E-PROCEEDINGS

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"Fostering a Culture of Innovation and Entrepreneurial Excellence"

23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

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A-ST091: FLOOD SECURE: BUILDING HOUSE RESILIENCE WITH INTELLIGENT FLOOD MANAGEMENT

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ABSTRACT

The design and construction of an Internet of Things (IoT)- integrated flood monitoring and alert systems using Arduino-based sensors are described in this technical study. Furthermore, of Ultrasonic, Water, and Float sensors, the system has a Blynk application that allows for real-time alert alerts. The system becomes an Internet of Things (IoT) device with real-time monitoring and automated reaction capabilities when wireless communication technology is included. To further reduce damage, the system has featured that automatically close house gates. The system monitors and controls flood conditions by processing data from various sensors using the Arduino microcontroller. Automated gate actuators are examples of responsive components that improve system functionality. Intelligent decision-making is built into the Arduino code, which also constantly controls the sensors and send alarms in response to predetermined water levels. With real-time IoT connectivity to enhance disaster preparation and safety, this IoT-Integrated Flood Monitoring and Response System gives an adaptable and scalable automated flood control solution.

Keywords: Flood Monitoring, Ultrasonic, Water Sensor, Float Sensor, Internet of Things (IoT)

1. Product Description

"Flood Secure" is an innovative IoT-based solution aimed at improving flood resilience. This system incorporates advanced sensors, such as Ultrasonic, Water, and Float sensors, to accurately monitor water levels. Powered by an Arduino microcontroller, it processes real-time data to perform automated actions, including activating a gate mechanism to block water entry. The system also features an SMS notification function, enabling immediate alerts to inform users during potential flood situations. Designed with scalability and modularity in mind, the system can be tailored for use in different settings, from residential properties to industrial facilities. Its wireless connectivity ensures continuous monitoring and remote accessibility, giving users timely and detailed updates on flood conditions. By combining automation, reliability, and ease of use, "Flood Secure" provides a comprehensive solution for proactive flood prevention and management.

2. Method Flow chart and Block Diagram

Figure 1 shows the Flow Chart of the IoT- Integrated Flood Monitoring and Alert System. The flood monitoring and alert system functions by alerting the users in the house through 3 outputs which are LED, buzzer, and Blynk and closing the gate of the house automatically through another 1 output which is servo resulting in 4 outputs.

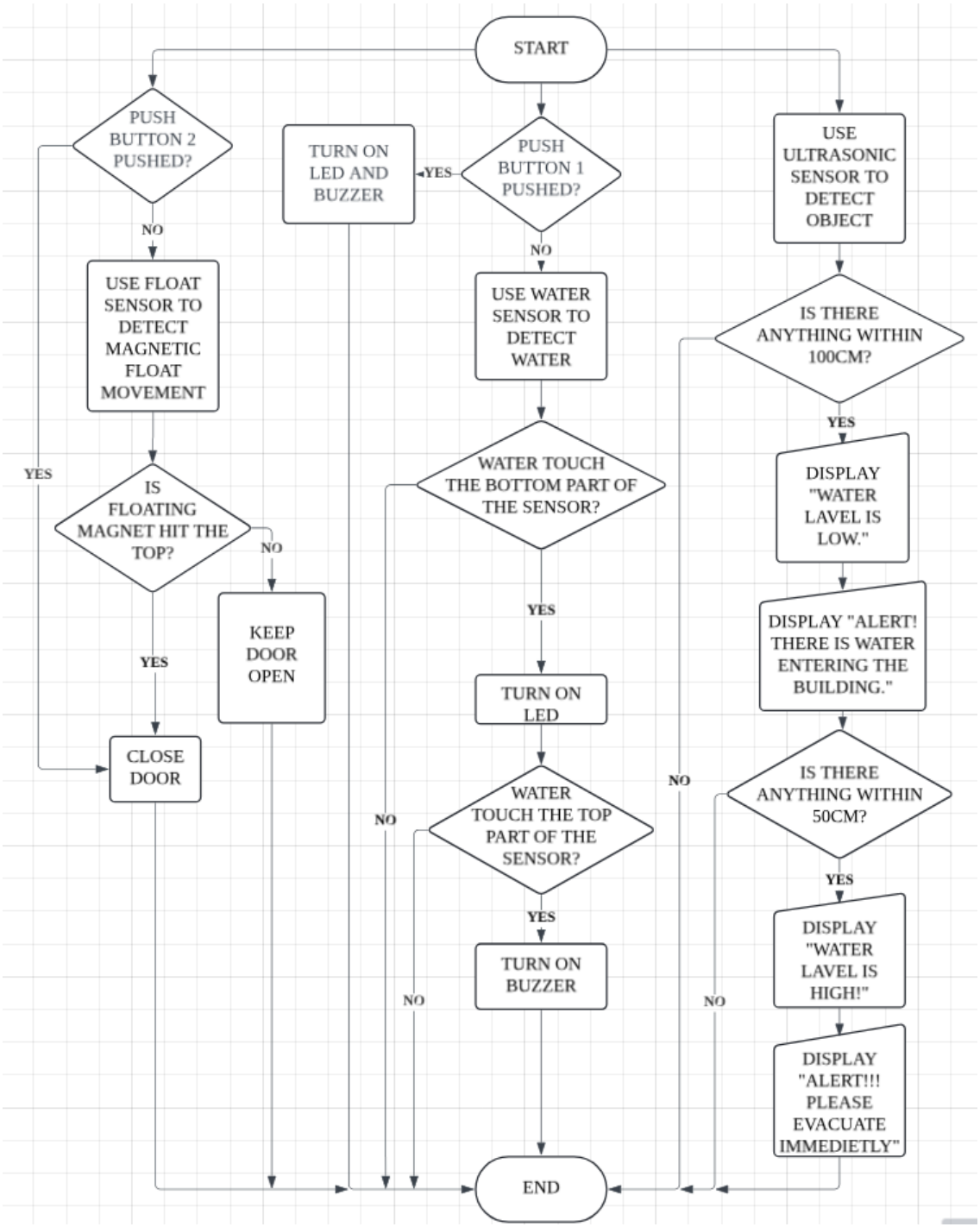

Figure 1. Model Flow chart

This will be achieved by using 3 sensors which are ultrasonic sensor, float sensor, and water sensor and 2 push buttons. The ultrasonic sensor function is to alert people about the water levels and to alert the people about the situation which is it will show distance of water from the ground at the Blynk and when the water is detected to be about 100cm from the sensor, it will send messages stated that “WATER LEVEL IS LOW.” and “ALERT! THERE IS WATER ENTERING THE HOUSE.” Meanwhile if the water rise and approach the sensor making the distance become closer which is 50cm, it will send messages stated that “WATER LAVEL IS HIGH!” and “ALERT!!!PLEASE EVACUATE IMMEDIETLY”. The water sensor works to turn on the LED when the water touches the bottom part of the sensor and turning on buzzer when the water touches the top part of the sensor. Push Button 1 works to override the water sensor, in this state the water sensor will temporarily off and the led and buzzer will be on without any condition. The float sensor works by closing the gate of the house if the magnetic float reaches the top of the sensor. Push Button 2 works to override the float sensor, in this state the float sensor will temporarily off, and the gate will close immediately without any condition.

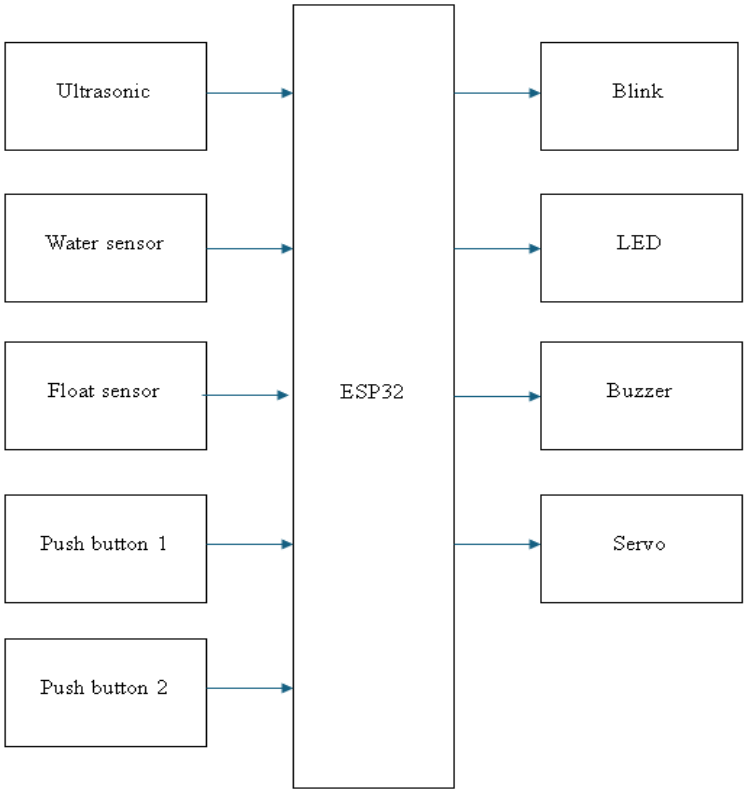

Figure 2. Model Block Diagram

Figure 2 shows the block diagram of the project. The system works by sending data from the input such as water distance from ultrasonic sensor and water contact from water sensor also whether the push button 1 and 2 is pushed or not. The data then will go through the

main component, Arduino microcontroller, which will process the data and then after being processed, the data will come out through output such as Blynk application, buzzer and led. The system also works by sending data from the input such as magnet movement by float sensor. The data then will go through the main component, Arduino microcontroller which will process the data and then after being processed, the data will come out through output which is servo.

3. **Novelty and uniqueness**
   This flood management system offers a groundbreaking approach by combining IoT technology with real-time monitoring and automated responses. Unlike traditional methods, it employs a network of sensors such as Ultrasonic, Water, and Float to enhance detection precision and support smarter decision-making. The integration of SMS-based notifications ensures users receive immediate alerts during emergencies. A unique feature is its ability to automatically close house gates, providing an extra layer of protection. The blend of automation and user-centric design makes this solution an innovative and practical tool for flood mitigation.

4. **Benefit to mankind**
   The project addresses a pressing need by providing a practical solution to mitigate the effects of flooding. By delivering real-time alerts and enabling automatic responses, it helps safeguard lives and property. Its versatile design allows it to be applied in various settings, from homes to larger infrastructures. Furthermore, the system's affordability and user-friendly nature empower communities to adopt effective flood monitoring measures, ultimately boosting preparedness and reducing disaster-related losses.

5. **Innovation and Entrepreneurial Impact**
   This project exemplifies innovation by integrating advanced IoT solutions into flood management. It encourages entrepreneurial thinking by demonstrating how technological advancements can tackle real-world problems. The system's modularity fosters collaboration and opens avenues for commercialization, enabling businesses to develop tailored flood prevention products. By showcasing the potential of engineering to address societal issues, the project promotes research, development, and entrepreneurial activity in both academic and industrial contexts.

6. **Potential commercialization**
   With its modular design and adaptability, this system is well-suited for commercialization. It can serve a diverse customer base, including residential, commercial, and public sectors. Its affordability and ease of implementation make it highly marketable, while its compatibility with smart home technologies adds value. Partnering with private companies and government entities could expand its adoption, positioning the system as a reliable and innovative product in the disaster management and safety industry.

7. Acknowledgment

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8. Authors' Biography

Muhammad Afiq Hakimi Bin Rosli is a Student at the UiTM, specializing in electrical engineering that specifically leads to computer. With over 2 years of experience, he has pioneered methods for designing software prototypes for the model and coding in C++ for the model.

Muhammad Aiman Bin Sulhan is a Student at the UiTM, specializing in electrical engineering that leads to electronics specifically. With over 2 years of experience, he has pioneered methods for designing hardware prototypes for the model and assembling the component for the model .

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