Autonomous Flood Gate Control using Arduino UNO with GSM Technology

M. Edwin Lawrance [1]
C. Gobiya [2], V. Gowsalya [2], R. Masi [2], R. M. Priyanka [2]
[1] Assistant Professor, [2] Student
SSM Institute of Engineering and Technology, Dindigul.

***Abstract*— An autonomous flood gate system has been proposed and developed in this project that will be able to open and close gates automatically. This system is capable of sensing drain water and tidal water, it controls a pumps to irrigate excessive water, and DC motors are also used to control the movement of dam gates. . In this project we are using Microcontroller which controls all the operations in regarding the level of water in the dam. Arduino UNO used as a controller, it control the level of Water in dam and send message to the user through GSM Technology. By using this project we can avoid wastage of water and we can reduce the man power for continuous monitoring the water level in the dams.**

Keywords:- Microcontroller; Arduino UNO; GSM technology; pumps;

I. INTRODUCTION.

Dams are the major sources of water supply to cities, they also play a vital role in flood control and can assist river navigation. Most of the dams are built to serve more than one purpose and their benefits are manifold. It is necessary to implement some sort of communication between the metering systems and computer models to provide support in managing the complex systems of the hydro power plants. Generally, the dams are monitored through traditional surveillance techniques and the water management except the monitoring of level of water in some of the dams which is automatized. Management of water resources through dams becomes complex as the number of users depending on dams is huge and these users may have conflicting interests. This situation gets much complex with the fact that the available resources are limited with high possibilities of droughts and floods. This affects the densely populated areas. Dam monitoring is a tedious and long term process which has to be improved step by step. A new system for dam water monitoring and management should be established which can provide water level in real time and can allow us to come to quick conclusions regar ding the safety operations of the dams.using of a PLC ,ARM processor is really expensive and complex for small scale dam project.,Manual operation.Wastage of water.Conveying information to be take more time. For this process we require the components such as microcontroller, GSM modem, control circuitry, power supply and three sensors. These three sensors are placed in three different threshold levels and are connected to the controller. If for suppose the level of water is being increasing in the dam, then immediately when the water level crossed the sensor at level-1, the information is passed to the controller and then the controller checks for the precaution instruction which is given a by the developer and forwards it to the GSM modem. The modem immediately sends that particular SMS to the mobiles for which it is assigned saying that “The Water level has crossed the threshold level-1”. Automatic water pump controller is a series of function to control the Automatic Water Pump Controller Circuit in a reservoir or water storage.The water level sensor is made with a metal plate mounted on the reservoir or water tank.With a sensor in the short to create the top level and a detection sensor for detecting long again made for the lower level.And ground lines connected to the bottom of reservoirs. The controlling part of the water level is also done by the controller through the instructions given by the developer. This includes the operations such as the number of gates to be opened, the number of threshold levels that are crossed. In this process the controller checks the number of threshold levels that are crossed and according to that the gates are being controlled.

II. BLOCK DIAGRAM

In this block diagram, Arduino uno is employed as the processor. Power supply is provided 9v Ac supply to Arduino. Water level sensor used to detect water level as well as DC motor along with gear rack system is implemented in the system to open or closed gates. Micro switch and push switches are used for switching operation. A level sensor to identify the water level of a dam and that should be giving information to the corresponding authority people by using a GSM modem. The basic operation of control unit is the controlling water pump by arduino which is programmed by particular program. Water pump are connected with an output pin of arduino via a relay circuit which is connected with a transistor.

Fig 1 shows the block diagram of proposed system

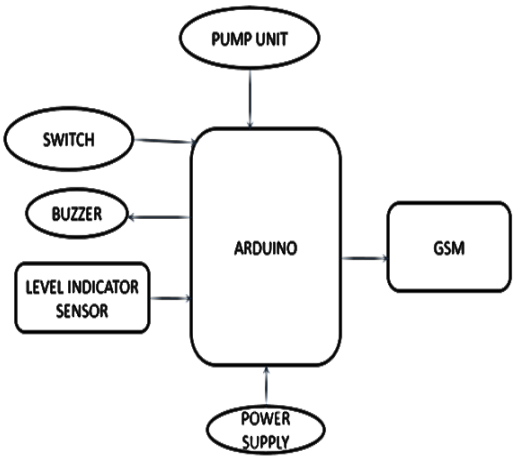

FIG. 1 BLOCK DIAGRAM

A water level sensor will monitor the level of the liquid. Depending on the need, it can be configured to perform a variety of functions for different situations. They could be used to provide feedback on water level, they can be used to control circuits that operate different components and they can be used to send an alarm signal and given information via GSM.

III ARDUINO BOARD

The ARDUINO is a low-power, high-performance CMOS 8-bit Arduino microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel ARDUINO is a powerful Arduino microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. fig 2 shows the ARDUINO BOARD

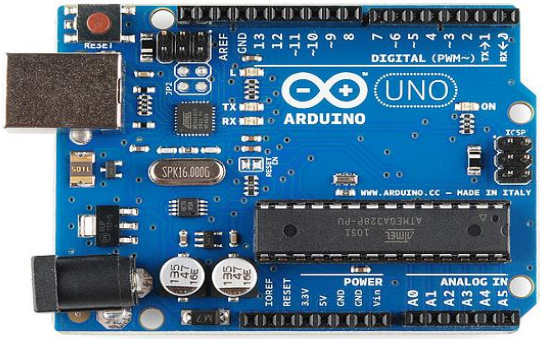

FIG. 2 arduino board

The ARDUINO provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the ARDUINO is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

The on-chip Flash allows the program memory to be reprogrammed in system or by a conventional nonvolatile memory programmer. By combining a versatile8-bit CPU with Flash on a monolithic chip, the Atmel Arduino is a powerful microcomputer which provides a highly- flexible and cost effective solution to many embedded control applications. There are two different memory types: **RAM** and **EEPROM**. Shortly, RAM is used to store variable during program execution, while the EEPROM memory is used to store the program itself, that's why it is often referred to as the 'program memory'. It is clear that the CPU (Central Processing Unit) is the heart of the micro controllers. It is the CPU that will Read the program from the FLASH memory and execute it by interacting with the different peripherals

IV. GSM TECHNOLOGY

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz**.** GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS). The basic GSM network elements are shown in below *figure 3*

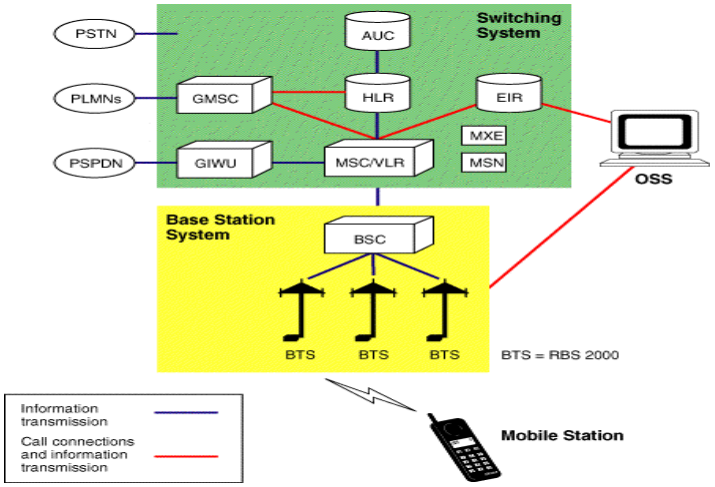

Fig. 3 GSM NETWORK

GSM MODEM:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

V. PROGREES

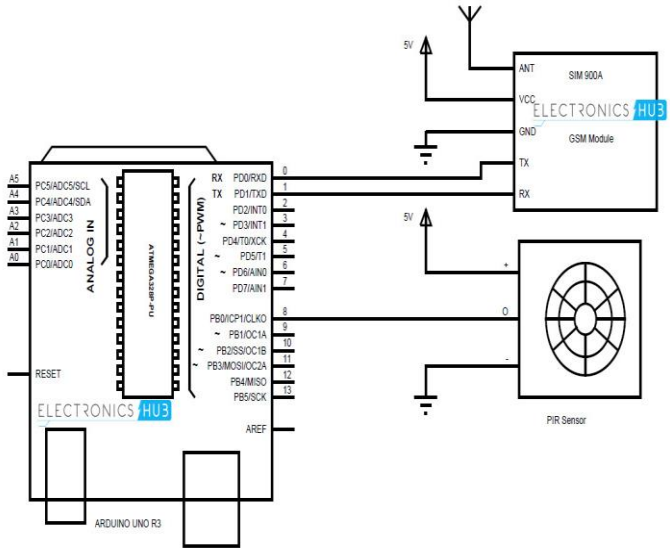

FIG. 4 SCHEMATIC DIAGRAM

In the first stage we plan on geting the data on the level of water using sensors. The sensors are interfaced with a micro controller which transfers the data to a local base station using far field/near field communication. In this stage we deal with transferring the data at shorter distances i.e., at a local base station. The distance might range from few hundred meters to one or two kilometres. The short data transfer modules like Bluetooth or XBee are interfaced with the Arduino and used to transfer the data. In this stage we work on transferring the data to long distances of order of several hundred kilometres. These helps us in gathering the data from all the nodes to a central base station which in turn reads the data and send the commands based on it. The technologies required to achieve this are yet to be finalized. Fig 4 shows the schematic diagram of proposed system.

The proposed idea has been implemented using short range communication sensors and Arduino micro controller. The first stage of the implementation which involves determining the level of water using water level sensors. The water level sensor is mounted on the top of a water container which determines the distance between the top of the container and the surface of the water. If the distance goes below a certain point it indicates that the water level in the container has exceeded optimum level.

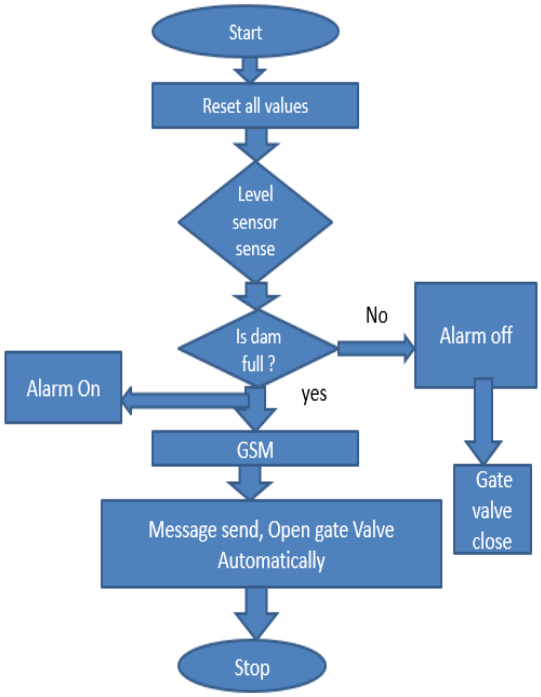

FIG. 5 flowchart

The flowchart shown in fig 5. The starting conditions all the values are reset. The water level sensor to sense the water level in the dam. If the dam is not to be fill, then the alarm in off condition and the gate valve in closed position. Otherwise, the dam water level increases beyond the limit, the alarm was turn on and signal given to the GSM. The message was send to the person and valve are open automatically. After the completion Process was stopped.

The embedded c program was written in the adurino board with the help of software

```
evel_sensor_using_coor_open_anc_dose

int level = A1; // level sensor pin is A0
int door = 2;   // door setup pin is digital pir 2

int val;      // variable for read the sensor value in A0

void setup() {
  Serial.print(9600);
  pinMode(level, INPUT); // level sensor is input for arduino
  pinMode(door, OUTPUT); // door setup is output from arduino
  digitalWrite(door, LOW); //  sum time initially the arduino digital pin is high that's why we set the pin low
}

void loop() {
  val1 = analogRead(A0); // we read the level sensor output from analogread pin A0
  Serial.print(val1);   // display the output in Serial monitor
  if (val1 > 250)       // we set the threshold value for level sensor if level sensor is greater than 250 means the door setup will works
  {
    digitalWrite(door, HIGH); //above 250 means the door setup is high
    delay(150);
    digitalWrite(door, LOW);
  }
  else
  {
    digitalWrite(door, LOW); //below 250 means the door setup is low
  }
}
```

VI HARDWARE IMPLEMENTATION

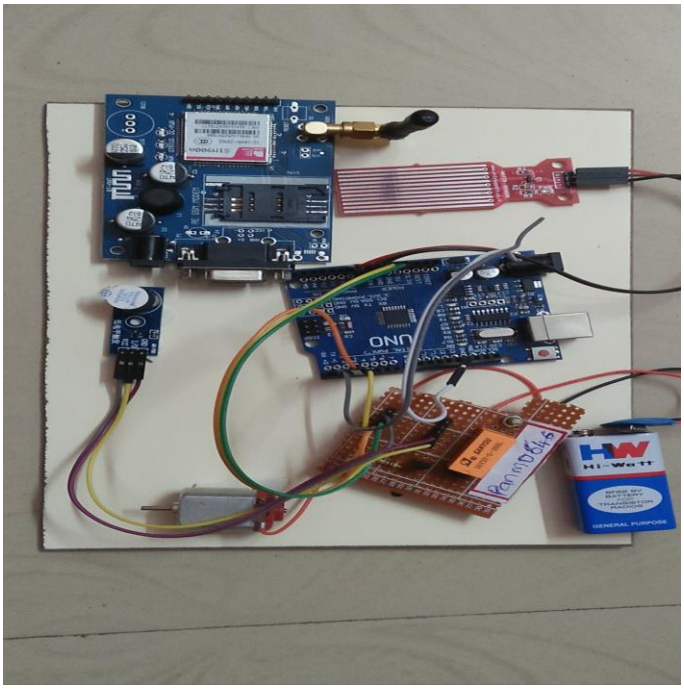

FIG. 6 SCHEMATIC DIAGRAM

The sensor assembly consists of four aluminium wires arranged at 1/4, 1/2, 3/4 and full levels in the tank. The dry ends of these wires are connected to analog input pins A1, A2, A3 and A4 of the Arduino respectively. A fifth wire is positioned at the bottom.The prototype implementation of short range controlling is done as above and the long range communication is under progress.

VII. APPLICATIONS & USES

The above mentioned method will ease the process of water level management on a large scale. We can solve many water related issues by this method. By installing a central command center we are decreasing the manpower required at each and every dam. Since this is a fully automated project, any kind of human intervention has been avoided. So the possibility of faults has also decreased.

In cases of emergency, the override capability will be given to an authorized personnel who can change the command if required. In places where there are issues of water distribution between two areas, this method helps in maintaining neutrality as the command is with the central command center and neither of the areas involved in the fight can give the command.

During times of natural disasters like floods, this method will be very helpful as we don't need to have any human to control near the actual site of the dam. Any command required for the gate opening or gate closing can be given from remote center. This also reduces the response time as the water level data near command center is real time and the decisions are taken almost instantaneously.

Since the data of water levels near all the dams throughout the country are at the same place, a quick decision on the routing of flood water can also be taken. This helps in decreasing the losses due to floods to a significant extent.

VII. CONCLUSIONS

Water is one of the primary resource for human survival. But unfortunately a mammoth amount of water is being squandered by uncontrolled use. There are certain automated water level monitoring systems in practice but they are used for various applications and have some shortness in practice. The main motto of this research work is to establish a flexible, economical and easy configurable system which can solve our water distribution problem between two regions and safeguard the low lying areas from floods etc. among many other issues. Using of a micro controller to manage the data and to reduce the cost. This type of system is more helpful in situations like floods where the automated gate lifting system will check the water levels and react according the situation. This could have a substantial benefit to the research work related to the efficient management of water at dams by reducing the manual work This project involved designing and development of automatic water level control system had exposed to the better way of software and hardware architecture that blends together for the interfacing purposes.The system employs the use of advance sensing technology to detect the water level..

IX. REFERENCES

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