Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 04, April-2021

Control of Water Overflow from Reservoir using SONAR, Wireless Communication Technology and Automation

Dibyajyoti Pandey
M.Tech Computer Science and Engineering
Bankura Unnayani Institute of Engineering
Bankura, West Bengal, India

***Abstract*—The Modern control systems use many sensors and actuators to continuously control and for physical processes. Information exchange among control system components is traditionally done through physical wires. The use of physical wire sensors and actuators limits flexibility, scalability and reliability, since the cabling cost is high, cable connectors are prone to wear and tear, and connector failures can be hard to isolate. By replacing some of the cables with wireless communication networks, costs and risks of connector failures can be decreased, resulting in a more cost-efficient and reliable system.**

The number of vehicles in roads is increasing alarmingly causing many accidents and collision causing huge loss of lives, to control the collision remotely operated collision detection and automatic brake system will reduce this harm.

In modern times the availability of fresh drinking water is decreasing in alarming rate hence, it is of utmost importance to preserve water. In many buildings there is unnecessary wastage of water due to overflow in Overhead Tanks. Automatic Water Level Controller can provide a solution to this problem.

Hence this automatic control system will provide a multipurpose facility to multiple objective in controlling modern systems.

Keywords—Modern Control System, Sensors, Actuators, Collision Detection, Level controller.

I. INTRODUCTION

Today's world is going to an automatic wireless zone, to control the hazard and accident we always need smart control systems. Smart control systems are built with sensors and actuators, but in modern world the need of wireless monitoring and control is much more needed.

With the advances in technology, the use of wireless communication for closed-loop control applications has attracted considerable attention from both academia and industry, especially during the last decade. It is, however, still a relatively immature research area as a lot of issues are still not addressed. Control over wireless networks is a cross-disciplinary research, as it requires a good understanding of the interaction between control and communication. Currently, engineers in both disciplines deal with many different problems arising when designing wireless networked control systems. On the one hand, communication engineers attempt to design novel scheduling algorithms to satisfy higher reliability requirements on transmissions while reducing the end-to-end latency and battery power consumption. On the other hand, control engineers are developing new analytical tools to improve the robustness of the closed-loop control systems against network imperfections, such as delays, data loss, data quantization, and time-varying sampling.

In this thesis, we propose new analysis and design frameworks to improve the performance and accuracy of data to provide a good control over various device used. An water level Indicator and controller is a best way to convey the requirement of control system.

A Water Level Indicator is a device by which the users can get the information of any water reservoir. This system is quite useful to reduce the wastage of water from any reservoir, while filling such reservoirs [1]. Availability of water resource in many regions of the world is decreasing and becomes a dominant issue now a day. This problem is arising because of poor water allocation, inefficient use, and lack of adequate and integrated water management. Water is in general used for agriculture, industry, and domestic fields of consumption [2]. That is why it is becoming an important matter of concern for efficient use and water monitoring and water management system for home or office. Recently there are many systems have been developed to ensure the proper utilization of this resource with minimum wastage. Proper monitoring of water level and its management can be a task for government and residence perspective [3].

II. RELATED WORKS

There are many proposed methods for finding the liquid level or distance between two objects and control the system in literature.

Automated water level controller can be used in Hotels, Factories, Homes, Apartments and Commercial Complexes, etc. Automatic water level controller will automatically "START ON" the pump set as soon as the water level falls below the predetermined level and shall "SWITCH OFF" the pump set as soon as tank is full. It can be used to predict flood, liquid level indicator in the huge containers in the companies, Fuel level indicator in vehicles [4].

Sensor is a device that responds to a physical stimulus (as heat, light, sound, pressure, magnetism, or a particular motion) and transmits a resulting impulse (as for measurement or operating a control). Sensor is important for taking input from the environment to the microcontroller. The specific input could be light, heat, motion, moisture, pressure, or any one of

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 04, April-2021

a great number of other environmental phenomena. The output is generally a signal that is converted to human-readable display at the sensor location or transmitted electronically over a network for reading or further processing [5]. In our project, we have used Sonar (sound navigation and ranging) as our main sensor to control level or distance between two objects and respond with output signal. We have also used HC-12 multi-channel wireless transceiver to transmit and receive serial data. HC-12 is a 100mW full duplex transmitter [6]. Arduino Nano is used as controller in both transmitter and receiver unit which is connected with HC-12 unit to process the signal.

Working of circuit modules

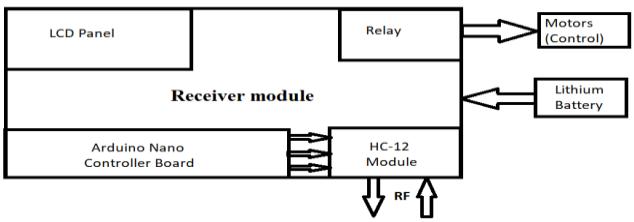
The level controller is mainly dependent on two major modules one is transmitter module and other is receiver module.

Transmitter module consists of Arduino Nano, HC-12 unit and a sonar, with a 12v battery with solar charger to make this unit portable and work in remote locations without any power, wire or charging requirements.

The Receiver module consists of Arduino Nano with HC-12 unit, an LCD unit to display the current level and a relay unit to control the mechanical motorized part as a feedback.

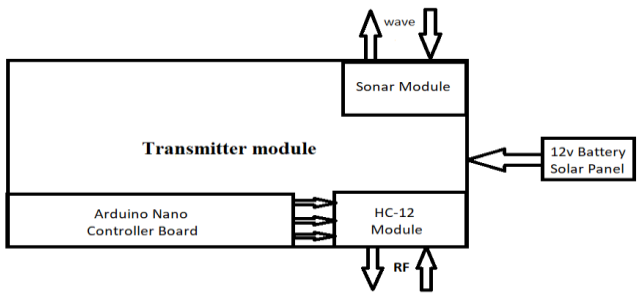
III. DETAIL DESIGN CONSTRUCTIONS

Receiver Module



This receiver module consists of an Arduino Nano controller board which is connected with HC-12 module a Radio Frequency (RF) Trans-Receiver. When a data is received (ON/OFF) by this module & this signal goes to the controller board and gets processed and an acknowledged signal is sent to sender (Relay) when the signal is ON then the relay turns on by the Arduino module, which further turns on the mechanical Motorized part. Again, when the signal is OFF, then the relay is turned OFF. This controller board also consists of an LCD display which receive the signal from the controller and shows user a message/information about the level of water and whether the Motor is ON/OFF.

Transmitter Module



This Transmitter module also consists of an Arduino Nano controller board which is connected with HC-12 module which is connected with a sonar module to measure the height of water level and feedback the signal to controller board. The controller board is programmed such as when the water level reaches to a particular height (Low level), it conveys ON signal through HC-12 to the Receiver module, and when the water level reaches to a particular height (High level), it conveys OFF signal through HC-12 to the Receiver module.

To make the device fully wireless the Transmitter module is connected with a 12V lithium battery and to charge this a solar panel is also connected with this.

A. *Applications*

This device can be used in multiple applied ways such as:

1. It can be used in large scale to control the water level in dams to prevent flood and other such problems.
2. It can be used to control water wastage in the municipality corporation tanks which supply water in a particular area.
3. It can be used in auto braking systems (anti-collision system) in vehicles.
4. It can be used in various industrial purposes as well.

IV. CONCLUSION

Automation of the various components around us has been widely increased to reduce human intervention and save time. It is known that improper water management can have harmful effects on both the system and the environment. The main objective of this project is not only to reduce manual labor but also help save water in an efficient manner. Finally, a conclusion can be drawn that this project can definitely be useful on a large-scale basis due to its minimum requirement of man power and also the installation process being easier making it more compatible for everyone to use.

REFERENCES

[1] HAFISA HAMEED, JOMOL T JOSEPH, " STUDY ON WATER LEVEL SENSORS", Water and Land Management Training and Research Institute

[2] Gunther Gridling, Bettina Weiss, " Introduction to Microcontrollers ", Vienna University of Technology, Institute of Computer Engineering, Embedded Computing Systems Group, Version 1.

[3] Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, "The avr microcontroller and embedded system using assembly and c",Pearson Publishers.

[4] O. Roy, A. Roy and D. Roy, “Automatic Water Level Indicator,” International Journal of Emerging Trends in Engineering and Development, Vol. 2 (6), March 2016, pp. 145-148.

[5] S. Bennett, “A History of Control Engineering 1930– 1955,” Peter Peregrinus Ltd, London, 1993.

[6] HC-12 Wireless rf uart communication module v2.4 user manual