Visvesvaraya Technological University, Belagavi

Sri Venkateshwara College of Engineering

Department of Electronics & Communication Engineering

(Accredited by NBA)

Final Project Presentation on

"*IoT BASED SMART WATER QUALITY MONITORING and FLOW CONTROL SYSTEM*"

Presented by

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CONTENTS

ABSTRACT

Water pollution is certainly one of the most important fears for the inexperienced globalization. In order to provide clean water, the quality needs to be monitored in real time. In this project, we present a low cost system for real time tracking of the water quality using IOT. The system consists of numerous sensors which are used to measure both physical and chemical parameters of the water. The measured values from the sensors can be processed through the Arduino controller and the working of the pump depends on these values. Finally, the sensor value can be viewed on the internet using cloud technology.

INTRODUCTION

- Over the past few decades, water has gradually succumbed to a fair degree of pollution.
- Chemical waste and oil-spills have become major pollutants. Eliminating pollution altogether seems impossible but limiting its effects is certainly possible.
- Dirty or contaminated water is used for drinking purpose without any proper treatment in many developing countries.

Fig 1: Drinking dirty water [1]

Fig 2: Dirty water from the tap [2]

LITERATURE REVIEW

SL. NO	Paper Details	Limitation	Future Enhancement
1.	N Vijayakumar and R Ramya "The Real Time Monitoring Of Water Quality" 2019 IEEE Sponsored 2nd International Conference on Innovations in Information, Embedded and Communication systems (ICIIECS)	• Simple sensors are used to sense the data and an LCD is used to display them. • No other component is used to store the data .	• Data is measured using sensors and they are stored in the cloud. • This helps in using the stored data for future usage.
2.	Yogesh K. Taru and Anil Karwankar "Water monitoring system using arduino with Labview" 2018– IEEE Conference Publication	• LABVIEW is used as a tool to process and send data to the cloud. • But this tool is not free of cost and requires a lot of hardware.	• Wi-Fi module is used to send the collected data to the cloud. • So it is cost effective and requires less components.

SL. NO	Paper Details	Limitation	Future Enhancement
3.	K. S. D. Krishnan and P. T. V. Bhuvaneswari, “Multiple linear regression based water quality parameter modeling to detect hexavalent chromium in drinking water” in 2017 International Conference on Wireless Communications, Signal Processing and Networking, 2017.	• Different parameters like conductivity, pH are read and displayed on the LCD . • But no wireless communication device is used to store and used them later.	• IoT is used as a platform to view the data from anywhere. • Water flow is based on pH, turbidity and water quality.
4.	Y. Wang, J. Zhou, K. Chen, Y. Wang, and L. Liu, “Water quality prediction method based on LSTM neural network” in 2017 12th International Conference on Intelligent Systems and Knowledge Engineering (ISKE), 2017	• Predictions of water quality is done using machine learning and the data collected from past years but not using sensors. • Hence accuracy of prediction is low.	• Measurement and prediction of quality is based on the real time data . • Detected by the sensors. • Hence accuracy of prediction is high.

SL. NO	Paper Details	Limitation	Future Enhancement
5.	"Smart Water" , open access journal published under the SpringerOpen brand in July 2017	• Communication here is done using 3G and internet which requires additional SIM card. • Large quantity of data storage and retrieving is not possible.	• Wi-Fi module is connected to the controller, which enables the controller to get connected to the nearest Wi-Fi hotspot and subsequently to the Internet cloud.
6.	Zoltan Kovacs, György Bázár, Mitsue Oshima, Shogo Shigeoka, "Water spectral pattern as holistic marker for water quality monitoring", Talanta journal, Vol 147 - January 2016	• UV-light spectrometer is used to measure the impurities present in water based on the spectral pattern produced. • This method is very costly.	• Sensor based system is more cost effective when compared to the spectrometer.

OBJECTIVES

The objectives of the proposed system are:

- To understand the existing water purification systems.
- To build a system to determine various water parameters such as pH, temperature, conductivity, turbidity and to measure the level of water.
- To design a system to purify the polluted water using a filter.
- To implement a system where the pump is turned ON and OFF automatically based on the water level.
- To analyze and store the recorded data and to use it for future purpose.

METHODOLOGY

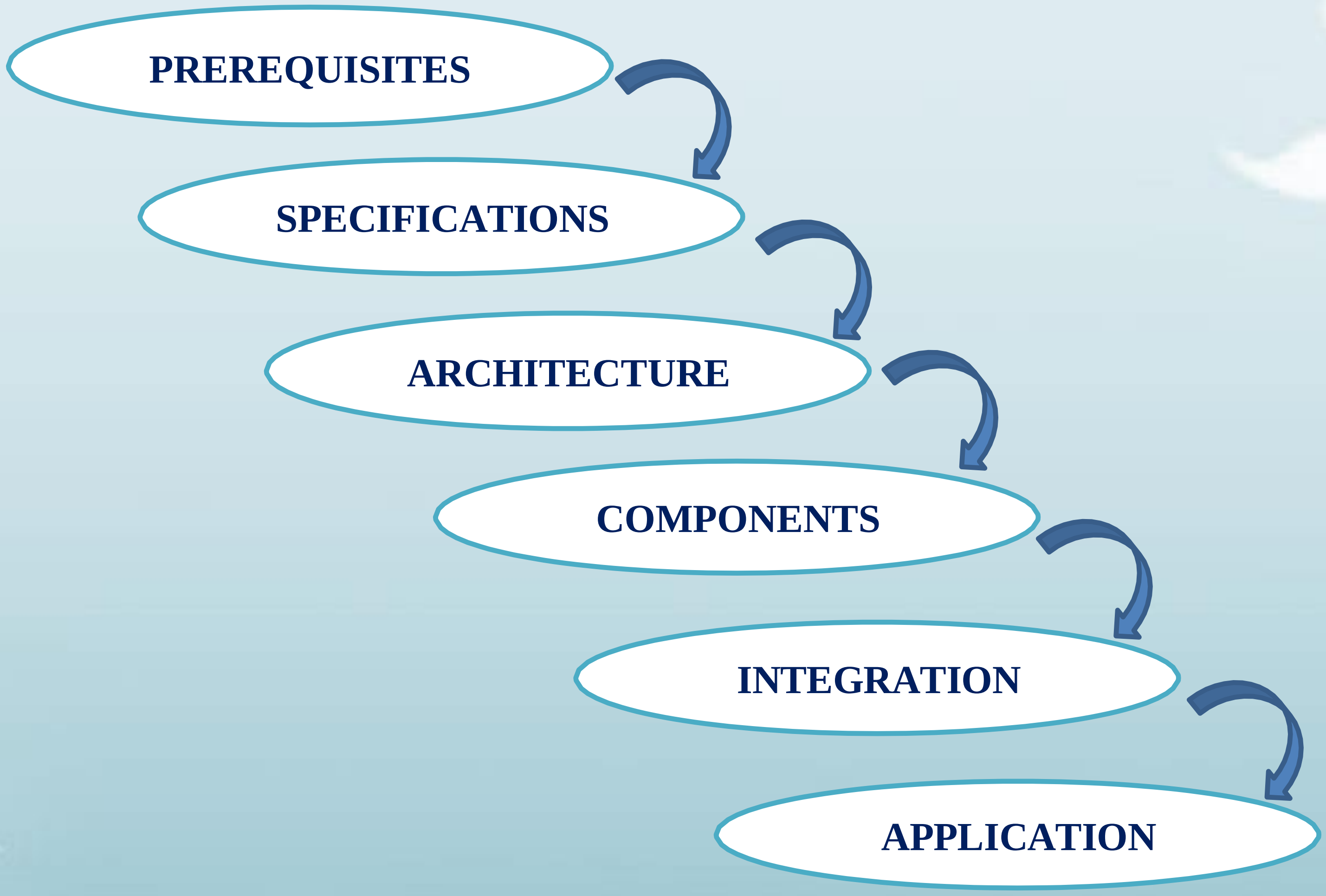


Fig:3 Sequence of flow of the proposed work

PREREQUISITES STAGE

It is the main degree of the project procedure which portrays the conditions and tasks. It is divided in to two types:

- Functional
- Non-functional

SPECIFICATIONS STAGE

Specification is a detailed description of the components. The table gives a specification of devices used:

SL.NO	DEVICE	SPECIFICATIONS
1	Microcontroller	Arduino Uno ATmega328P
2	Sensors	pH, Turbidity, Conductivity, Temperature, Water level
3	Wi-Fi Module	ESP8266
4	LCD Display	16x2 LCD
5	Filter	Sediment RO Filter

Table 1: Specifications of the components used

ARCHITECTURE STAGE

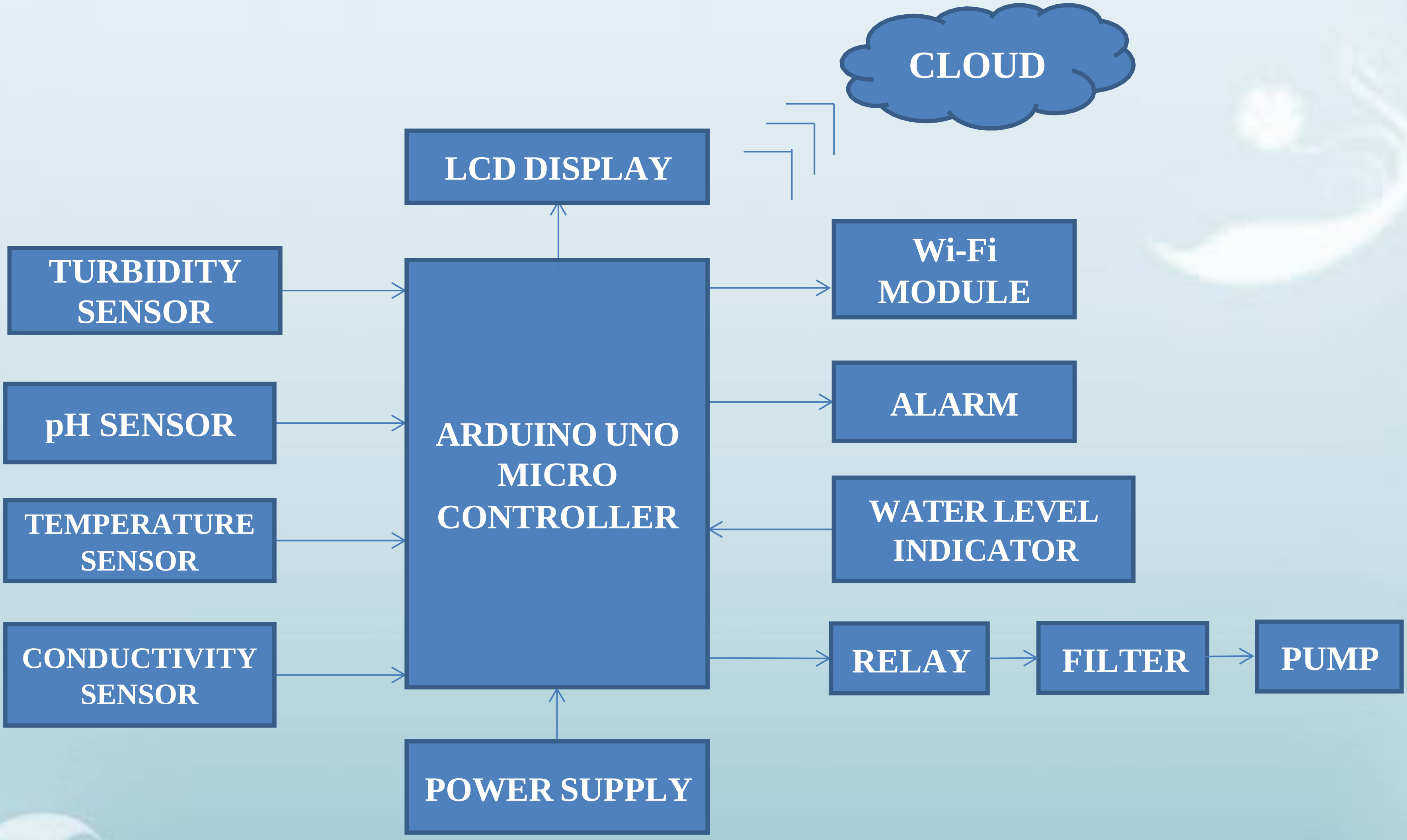


Fig4: Block diagram of IoT based SMART WATER QUALITY MONITORING and FLOW CONTROL SYSTEM

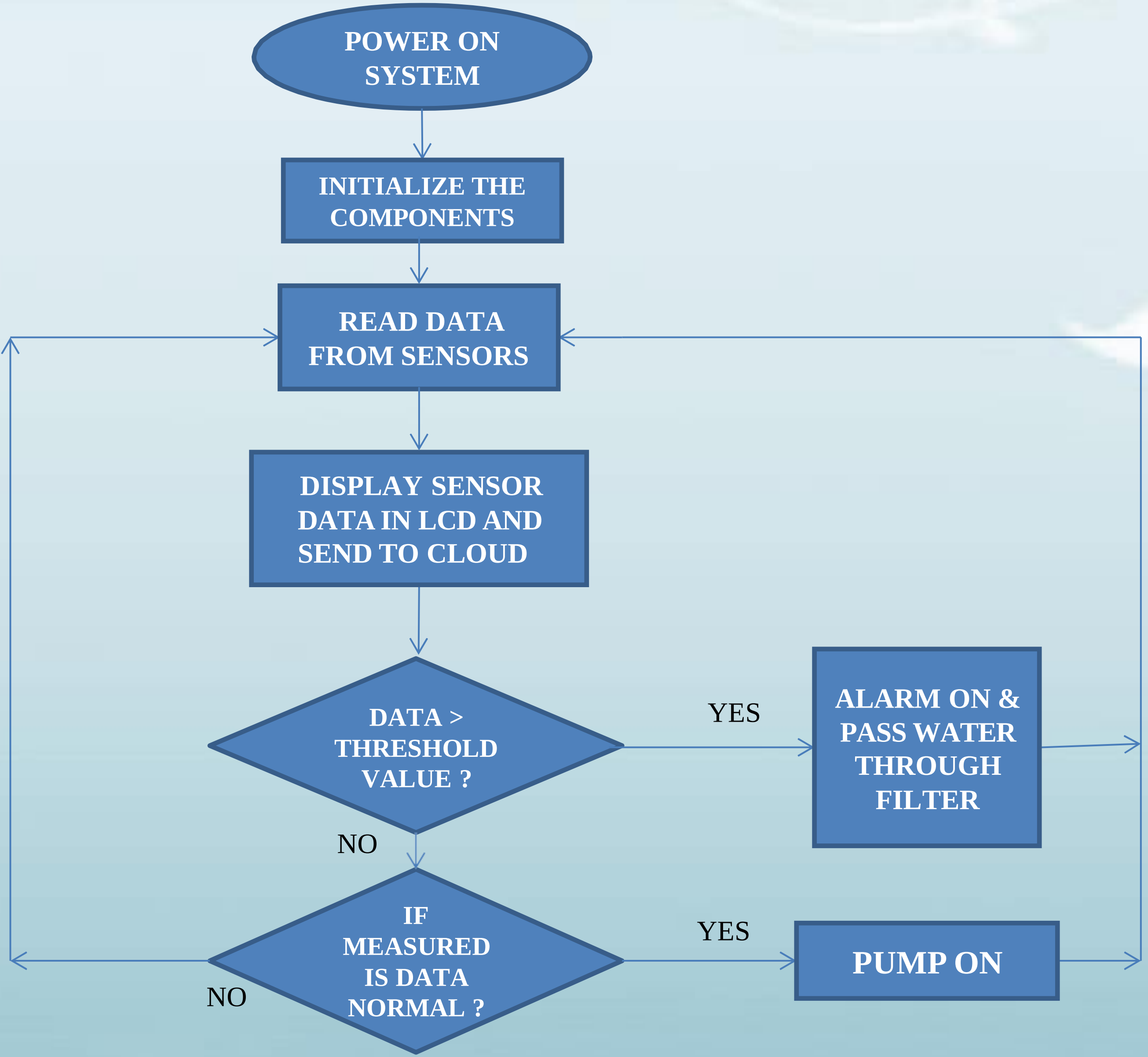


Figure 5: Flowchart of IoT based SMART WATER QUALITY MONITORING and FLOW CONTROL SYSTEM

ALGORITHM

1) Power ON the system.
2) Initialize the Arduino microcontroller, Wi-Fi module, LCD and assign threshold values to all the sensors.
3) After initialization, read the pH sensor, water level sensor, turbidity sensor, conductivity sensor and temperature sensor.
4) Display sensor data on the LCD and all the sensor data is uploaded to the cloud.
5) If values of pH, turbidity, conductivity and temperature sensors are all greater than the threshold value, then alarm will be ON and water is passed through the filter.
6) Water will be pumped if the water level and sensor data is normal.

INTEGRATION STAGE

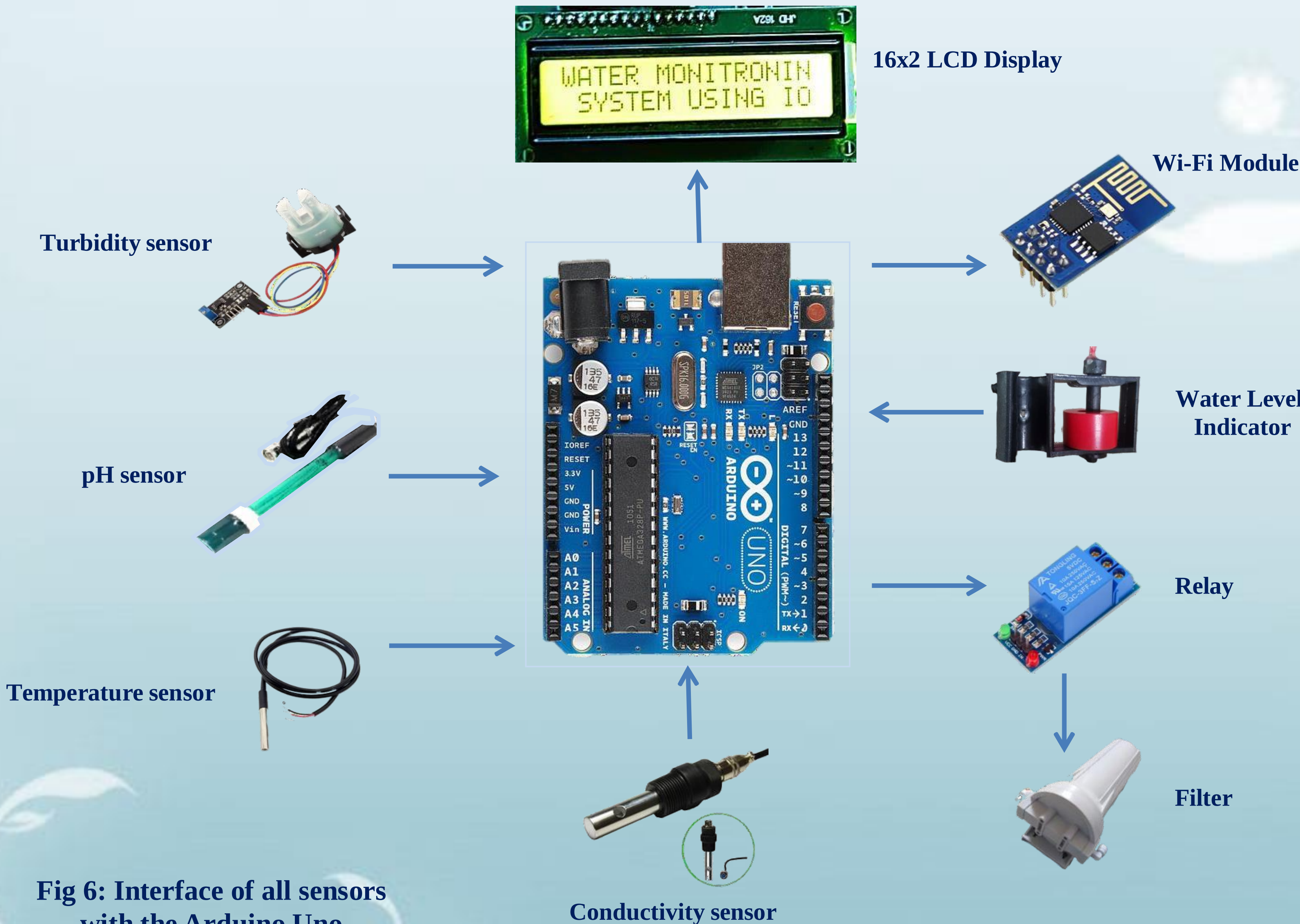


Fig 6: Interface of all sensors with the Arduino Uno

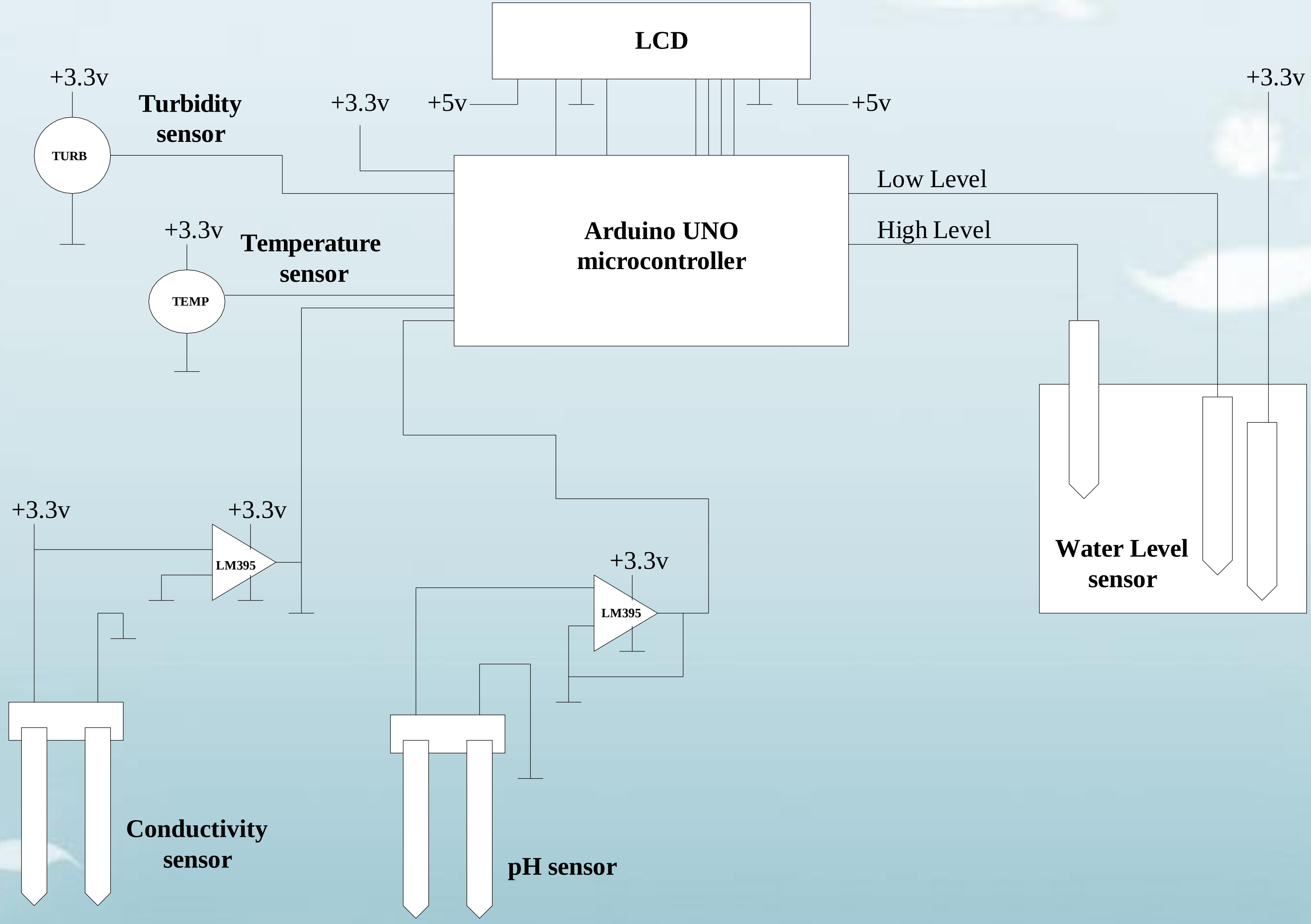


Fig 7: Circuit diagram showing the interface of all sensors with the Arduino Uno

IMPLEMENTATION OF TECHNIQUES

INTERFACINGOF ALL THE SENSORS

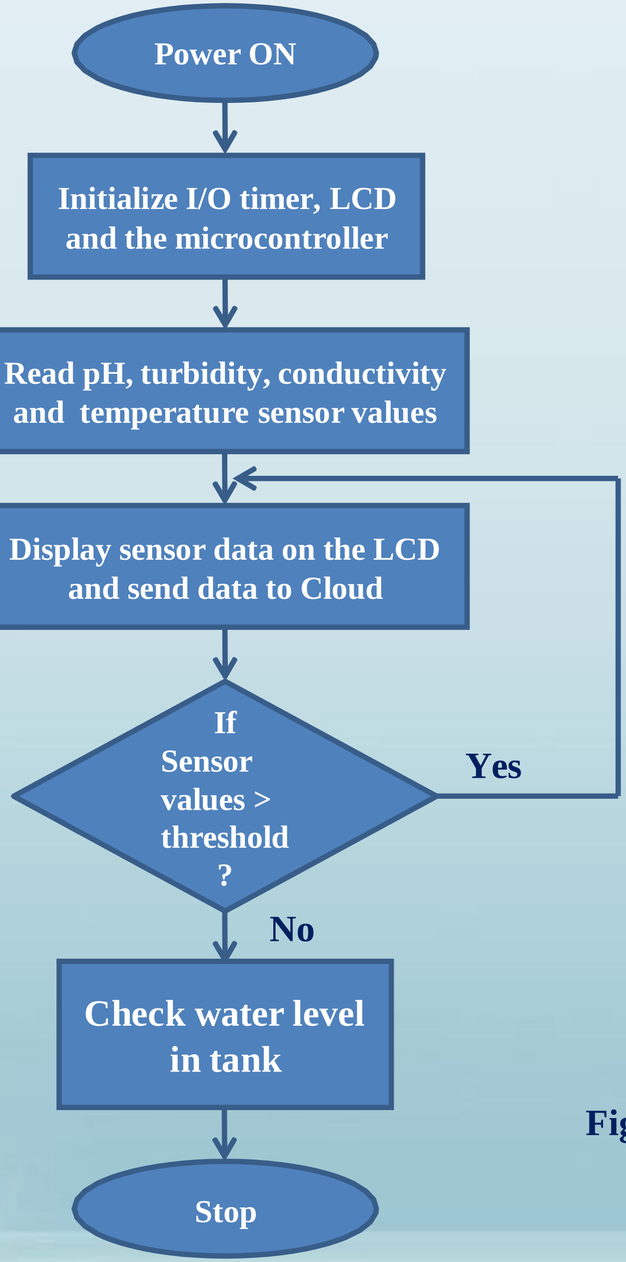


Fig 8: Interfacing of all sensors

INTERFACING OF AUTOMATIC PUMP

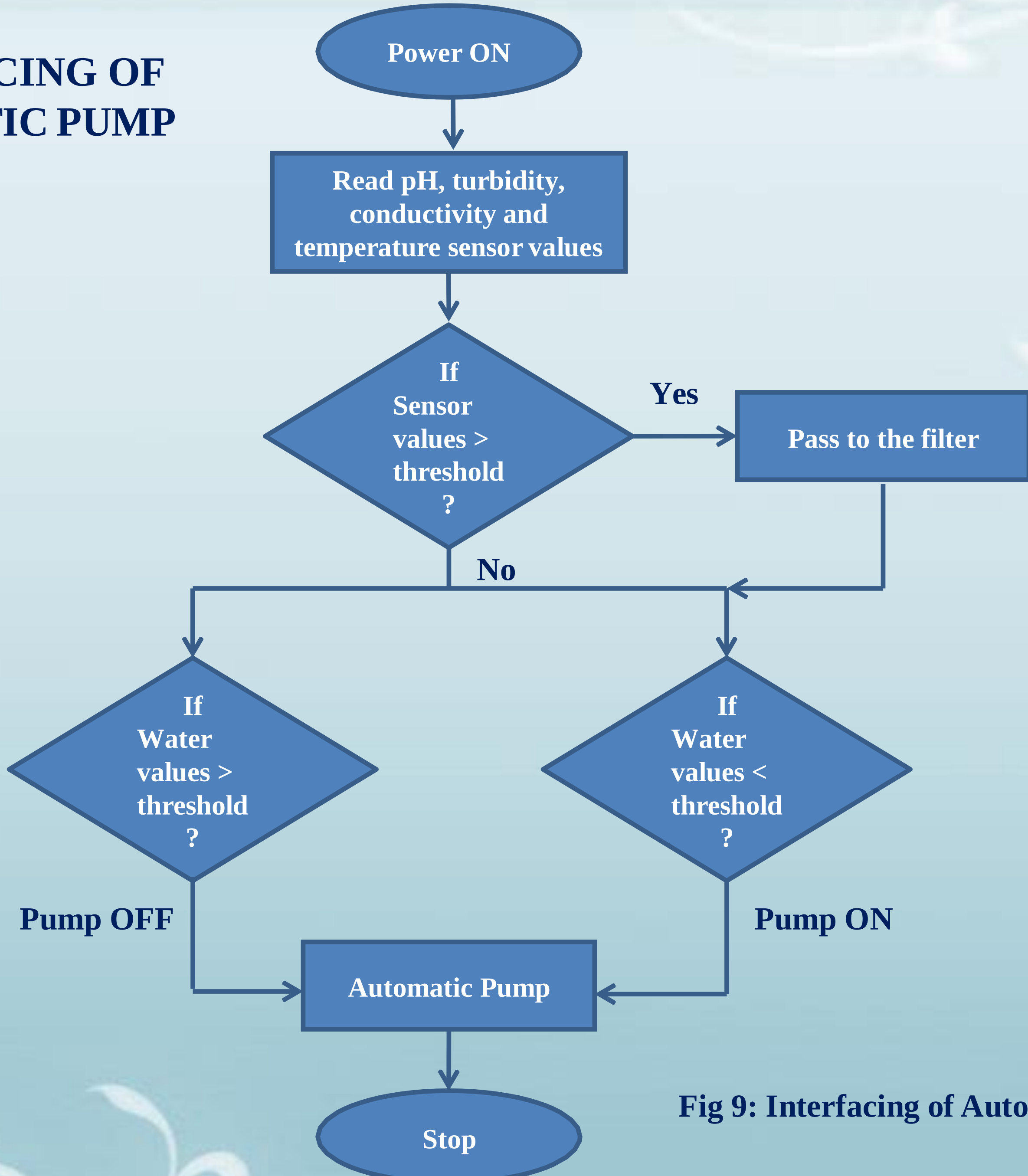


Fig 9: Interfacing of Automatic pump

DATA TRANSMISSION METHOD USED IN PRESENT SYSTEM

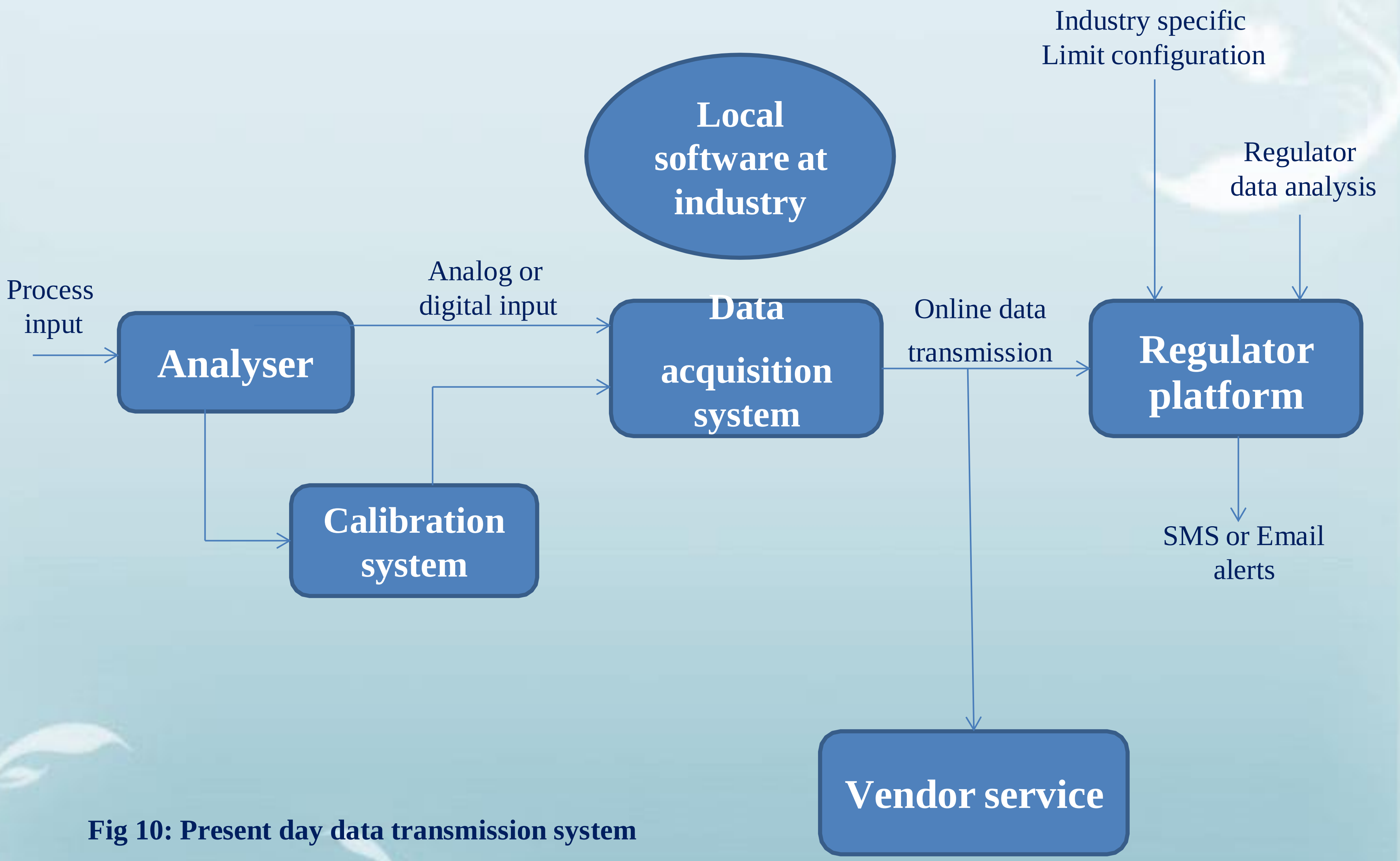


Fig 10: Present day data transmission system

DISADVANTAGES OF THE EXISTING SYSTEM

- Setting Upper Clamp
- Changing Linearization Co-efficient
- Changing Analyser Range
- Data Simulation from Vendor Server
- File Based Data Transfer
- Non-Continuous Data

DATA TRANSMISSION METHOD USED IN FUTURE SYSTEMS

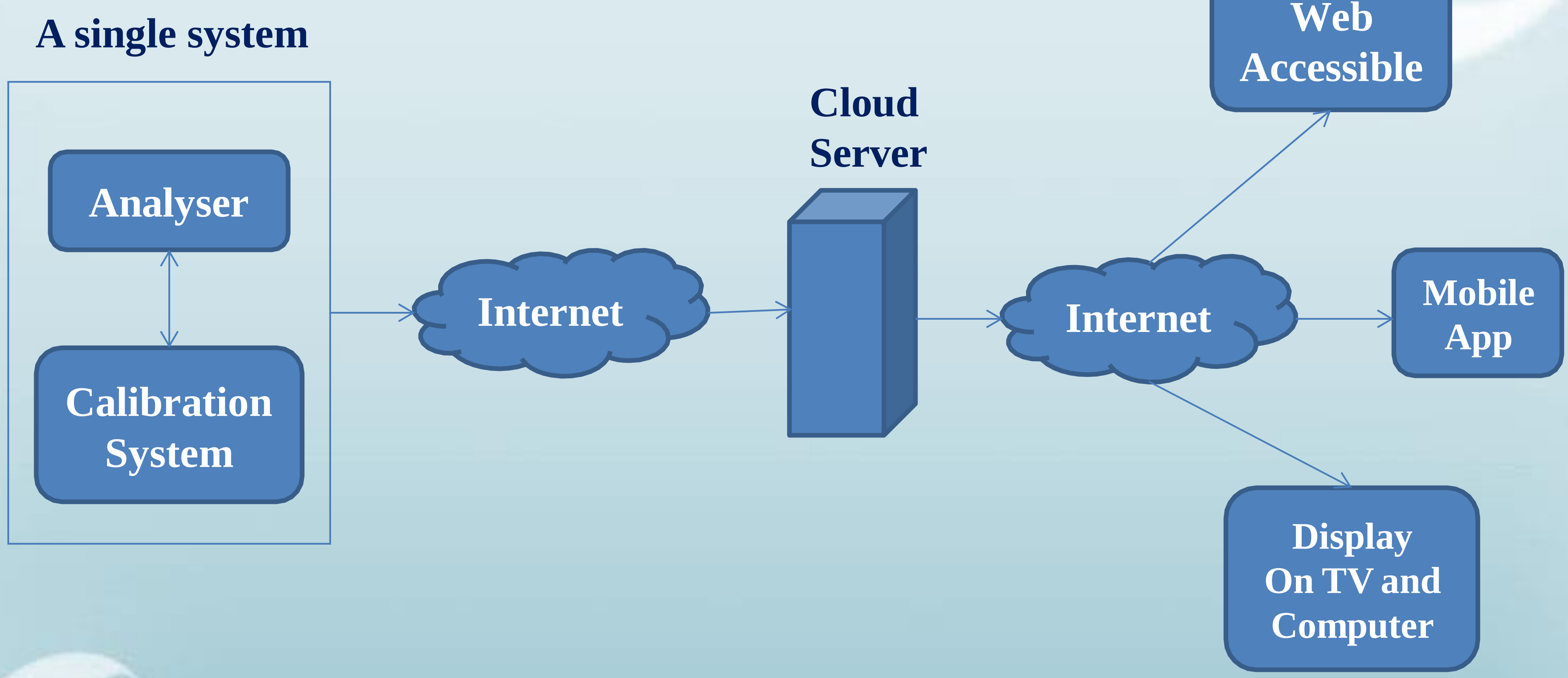


Fig 11: Data transmission system used in our project

RESULTS AND DISCUSSIONS

APPLICATION STAGE

Safe range for all the sensors values set according to WHO standards.

PARAMETERS MONITORED	QUALITY RANGE	UNITS
Turbidity	0.1-5	NTU
pH	6.5-8.5	pH
Conductivity	300-800	microS/cm
Temperature	27-29	Celsius

Table 2: Range for all the sensor

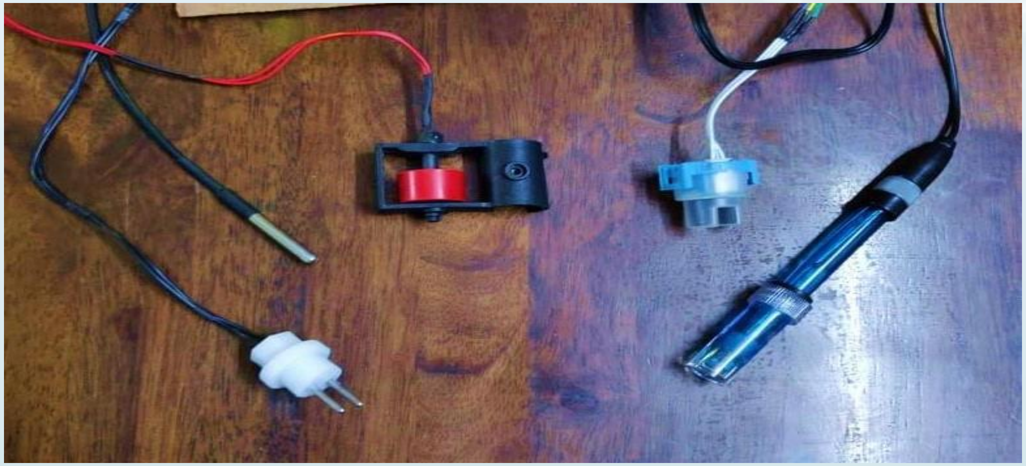


Fig 12: All the sensors used
(from left: Conductivity sensor, Temperature sensor, water level sensor, Turbidity sensor, pH sensor)

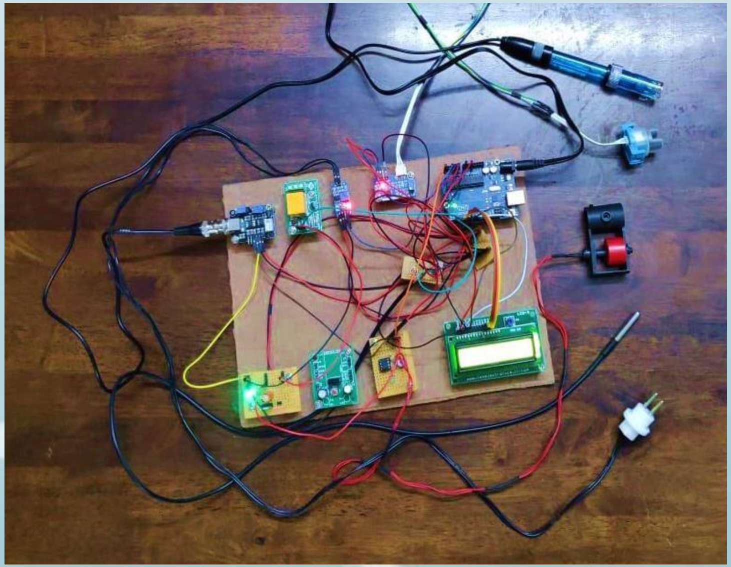


Fig 13: Interface of all sensors with Arduino UNO

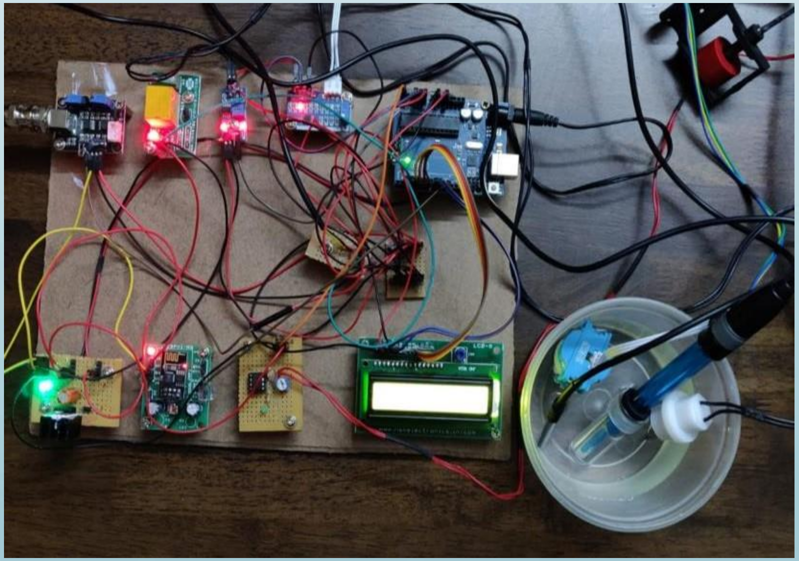
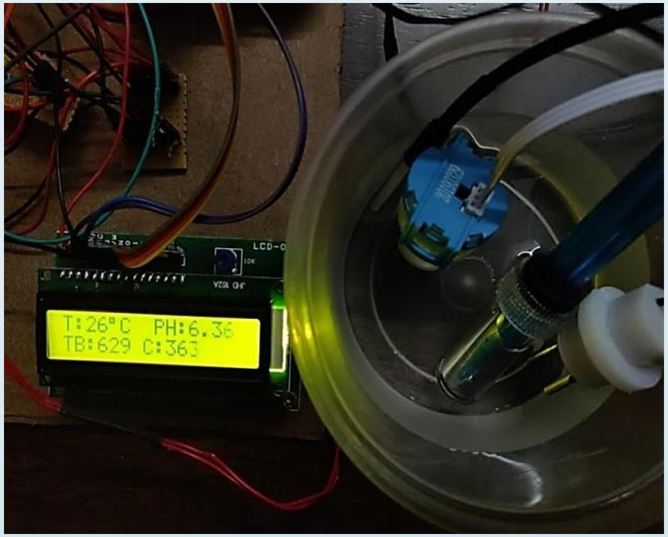


Fig 14: Sensors in water

Fig 15, 16, 17 and 18: LCD displaying the project title, WiFi connectivity and the values of various components



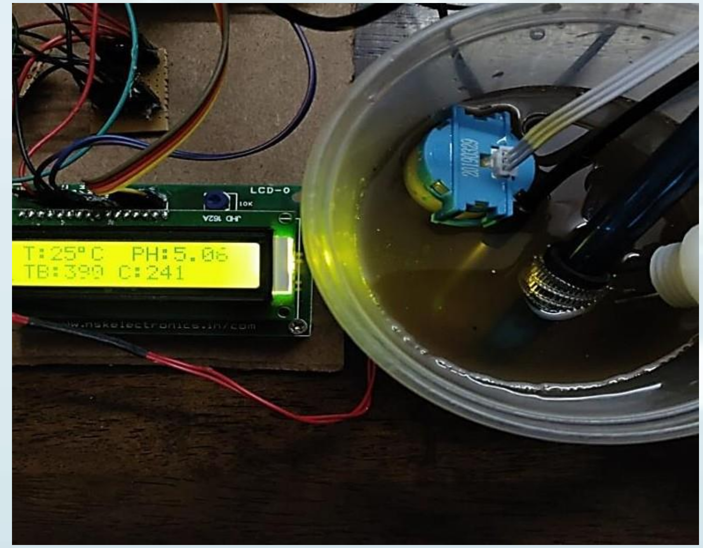


Fig 19 and 20: LCD displaying the values of parameters

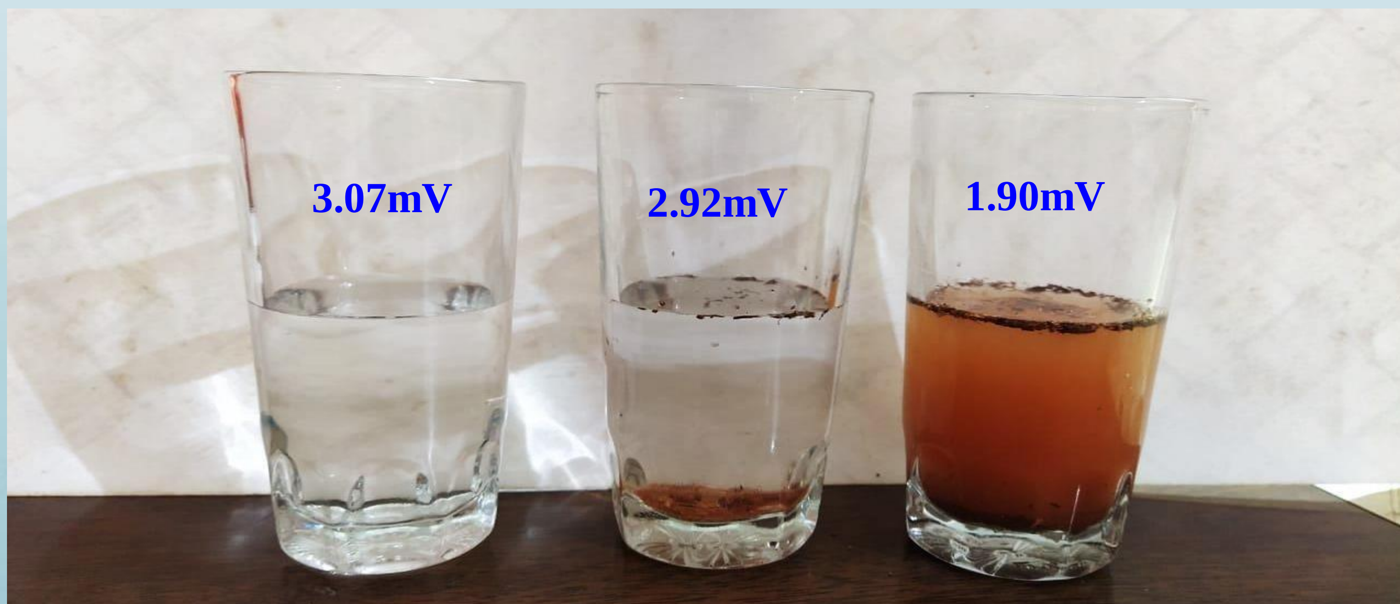


Fig 21: Different water samples with turbidity values

WATER TYPE	TEMPERATURE	pH	TRBIDIDITY		CONDUCTIVITY
			ANALOG VALUE	VOLTAGE	
Drinking Water	26 degree	6.36	629	3.07	363
Salt Water	26 degree	6.39	600	2.92	435
Mud Water	25 degree	5.06	390	1.90	241

Table 3: The values of different parameters as observed for different water samples

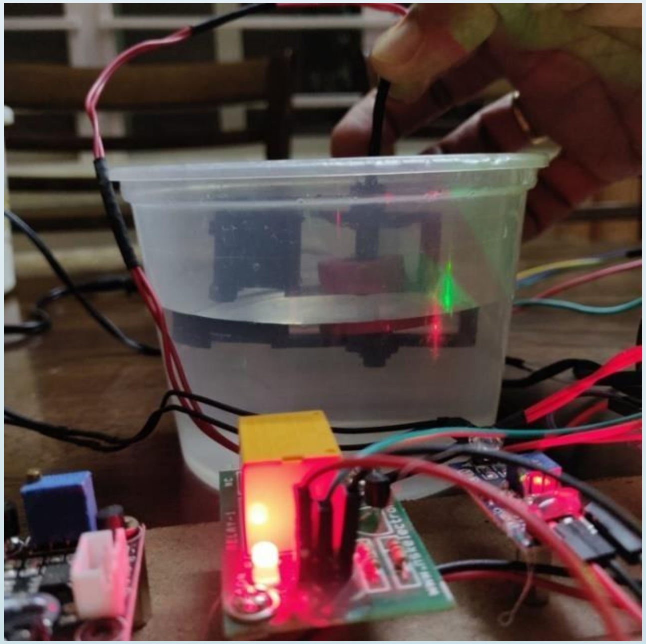


Fig 22: LED of the pump is turned-on when the water level sensor is down

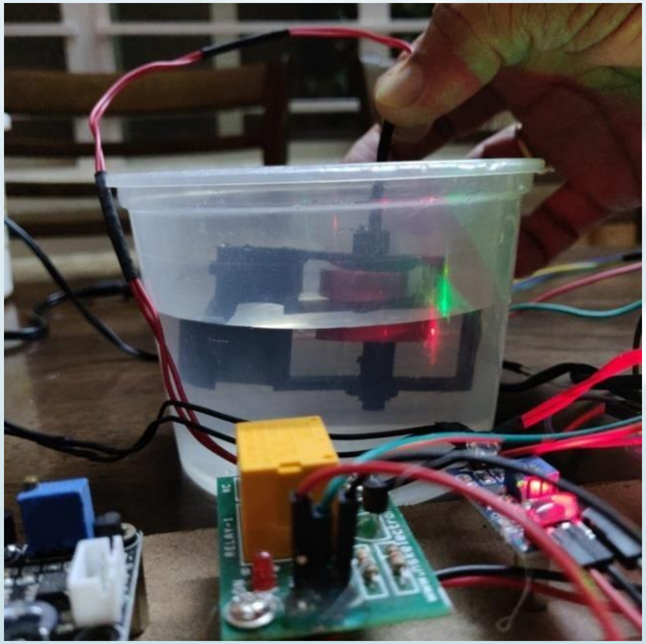
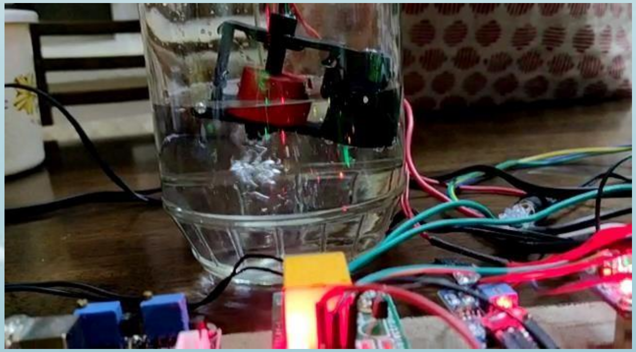
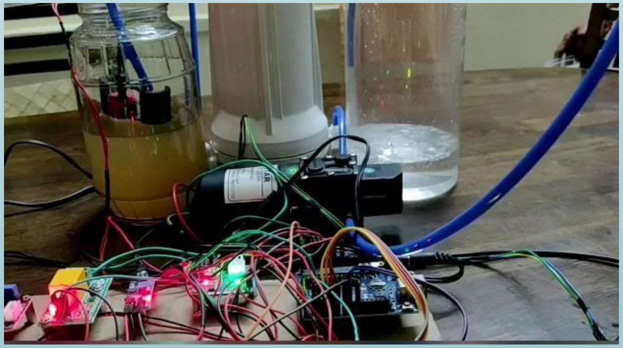


Fig 23: LED of the pump is turned-off when the water level sensor is up



Video 1: Turning ON and OFF of the pump



Video 2: Water Purification

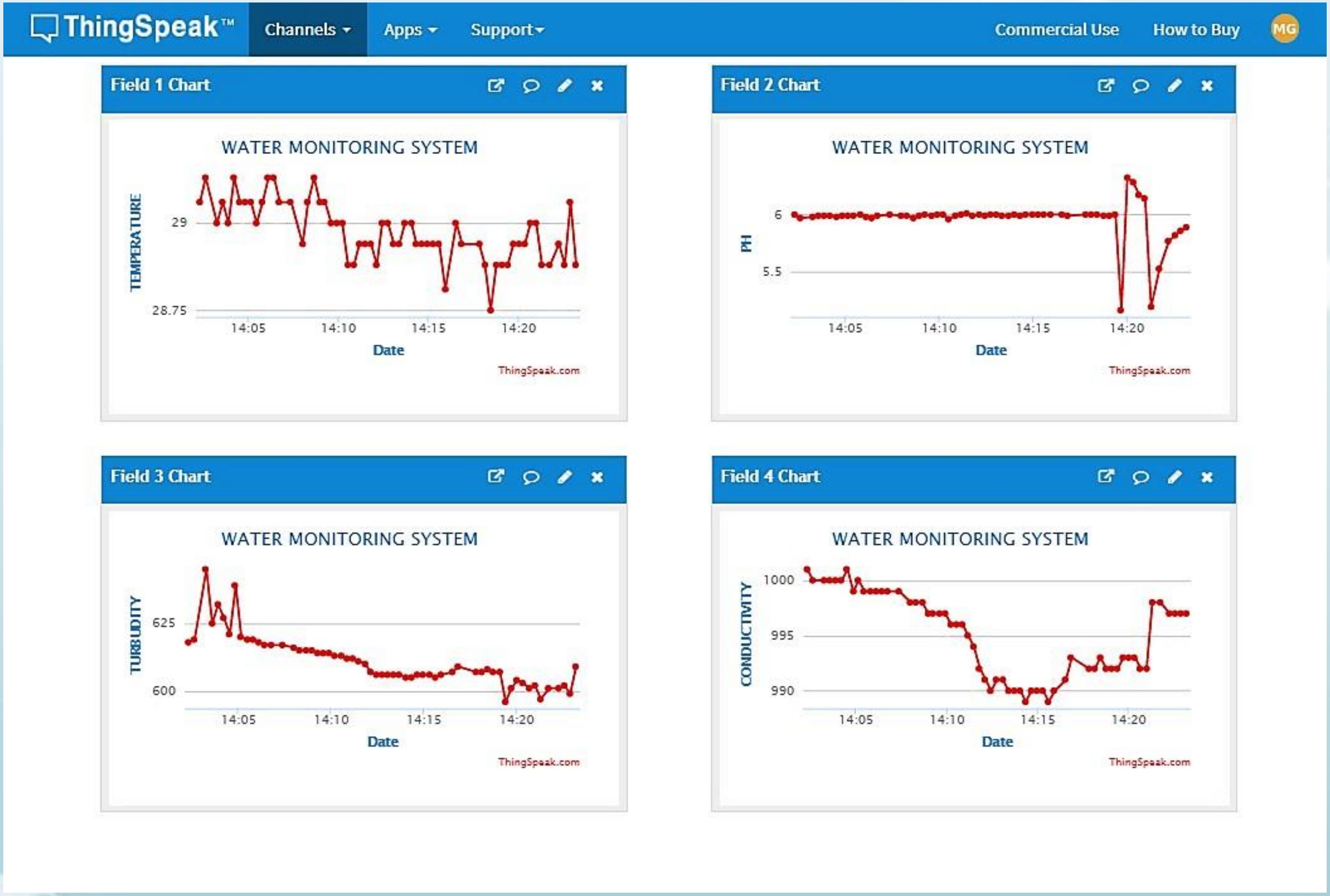
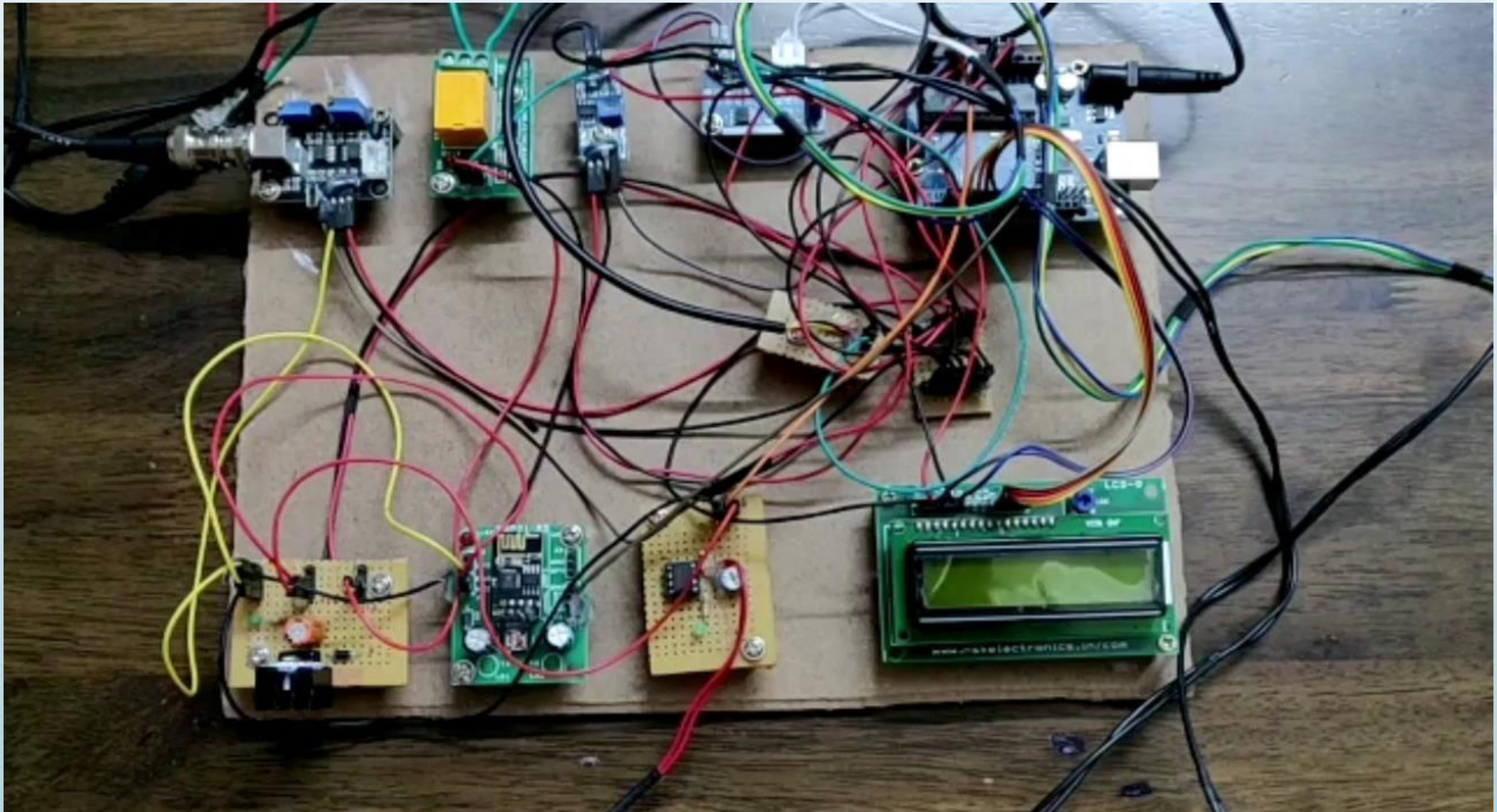


Fig 24: Graphs for all sensor values



Video 3: Full working

PROJECT COST

PARTICULARS	AMOUNT
Materials / Consumables	7100
Labour	1200
Travel	2000
Report	2000
Miscellaneous	1500
TOTAL	13800

Table 4: Cost of the whole project

SOCIETY AND ENVIRONMENT RELEVANCE

- Due to vast increase in global industrial output, rural to urban drift, high use of fertilizers in farms, the water quality and quantity has reduced globally and hence real-time quality monitoring is given priority.
- The system being proposed here is cost effective while compared to the other existing systems so its affordable to everyone in the society.
- As the system is small in size, it can be portable and hence can be used to monitor water quality even at the remote placed and the values can be accessed from any other place.
- This system can be used for commercial purposes like food industries, pharmaceutical industries and others to have a real-time monitoring of the water they are either using for production or they are letting out as waste water. This system can also be used for domestic purpose as well.
- The transmitting of measured data to the cloud helps organisations like the Pollution Control Board to constantly keep a track of the water and take necessary charges on industries who are violating the regulations and norms being set.

CONCLUSION

- Sequential follow up of water pollution status in remote region can be achieved by monitoring the quality of water & collecting comprehensive data.
- This system provides quick discover of the possible water pollution accidents or disasters.
- Transferring the abnormal water quality information to monitoring centre by quicker communication network.
- Provides graphical references of data to the concerned department to comprehend the status of the water and take quick actions.
- The automatic pump helps in preventing wastage of water.

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