NEER: AUTOMATED WATER DRAINAGE AND ANTI FLOODING SYSTEM

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Abstract - The objective is to implement the setup in a flood prone area. The Arduino driven Automated System will be installed in the low laying areas where the water gets clogged. The IR Sensor (HC-SR04) will detect the depth of the water. If the water exceeds the Safe height, the system will trigger the pump connected to it and drive the water to another way. The depth of water will be constantly displayed on the LCD so that it is kept under constant vigilance by the supervisors. Also the triggering alarm would be indicated by a siren and the flickering LED light. The Arduino UNO and its sub parts are programmed in C++ using Arduino IDE. The various libraries required for the system functioning is called to the program and the methods are implemented as per the requirements. The automated system can be fixed anywhere, where the water monitoring is required, irrespective of the kind of fluid involved. The program once fed in the system makes it run without software support which makes it compatible. The objective of the system is to avoid water overflow in order to prevent the appliances from getting effected.

Keywords - Arduino, Microcontroller, embedded systems, sketch.

I. INTRODUCTION

Water clogging is one of the most common and irksome things that happens post heavy down pour. This causes flooding and other water borne diseases. Clogging of water is caused due to improper drainage of the access water. Hence with this project we aim at solving the problem by diverting the access water to drains once the rain water has reached above a certain mark.

We will be using Embedded systems to work with this project. Embedded Systems consists of a Micro processor or a micro controller, a sensor and an actuator. Micro controller device we are using is Arduino UNO RS, for analyzing the physical feed and simultaneously converting it into digital data. The Arduino UNO RS will be attached to the Sensor (HC-SR04) which will collect data from the physical world and feed it into the processors. The processor will pass on the data to actuators which in this case would consist of a motor pump [3]. Actuators also effect the outer world or any other system attached to it by acting upon it. In this case the access water would be pumped out from low laying areas to the drains.

The Embedded Systems requires software for its functioning. The Arduino micro controller uses Arduino IDE, which is the platform for developing the program according to which the hardware setup will function.

Arduino IDE is an open source which can be used to upload programs to the microcontroller boards. The IDE runs on Windows MAC OS X and Linux. The Arduino language used in the IDE for developing programs are merely a set of functions used in C and C++. The program undergoes a small change like 'automatic generation of function prototypes' and then directly passed on to C/C++ compiler (avr g++).

The program written in the Arduino IDE is called as Sketches and once the program is finished the sketch is uploaded in the micro controller board through a USB cable. The microcontroller pins is connected with sensors and actuators which bring in the action required by the sketch. The Sketch consists of two parts: - the void setup () and void loop (). Void setup () is used to define the pins which is connected to the microcontroller board and void loop is used to type the program for execution.

In this project we define the pins to which the sensor and actuator (including LCD Display and Motor pump) in the void setup [8]. The feed from the physical world will be taken from the pins those are defined failing to which an error message will be shown. The void loop () part will continue to execute the program till the time it is asked to stop. This part will consist of the execution code which will consist of the function performed by the setup finally. The code will determine the water level control and its flow.

Once the program is being fed into the microcontroller board i.e. Arduino UNO RS then the USB cable can be disconnected from the system and the embedded system can be run with the help of external power source.

The external power source and other devices used in the experiment should be very wisely chosen depending upon the electric specifications. Arduino UNO can function up to 5V of electricity; if any device attached to it is of higher electric specification then the micro controller will tend to fuse. Hence the external power provision should be also under control [7].

II. RELATED WORK

Water is one of the most important thing in this world. Recycling the water which is wasted is a very useful technique. Automation of things makes work easier and less complicated. Effectiveness and accuracy of the work is increased. Man power required is less and hence more of it could be invested in monitoring the systems and its proper execution.

We studied papers related to similar execution of automated water.

Precision irrigation is a brand new concept in the field of irrigation. It involves the accurate application of water to meet the specific requirements of individual plants or management units and it is a very important application to minimize adverse environmental impact [1].This method is very useful to use the water in a very efficient and useful manner.

Control of the same irrigation system using a wireless sensor network is a major advancement in the field of irrigation. An irrigation machine is controlled electronically by a logic controller that updates the geographic location of sprinklers from a differential Global Positioning System(GPS) and communicate wirelessly with the computer that is present at the base station. Communication signals that were sent to the base station were successfully interfaced using Bluetooth Wireless technology which is very cost effective. [2].

Intelligent water irrigation using embedded system, which sprinkles the water in the farm at when the water level increases, also time to time on a regular basis. In this case the microcontroller is attached to the sprinklers as the actuators and has two executions. First to sprinkle the water whenever it is in excess and second to sprinkle it regularly from time to time. [3]

Another paper is automated water tap controlling system, where the water whiles it is getting dispensed without getting wasted. The water is dispensed out only when there is an obstacle detected in the way of its sensor. Once there is found to be an obstacle the actuators will be triggered to start dispensing the water flow. [4]

Using of pumps and flushing system is an efficient technique when the waste water has to be pumped from the drainage system. Automated flushing systems plays a very important system that was implemented when a flood hit the town of Cambridge. [5]. The different levels and the types of sensor that will be suitable for the irrigation and the effects of high frequency sensors were also studied. [6]Any system or a working model which consumes a lot of electricity is not efficient. In order to conserve power and the usage of high amount of electricity, we studied the types of power conservation techniques, intelligent light systems and proposed a model which will less power than the other models. [7]

Automated water level sensing and detection is another project prepared which senses the level of the water and detects it with the help of display. This uses a sensor to detect the height of the water and LCD as an actuator to display the level of the water level. [8]

III. PROPOSED WORK

A. ASSEMBLING HARDWARE

The assembling of the Arduino is done by connecting the sensors and the actuators to the Microcontroller. The Sensor(HC-SR04) consist of 4 pins. The Echo pin, Trigger Pin, Vcc and GND. The Echo pin is used to send the IR rays to detect any obstacle [4]. If there is any obstacle in the way of the IR spectrum, the rays get reflected and detected by the trigger pin. The time of the to and fro of the IR rays is detected. The Vcc pin is used to direct voltage to the sensor and GND pin is for ground reference. The ECHO and TRIG pin is connected to the input output pins of the Micro controller, Vcc and GND (HC-SR04) to 5v and GND pins of microcontroller respectively.

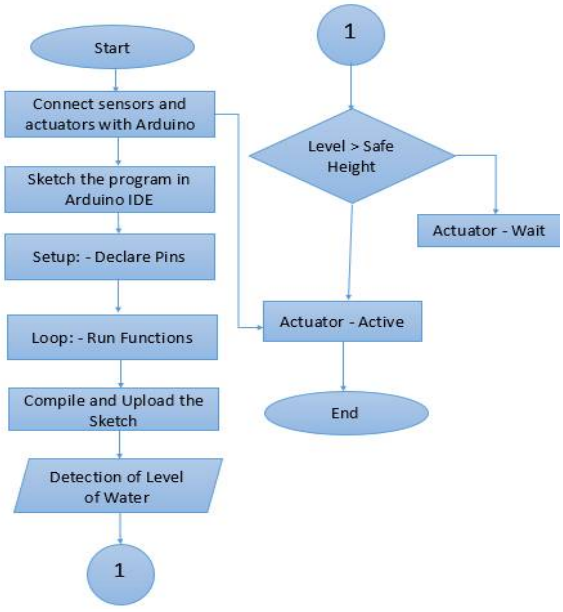
The actuators will be connected to the other Input Output pins of the micro controller. All the pin connections will be defined in the Sketch Program in the void setup () section.

Once the defining of various pin connections is done we move ahead with feeding the sketch to the Microcontroller board.

B. PROGRAMMING THE SKETCH

The programming is done on the Arduino IDE. The libraries used to code are of C/C++ and we compile it in Arduino platform using AVR g++.

The code is compiled and run in the IDE to test for errors. If there is any error, a pop up message will come notifying the error. If no error is detected, we can go ahead with the uploading the sketch to the Microcontroller board.



C. WORKING OF THE SETUP

Once the code is uploaded the USB cable can be detached and the external power source can be provided. This will make the setup portable and easy to install.

The sensor will detect the water level and alert once the level has increased and automatically trigger the motor pump. The pump will drive out extra water and drain it out of the flooding area. We can attach the generator at the end of the drainage pipe to generate electricity

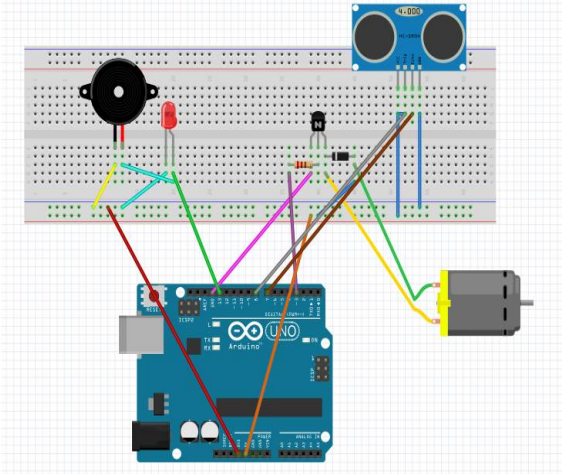


Fig 1: Breadboard Diagram

IV. ANALYSIS AND RESULT

The breadboard is the base where all the electronic parts are assembled before testing the circuit. It is a board for making the experimental model of the electronic circuit.

It. is the platform where the wire connections are made. The Arduino is connected to the components so as to control it. The components are LED, Piezo buzzer, HCSR04 sensor, NPN Transistor 270 ohm resistor, diode, jumper wires and a motor. These are connected to the output pins of the Arduino board as shown in the Fig 1. The maximum voltage of any of the components are up to 5V only, power consumed more than that might result in burning of the Arduino board.

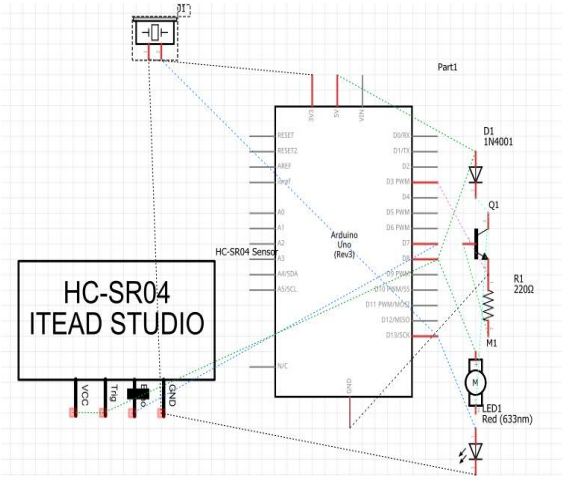


Fig 2: Schematic Diagram

The schematic diagram represents the diagrammatic sketch of the entire setup. It is the universal setup for the Electronic diagram. The details such as the output pins connected to the micro controller and components are presented clearly. For each component pin there is a unique microcontroller pin assigned for the unique function that has to be performed. In the coding part we mention the kind of function that is required out of the particular pin and hence the component respectively.

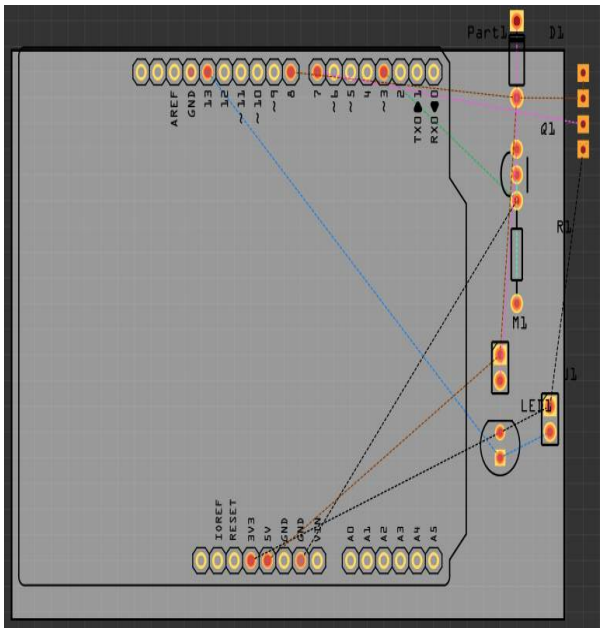


Fig 3: PCB Diagram

i) Commercialization

The Fig 3 represents the PCB (Printed Circuit Board) Diagram of the setup. The diagram represents the most compact representation of the set up. The connections are soldered and made mobile. This is the last step of the demonstration. To make the setup commercial we print the board into a chip.

ii) Preventing the clogging of water

The flood water is drained out as soon as it reaches a particular height, thus preventing the clogging of water which might further result in damage of life and properties. The water can either be diverted into oceans and seas or can be harvested for flood water exploitation.

iii) Water reuse

The flood water can be harvested and reused to generate hydroelectricity. A generator can be fixed at the other end of the pump nozzle and the released water would rotate the turbine producing electricity. We can divert the water at low laying areas after analyzing on the GPS [2].

iv) Spate irrigation purpose

The water clogged can be diverted to the farmlands or gardens for irrigation purpose [3]. In this way the devastating consequences are averted and the low laying areas which need water for crop plantation purpose is irrigated.

v) Industrial usage

The flood water can be diverted to big industries which often require a large amount of water for it to function, like textile industries and mills. Here the water is required to wash the textiles and the appliances. The water can be automatically flushed in to wash the appliances or the textiles [5]. The flood water which otherwise is waste can be used at such spaces and maintain the equilibrium by not further exploiting fresh water.

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