

NEMO: AN ARDUINO AQUARIUM MONITORING SYSTEM CONTROLLED BY AN ANDROID MOBILE APPLICATION

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ABSTRACT

- Mobile applications are portable and can assist with different kinds of tasks
- This study aims to create an aquarium monitoring system that is manageable, cost-efficient, and relevant
- Arduino microcontrollers are highly customizable
- The mobile application alerts the user on aquarium conditions given by the sensors and allows the user to control the aquarium's lighting supply

INTRODUCTION

- In 2007, when Apple released the first iPhone, they boasted a new type of service that meets a lot of users' needs, "Whatever you want to do, there is an app for it".
- The type of users range from large industries to individuals who use mobile apps to help in their hobbies such as maintaining an aquarium.



INTRODUCTION

- Understanding what happens inside the aquarium is important in ensuring healthy aquatic life
- Monitor aquarium conditions regularly to prevent problems

THE PROBLEM

It is not easy and accurate to measure the quality of water visually or manually.

Most of the existing monitoring devices are too complex and expensive.

What is an efficient way to monitor the water quality of an aquarium?

OBJECTIVES

This study aims to create an Android application and an Arduino-based system that will be able to digitally monitor a freshwater aquarium using sensors and actuators.



SCOPE

This study focuses on small-scale home freshwater aquariums containing common tropical fish. The system measures the temperature, pH, and turbidity of the water.

LIMITATIONS

The accuracy of the data is dependent on the specifications of each sensor. Arduino clones will be used for prototyping.

MATERIALS

- Laptop
- Android Phone
- Breadboard
- Arduino UNO
- WiFi Module

METHODOLOGY

- Temperature Sensor
- pH Sensor
- Turbidity Sensor
- LED Strip
- Jumper wires
- Resistors

METHODOLOGY

DEVELOPMENT TOOLS



Arduino IDE

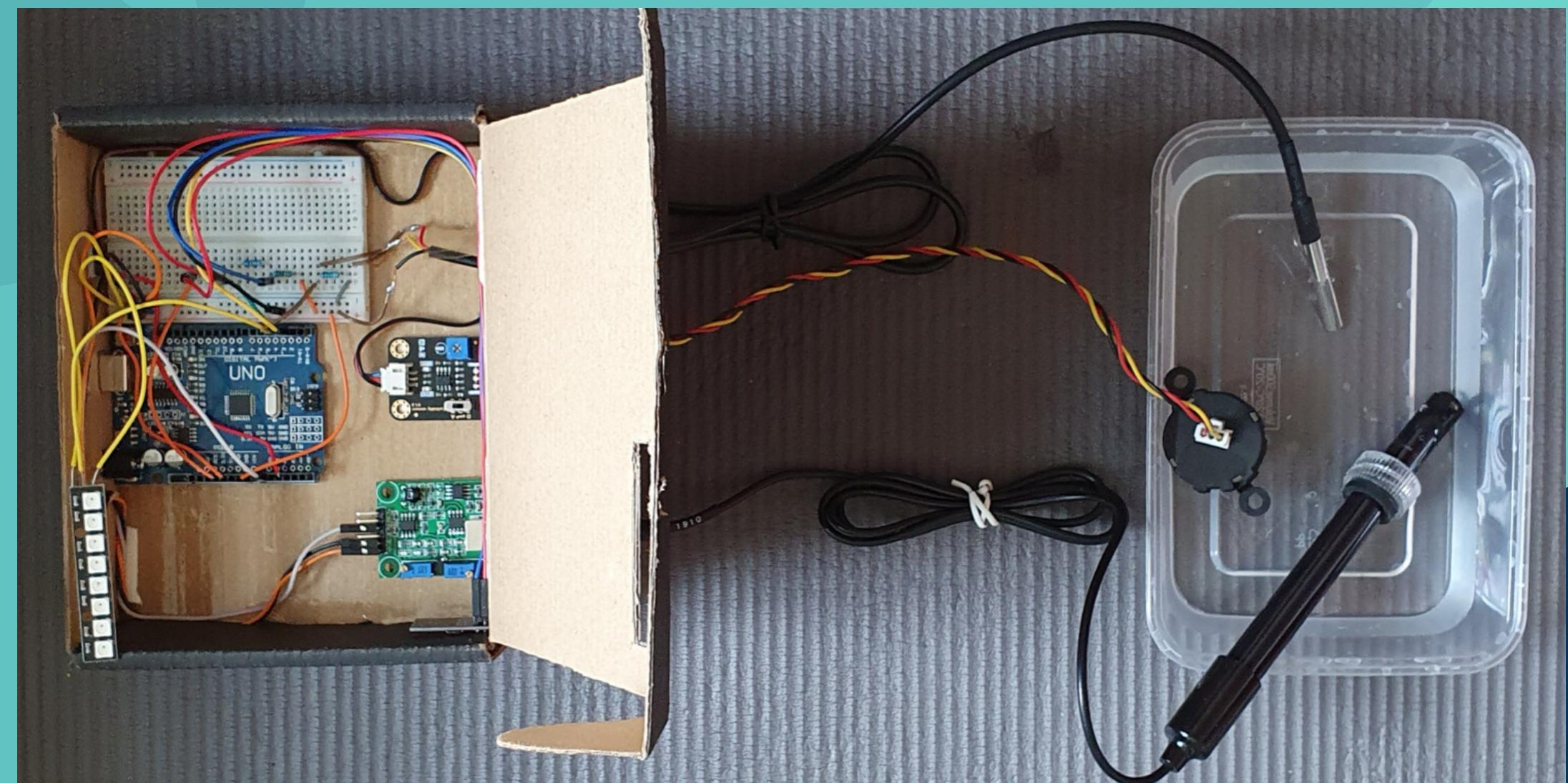
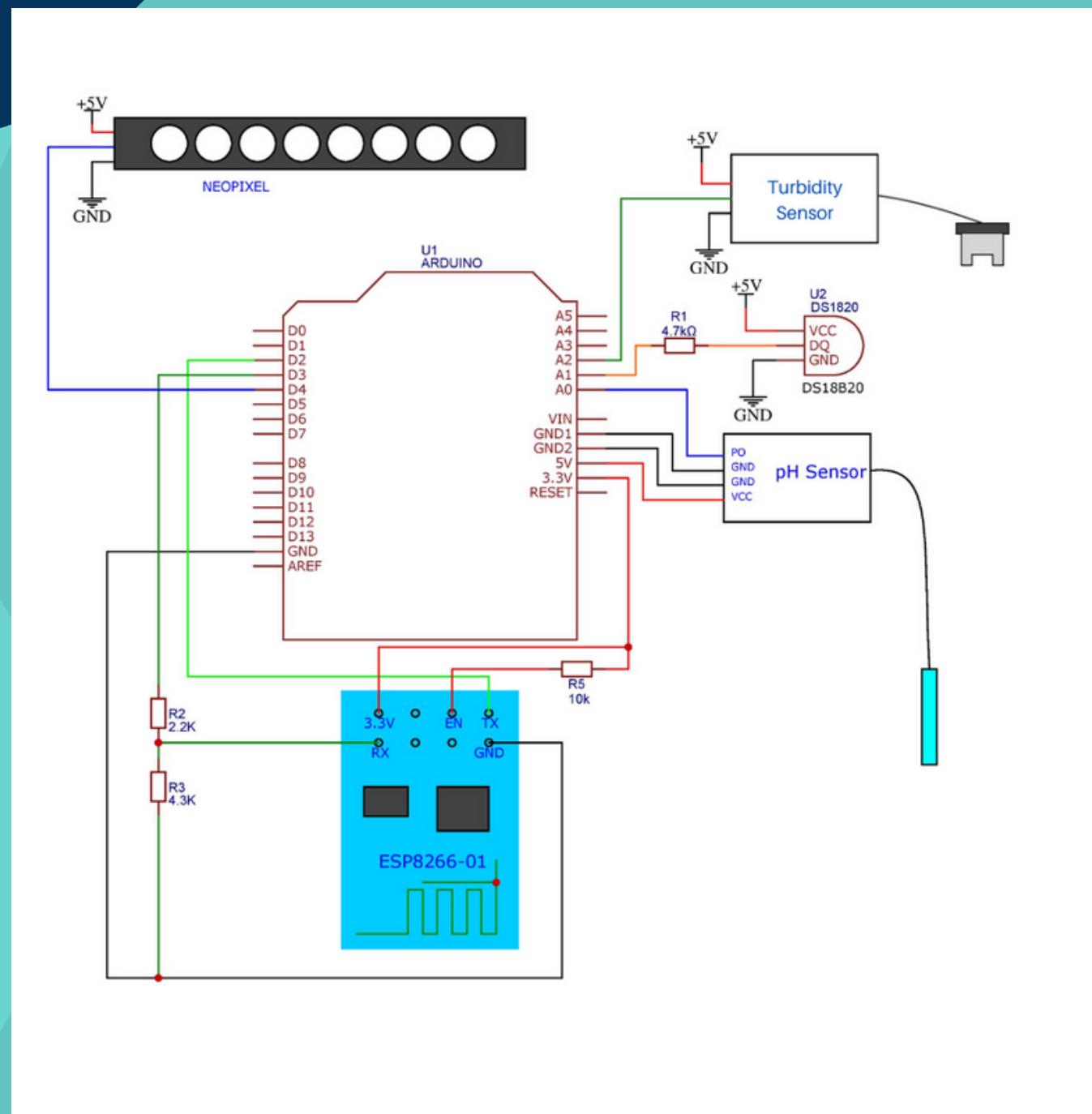


Android Studio



Google Firebase

HARDWARE ASSEMBLY





DATABASE SETUP

A realtime database is created using Google Firebase. This database acts as a middleware between the Arduino and the mobile app



DATA GATHERING

Sensors are calibrated in order to obtain the formula for conversion. A program containing sensor commands and conversion algorithm of sensor readings is uploaded to the Arduino Uno.



WIFI MODULE INITIALIZATION

A program that includes the credentials of the WiFi network to connect to and the algorithm of sending and receiving data to and from the database is uploaded to the WiFi module.



DATA ANALYSIS

Data collected from the sensors are compared with the threshold parameter values that indicate an ideal environment for the fish. (pH: 7.00, temperature: 22.22 – 27.77 ° C, turbidity: 0 – 10 NTU) This is used in determining when to alert the user through the mobile app.

DATA TRANSFORMATION

https://nemo-7037b.firebaseio.com/

nemo-7037b

- labeldate
 - M8zb_VDzgj3LMtJVCTt: "Jun 4 9:56
 - M8zbinsGKF9NDRtvjC: "Jun 4 9:57
 - M8zbkdojk3VRZgYmjA5: "Jun 4 9:57
 - M9EJTe3HoazpnNzdsgS: "Jun 7 11:06
- light: 0
- + phvalues
- sensorvalues
 - pH: 7
 - temperature: 27
 - turbidity: 13
- statscount: 4
- tempvalues
 - M8zb_VDzgj3LMtJVCTx: 30
 - M8zbinu8Q37cTgRahV5: 34
 - M8zbkdojk3VRZgYmjA9: 37
 - M9EJTe41VelCCFB5lZ2: 27
- + turbvalues
- + xaxis



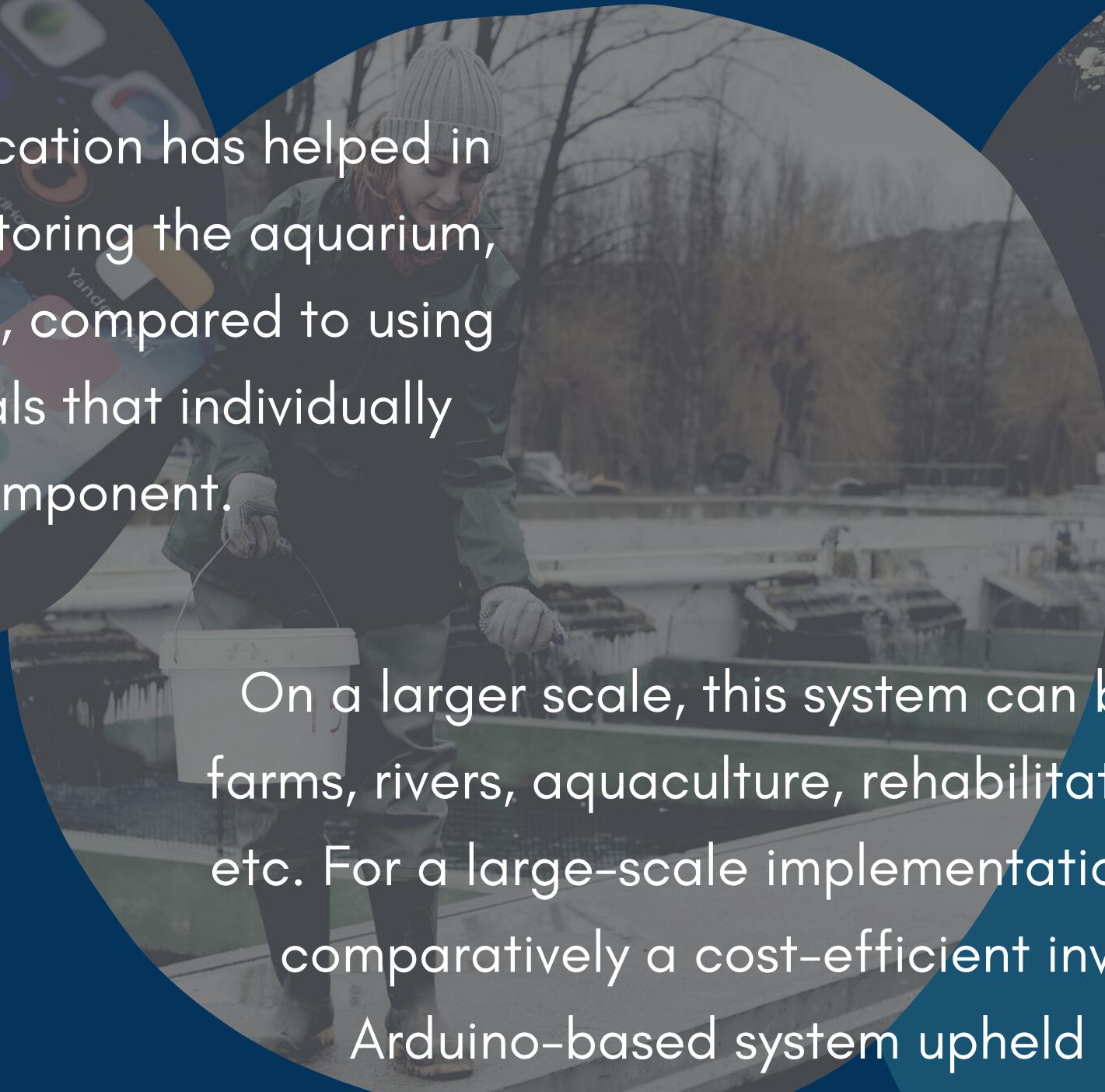
RESULTS AND DISCUSSION

Testing the system on water from an aquarium and on clean water yielded the appropriate corresponding values for temperature and pH but varied on the turbidity level. The most accurate readings of turbidity are obtained from a well-lit aquarium.

CONCLUSION AND FUTURE WORK



The use of the mobile application has helped in minimizing the time of monitoring the aquarium, specifically its water quality, compared to using separate complex materials that individually measure each component.



On a larger scale, this system can be used on fish farms, rivers, aquaculture, rehabilitation sanctuaries, etc. For a large-scale implementation, this system is comparatively a cost-efficient investment. The Arduino-based system upheld its ease of implementation, operation, maintenance and cost-efficiency.



THANK YOU

Nemo: An Arduino Aquarium Monitoring System
Controlled by An Android Mobile Application