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Remote Control Flood Relief Water Drone

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Abstract: *Operational applications of the RC Water Drone in various disaster scenarios are explored, highlighting its potential to assist rescue teams, deliver emergency supplies, and perform preliminary damage assessments without endangering human rescuers. Finally, the project evaluates the future prospects of integrating artificial intelligence, autonomous decision-making, and swarm drone technology to further enhance the effectiveness and scalability of flood disaster management operations.*
The project discusses the key design considerations, including drone buoyancy, stability, propulsion systems, remote control range, camera integration for real-time monitoring, and payload capacity for life-saving equipment. Additionally, the technological components such as microcontrollers, wireless modules, sensors, and power systems are elaborated in detail.

Keywords: Remote control Technology, Arduino, Wireless Communication, Cost-Effective

I. INTRODUCTION

Floods, triggered by events such as heavy rainfall, rapid snowmelt, dam failures, or rising sea levels, are among the most catastrophic and frequent natural disasters across the globe. Their consequences are far-reaching, resulting in extensive economic losses, severe environmental degradation, and tragic human casualties. Each year, millions of people are displaced, losing access to necessities such as shelter, clean drinking water, medical aid, and food supplies. In the wake of such disasters, the ability to conduct rapid and effective rescue operations becomes critical to minimizing the damage and saving lives.

II. LITERATURE REVIEW

The growing need for efficient, cost-effective, and rapid-response rescue systems has driven research into remotely operated life-saving devices. Several studies have laid the foundation for the development of unmanned rescue systems, including life-saving buoys and remote-controlled boats. This section reviews relevant literature that has contributed to the design and advancement of such systems.

Together, these studies provide a strong theoretical and practical foundation for the design, development, and refinement of the remotely controlled life-saving boat. They helped shape decisions related to hardware selection, power management, structural design, and control system integration.

Scope- Suggesting future improvements such as AI-based victim detection, semiautonomous navigation, and swarm operations for large-scale disasters.

Aim-To deliver the supplies and support the rescue team to rescue the humans quickly.

III. APPLICATION

There are various uses for the remote-control flood relief drone in research, emergency response, and disaster management.

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3.1. Search and Rescue Operations-

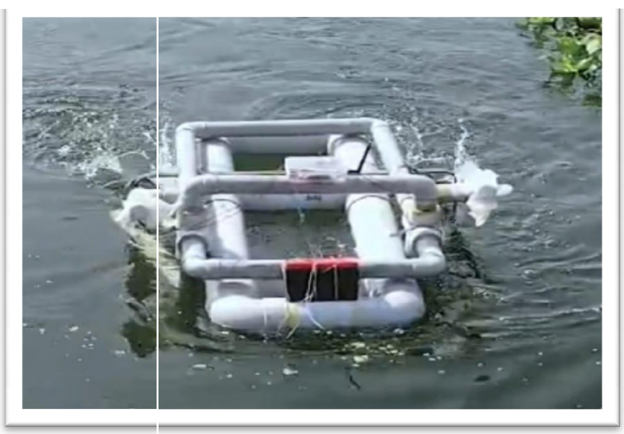
RC drones are important and helpful during floods for searching and rescuing humans. They can easily reach hard-to-access areas.

3.2. Supply Delivery-

RC Drones provide a safe and efficient method for delivering essential supplies in flood-prone areas, ensuring continuous relief without exposing human responders to danger.

IV. PROPOSED SYSTEM

The Life Saver drone project follows a structured methodology starting with the identification of key requirements such as buoyancy, stability, remote control range, and load capacity. After conceptual design and component selection, including NRF24L01 wireless modules, Arduino Nano microcontrollers, waterproof DC motors, and a lightweight hull structure, the mechanical and electrical systems are developed to ensure reliable operation in water environments. The control system is programmed to receive joystick inputs remotely and manage motor actions accordingly, with safety features like emergency stop included. A prototype is then fabricated and assembled, followed by rigorous testing for buoyancy, maneuverability, communication range, and load handling. Based on the testing outcomes, necessary improvements are made, leading to the final implementation of a fully functional and safe remote-controlled life-saving drone.

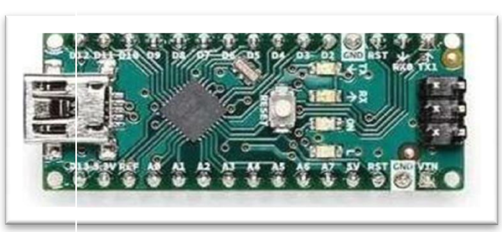


V. COMPONENTS USED

5.1. Arduino nano

The Arduino Nano is an open-source microcontroller board, developed by Arduino.cc, that was released in 2008 and is designed for breadboard use.

The Nano can be powered via a USB connection, external adapter, or battery through the VIN pin. It uses a Mini-USB port for programming and communication with a computer. The board has a flash memory of 32 KB, of which 2 KB is used by the bootloader



5.2. NRF24L01 Module-

The NRF24L01 is a popular Arduino-based 2.4GHz transceiver with an embedded baseband protocol engine, ideal for ultra-low power wireless applications in the ISM frequency band, requiring only an MCU and few external components.

General Specifications –

Operating Frequency 2.4 GHz ISM band

Number of Channels 125

Max Payload Size 32 bytes per packet

Number of Data Pipes 6 (for multi-device communication) Antenna Type PCB trace or external (SMA for PA+LNA version)

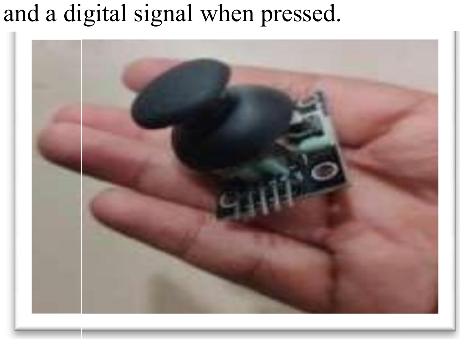
Modulation Type GFSK (Gaussian Frequency Shift Keying)

Operating Temperature -40°C to +85°C

Module Dimensions ~15 x 29 mm (varies by version)

5.3. Analog Joystick Module

A joystick module is an input device commonly used to control movement in two dimensions (X and Y axes) and sometimes includes a push-button feature. It typically consists of two potentiometers and a switch, allowing it to output analog values for directional input and a digital signal when pressed.



5.4. Motor

A 500 RPM high torque DC motor is designed to provide strong rotational force at low speed, making it suitable for applications requiring power over speed.

These motors typically operate at 6V to 12V and can deliver torque values in the range of 10 to 30 kg/ cm or more, depending on the model. The motor shaft can be directly connected to wheels or mechanical components in robotics and automation projects. These motors are popular in robotic vehicles, conveyor belts, and lifting mechanisms that require reliable, high-force output.

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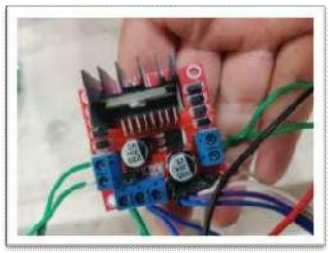
5.5. Motor Drivers

The L298N is a dual H-bridge motor driver module that allows control of the speed and direction of two DC motors or one stepper motor. It can handle motor supply voltages from 5V to 35V and output current up to 2A per channel.



5.6. Li-ion Battery

A 12V lead-acid battery is a rechargeable power source commonly used in automotive, backup, and robotics applications. It consists of six 2V cells connected in series and uses lead plates and sulfuric acid as electrolyte. These batteries are known for their high current output, durability, and relatively low cost. However, they are heavy and require careful charging to avoid sulfation and damage. Lead-acid batteries are ideal for powering high torque motors, inverters, and systems needing stable voltage over extended periods.

12V/8Amp battery rating

Run Time: Two to Three Hours

VI. CONCLUSION

The Life Saver Water Drone project is a successful example of the application of embedded systems and wireless communication in the design of an efficient and affordable water rescue system. With safety, reliability, and remote operation as the design focus, the prototype was able to execute critical rescue operations like moving over water, reaching a target, and safely returning with a load. Through strategic component selection such as the Arduino Nano, NRF24L01 wireless modules, and DC motors, the system met its functional objectives while remaining simple and affordable.

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