet of Things.

III. SIMULATIONS AND RESULTS

- **OVERVIEW OF THE SYSTEM**
  The system describe it self in flow diagram. It has majorly developed to control the operation of accessories of agriculture(pump). Sensors gives data, LabVIEW monitores them, IOT and android app gives signalling command relay operates on the command and solar or grid powers the functioning of pump. We determine the execution order of the function and VI's under temperature sensor.
  We have done this work in four stages. In first stage we took input from temperature and humidity sensors and monitor the output. On LabVIEW GUI program. While in second stage we enhance our work by adding this parameter to cloud computing network by IOT and controlling them via blynk app to on/off from an simple android application. In third stage, we use this on/off signal as the tripping command by VK3FF-S-DC5V-C relay. We use another combination of three relay to judge the mode of supply solar or grid. In

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fourth stage we use flow sensor(YFS201), ultra sonic sensor(HCSR04), moisture sensor(YL69), gas sensor(MQ135)for safety precautions against any gas leakage, Animal appearance and water flow in field. Again this data will be shown on screen and farmer can judge and can take decision.

- **Stage v1.0**

➢ In this version we made VI to sense temperature, humidity, moisture level, air quality.
➢ To connect DHT11 sensor to ARDIUNO at digital pin number 2.
➢ To connect YL69 sensor to ARDIUNO at analog pin number 1.
➢ To connect MQ-135 sensor to ARDIUNO analog pin number 0.
➢ Select the com port and run the program in LIFA.
➢ Run the program in LabVIEW and see the output at the front panel.

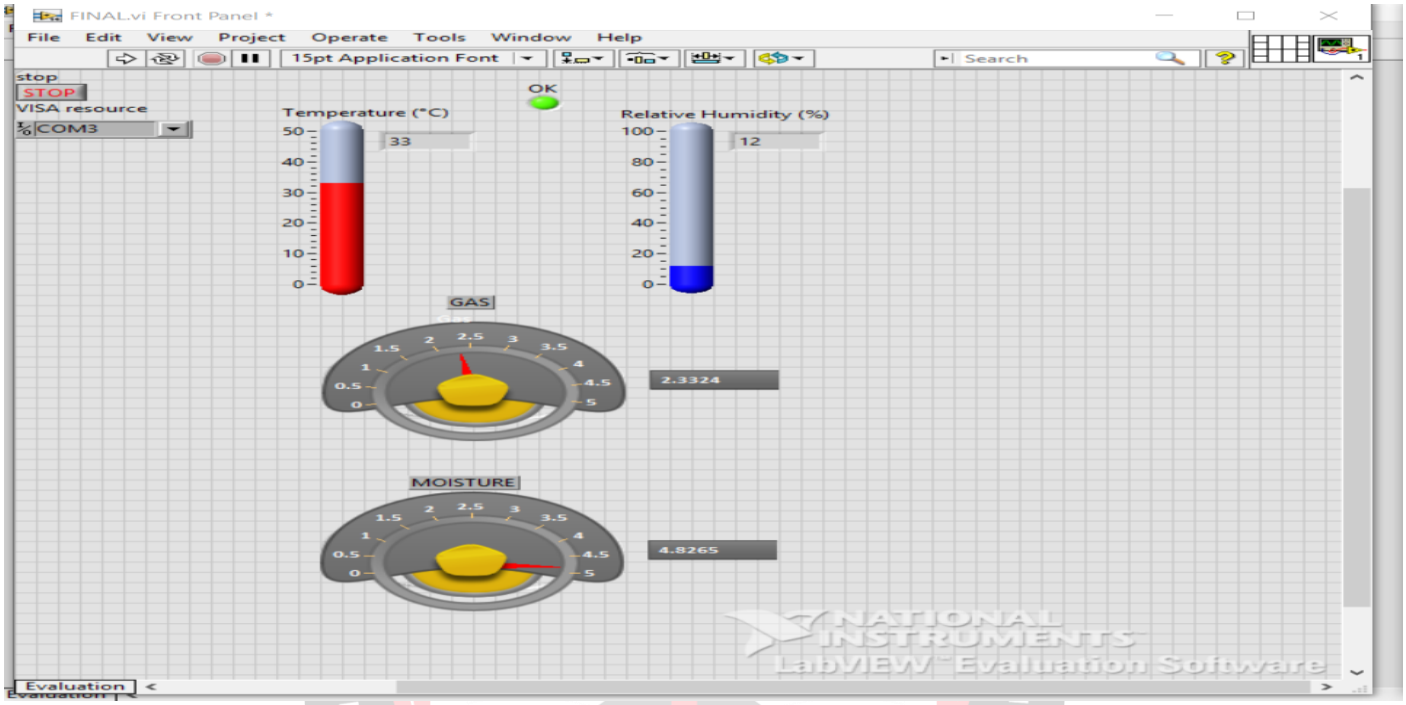

Fig 2: Front panel of system

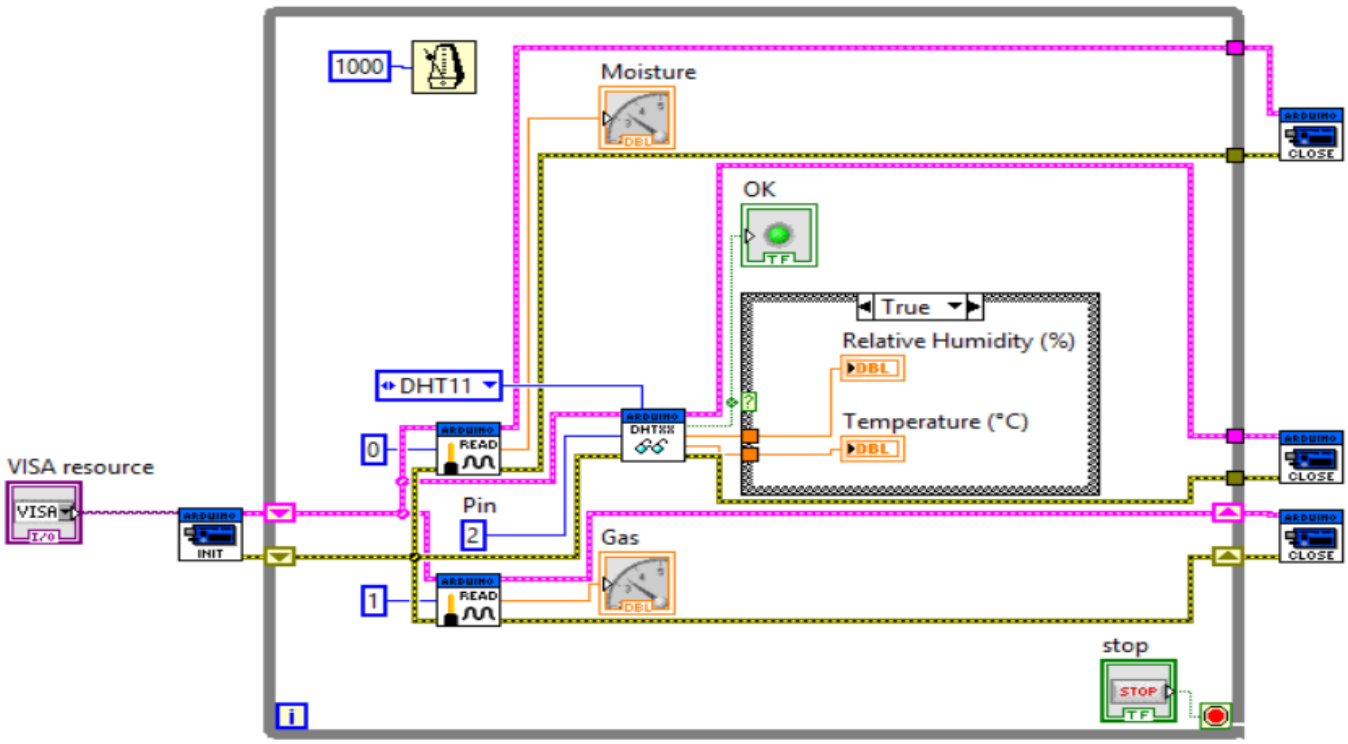

Fig 3: block diagram of the system

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- **Stage v2.0**

➢ We have done the basic programming in the arduino.
➢ When we click ON in the BLYNK app then the authentication code is being send to the prefeered email.
➢ We copy that unique token to the arduino program .
➢ This creates a server link that can control pin no 12 on arduino board.

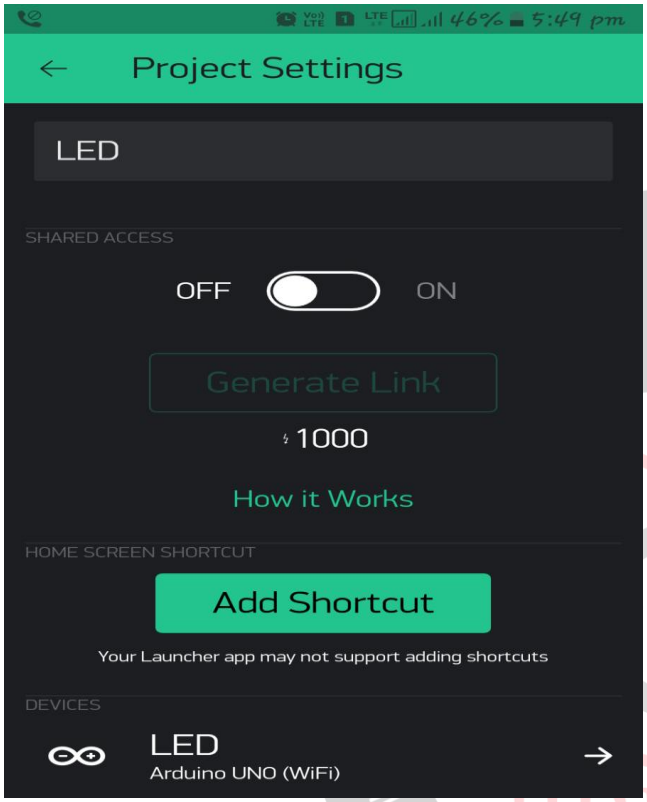

Fig 4: ON/OFF Window

- **Stage v.3.0**

➢ Pin 12 output is given to the relay to control the ON OFF command.
➢ Two relay combinations can be made to decide the mode of supply (solar or grid)
➢ We are using voltage sensor as a reference for switching command to solar and grid.
➢ Using any of these supply pump can be performed.

- **Stage v.4.0**

➢ In this version we have done programming to sense animal appearance and water flow rate.
➢ To connect sensor YF201 to ARDIUNO at digital D2 pin number .
➢ To connect sensor HCSR04 to ARDIUNO at digital D11 and D12 pin number respectively echo and trigger.
➢ Select the com port and run the program in ARDIUNO.
➢ Run the program in and observe the output at screen.

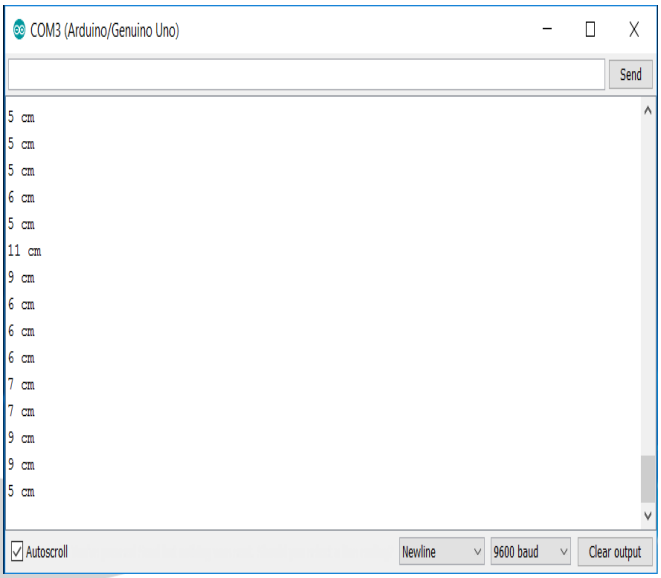

Fig 7: HCSR04 Output

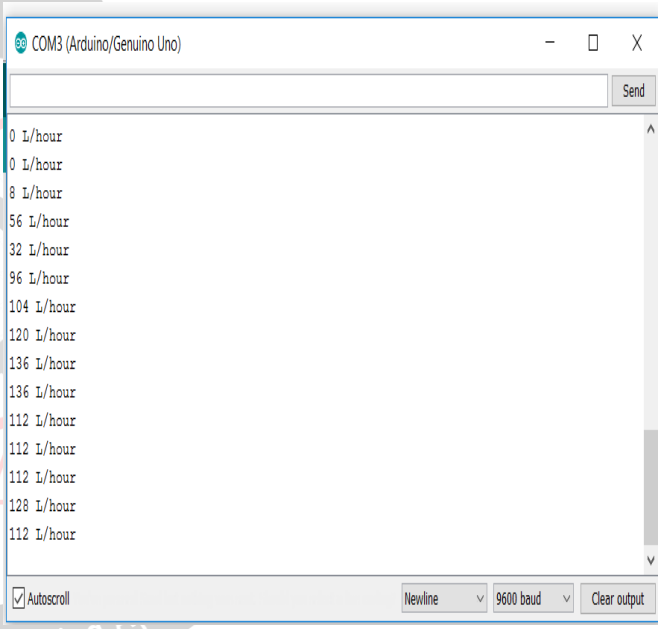

Fig 8: YFS201 output

IV. CONCLUSION

In the concluding lines, we can say that this is for the operation of submersible pump after monitoring the various soil parameters on LabVIEW and the control being done by IOT. It is reliable system for farmer to take agriculture into different era of automation.

We focused on solving these issues and after successful efforts we would be leading towards an era where water scarcity would be covered up and farmer will be much relaxed about crops. We would be creating an atmosphere where not only farmers but every individual consuming by-product takes responsibility of cultivation.

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