International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 03 | March – 2025 DOI: 10.55041/ISJEM02300
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

Remote Operated Human Rescue Boat System: "Enhancing Safety & Efficiency in Real-time Flood Rescue Operations"

Raman S. Bais [1], ramanbais2004@gmail.com
Dr. M. V. Lande [2], milind.jdiet@gmail.com
Manoj G. Raghu [3] raghumanoj405@gmail.com
Ashish H. Ramteke [4], ashishramteke754@gmail.com
Chetan R. Hemane [5], chetanhemane3008@gmail.com
Sandesh Y. Katrojwar [6], sandeshkatrojwar28@gmail.com
Anumesh V. Thakare [7] anumeshthakre738@gmail.com
Department Of Computer Engineering
Government Polytechnic, Gadchiroli Maharashtra, India

Abstract - *The effects of the flood that has been occurring in our country have attacked the life of the flood victim, that disturbing the profitable and social conditioning and has destroyed the properties, caused difficulties and the cost of repairing and restoration is precious for individualities and so does the government. Floods across India caused an aggregate of 547 deaths in 2022, down from some 656 deaths recorded in the former time. Over the last decade, the number of deaths due to floods across the country was in 2010, with a death risk of 965 people. Avoid lot of the flood tide victim from not getting the first aid as soon as possible we've constructed a device called Remote - Operated mortal Rescue Boat System Enhancing Safety and Efficiency in Realtime Flood Rescue Operations. to help the flash flood victim get first aid as soon as possible and to avoid their life from being hovered. This device worked like a boat with lower size and only using the smartphone (Android) or ever control it, therefore also allowing it to carry the first aid kit similar as lifejacket, medicine, and life- tube. This device also uses the system Internet of Thinking (IOT) in its software. As a result, this mobile will succeed in decreasing the number of flood victims from not getting first aid as soon as possible and will also help lighten the burden of the rescue team from struggle, giving some help to those in need.*

Key Words: IOT, First-Aid kit, remotely operated, android based application.

1. INTRODUCTION

Flood is the biggest natural disaster sustained by India or throughout India, involving all India there is total of 400 rivers. The sprinkle rainfalls from the southwest cause flooding in waterways analogous as Yamuna, Ganga, Brahmaputra, etc. The violent monsoon swells the banks, which leads to flooding in contiguous areas. Flood- affected Area(in Million Half.) The most overflow- affected country in India falls under the Ganga River and Brahmaputra. flood tides across India caused an aggregate of 547 deaths in 2022, down from some 656 deaths recorded in the other time.

Over the last decade, the topmost number of deaths due to flood tides across the country was in 2010, with a death threat of 965 people. India is liable to floods. Out of the grand geographical area of 329 million hectares(MHA), farther than 40 MHA is overflow apt. Flood Affected Area. Flood Affected Area Atlas of India It covers 342,239 square kilometres or 10.4 of India's grand geographical area. consequently, this paper offered a boat which is a salvation mini boat that ruled utilizing Remote & Android (IoT), which comprehended HC- 05 Bluetooth, Servo motor, motor Speed Controller , DC motor and Arduino as a microcontroller and an operation connected with this device. The HC- 05 has two operating modes, one is the data mode in which it can shoot and take data from other Bluetooth devices and the other is the AT command mode where the oversight device medium can be changed. We can also it can be operated to the ever joystick with transmitter and receiver that covers up to 1.5 km around [2].

Floods are one of the most devastating natural disasters, posing significant threats to human life, property, and infrastructure. In such high-risk environments, swift and effective rescue operations are crucial to minimizing casualties and ensuring the safety of affected communities. Traditional flood rescue operations often rely on human rescuers using boats, which can be challenging due to dangerous water conditions, limited accessibility, and the time-sensitive nature of the task.

The Remote Operated Human Rescue Boat System aims to revolutionize flood rescue efforts by introducing a technologically advanced solution that enhances both safety and operational efficiency. This innovative system uses remote-controlled boats equipped with advanced sensors, GPS tracking, and communication tools, enabling rescue teams to deploy boats quickly without putting human lives at risk in hazardous conditions [3].

The Remote Operated Human Rescue Boat System represents a step forward in disaster management, offering a reliable, efficient, and safe solution for rescue operations during floods and other water-related emergencies.

So soon as possible we have constructed a device called Remote - Operated mortal Rescue Boat System "Enhancing Safety and Efficiency in Realtime Flood Rescue Operations". to help the flash flood victim get first aid and giving some help to those in need [2].

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 03 | March – 2025 DOI: 10.55041/ISJEM02300
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

2. LITERATURE SURVEY

Sr.No.	Authors / Researchers	Purpose	Improvements
1.	Robertson, Douglas & Bucinell, Ronald. (2005) [5].	Performance and Efficiency Complete Execution of Boat	- Speed: Fast boats. - Endurance: Longer operational hours.
2.	Sarlak, Hamid & Abshenas, Saeideh. (2008) [2].	Design Considerations	- Boat shape: Optimized for Weight and stability. - Materials: Plastic, PVC, Aluminium polyethylene.
3.	Eugene, C. & Lim, J. & Nirmal, Umar & Lau, Saijod. (2019) [1].	Introduction to Human Rescue Boats	- Purpose: Save individuals in water-based emergencies. - Types: Battery powerd RC boats.
4.	Adake, Mr. (2019) [4].	Technological Integration Wireless Sensors	- Autonomous boats for dangerous scenarios. - Sensors: GPS, infrared, sonar.
5.	National Research Council (2021) [6].	Challenges in Rescue Operations	- Weather: Boats must endure extreme conditions. - Coordination: Efficient communication between units. - Environmental impact: Eco-friendly boat designs.
6.	Miranda, Johanne & Villadelrey, Vivien & Cruz, Febus. (2023) [3].	Safety Features and Equipment GPS & Water Quality Management	- Stability: Self-righting designs. - Rescue equipment: medical kits. - Communication: Radios, GPS, Satellite.

3. PROPOSED MODEL

The Remote-Operated Human Rescue Boat System aims to enhance flood rescue operations by utilizing a combination of components, including a transmitter and receiver, 775 DC motors, MG995 metal servo motors, gears, and a 2200 mAh LiPo battery [1]. The boat is designed to be remotely controlled, allowing for efficient navigation through flooded areas to rescue people. Three 775 DC motors provide propulsion, with one motor for forward movement, another for backward motion, and the third controlling the boat's steering through a set of gears. The MG995 servo motor operates the steering mechanism or a potential rescue arm/grabber, adding functionality for retrieving individuals or objects in the water. The power is supplied by a 2200 mAh LiPo battery, ensuring the system has sufficient runtime for rescue operations. The boat's receiver receives commands from the transmitter, which controls the motors and servo. A microcontroller can be used to manage the control signals, translating them into movements of the boat. After assembling the components and conducting rigorous testing in both dry and water conditions, the boat is calibrated for optimal performance. This system is designed to improve safety and efficiency in real-time flood rescue situations by allowing operators to remotely control the boat, navigate obstacles, and perform rescue missions with precision[2].

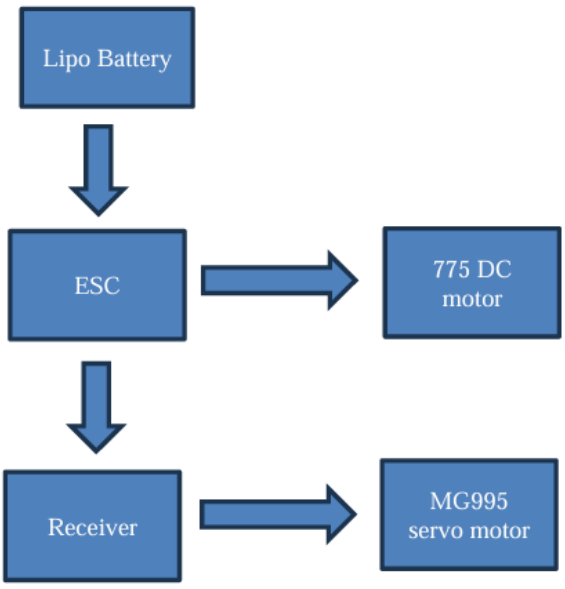

Figure -1: Block diagram of RC Boat Connection

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 03 | March – 2025 DOI: 10.55041/ISJEM02300
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

3.1 WORK DESCRIPTION:

In the Human Rescue boat system we use some devices they essentially worked as LiPo battery, ESC, 775 DC motor, receiver, and MG995 metal servo motor represents a control system commonly used in remote-controlled boats. The LiPo battery serves as the power source, providing the necessary voltage for all components in the system. The ESC (Electronic Speed Controller) connects to the 775 DC motor, a high-torque motor often used for tasks requiring substantial power. The ESC controls the speed and direction of the motor based on the control signals it receives from the receiver, which is typically operated by a remote control or transmitter. The servo motor's metal gears ensure it can handle higher loads and provide more reliability in heavy-duty tasks. This integrated setup allows for fine-tuned control over the motor's speed and movement. These components ensure that the system can be remotely controlled with both speed and precision, making it suitable for demanding applications where accuracy, torque, and efficient power management are essential [2].

3.2 HARDWARE DESCRIPTION:

a) Transmitter & Receiver

Figure - 2 : Transmitter & Receiver connection

A Transmitter & Receiver both are connected with each other. They can be useful for sending and receiving a signal from any electronic devices like radios, tv, satellites, phones, and many other devices can remotely operate. So, this device can be useful in RC remote operated boat. For controlling there all movements and motions efficiently.

b) 775 DC motor & 3-D Gears

Figure - 3 : Dc motor with 3-D Printed Gears

775 DC motor and 3D printed gears can create efficient, customizable mechanical systems. The DC motor powers the gears, which then transmit rotational motion to other components in the system. 3D printed gears are advantageous because they can be designed to fit the specific requirements. However, it's important to ensure that the gears are made from durable materials to handle the torque and stress produced by the 775 motors.

c) MG995 Metal Servo Motor

Figure - 4: Servo motor

The MG995 is a high-torque, metal-geared servo motor used in robotics and RC vehicles. It operates at 4.8V to 6.0V DC, providing up to 9.4 kg cm of torque at 6V. Metal gears offer durability and resistance to wear. This motor can be used for generating a torque and rotate the RC Boat in Particular direction as per transmitter & receiver commands.

d) 320-A 12V Electronic motor speed controller (ESC)

Figure - 5 : Electronic Speed Controller (ESC)

An Electronic Speed Controller (ESC) 320A 12V in an RC boat system regulates the motor's speed. It acts as a bridge between the motor and power source, converting controller input into motor power. The ESC adjusts the voltage and current supplied to the motor based on user input, ensuring smooth speed control. The 320A rating allows the ESC to handle up to 320 amperes, suitable for high-power motors in larger RC boats. The 12V specification indicates it works with a 12-volt power supply. This component is essential for controlling acceleration, deceleration, and overall movement of the boat.

e) 11.9 V (2200 mAh) Lipo Battery

Figure - 6 : Lipo Battery

A LiPo (Lithium Polymer) battery in an RC boat powers the motor and electronics, offering high energy density and a lightweight design. These batteries provide stable power and

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 03 | March – 2025 DOI: 10.55041/ISJEM02300
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

handle high discharge rates for efficient operation. Their high power-to-weight ratio makes them ideal for RC boats.

4. FUTURE SCOPE

The Project of Remote-Operated Human Rescue Boat System "Enhancing Safety and Efficiency in Real-time Flood Rescue Operations" is to make it even more efficient, smarter, and able to cover more areas during flood rescues. The boat will be upgraded with advanced technologies like thermal cameras and AI to help it see better in bad conditions and find people more easily. The plan is to make the boat more autonomous, meaning it can work on its own to find and rescue people without much help from humans. Multiple boats will work together as a team, covering larger areas and rescuing more people faster [3]. The boats will also run longer by using solar power, so they don't need to recharge as often. The project plans to spread the boats worldwide, working with rescue teams and providing training so they can use the system in floods everywhere [4]. There will also be better safety features, like stronger boats, automatic life-saving devices, and real-time health monitoring for rescued people, making sure both victims and rescuers stay safe. Overall, these upgrades will make a more reliable tool for saving lives during floods.

5. HARDWARE CONNECTIONS

Figure - 7: Connections of all electronic devices

6. OUTPUT

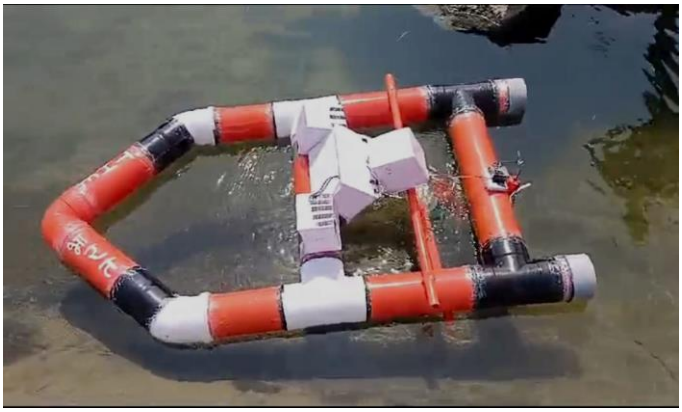

Figure - 8 : Model of the RC Boat

7. IMFORMATION OF THE PAST RESEARCH ON BOAT :

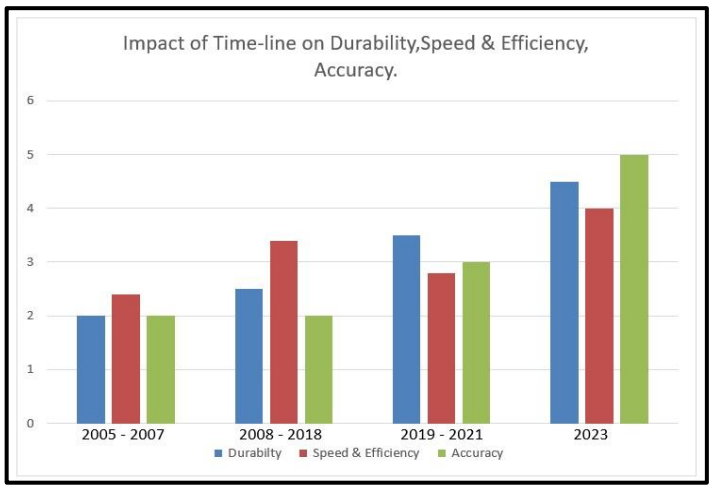

Figure - 9 : Timeline of previous year's research

1) Durability -

Durability refers to the boat's ability to withstand harsh environments, such as rough waters, extreme weather, and long operation hours.

- **2005-2007**: Early models were somewhat fragile and required careful handling. They might have been made from lighter materials, leading to wear and tear over extended use.
- **2008-2018**: Durability improved due to better engineering, stronger materials (e.g., high-strength plastics, aluminum alloys), and increased testing in real-world rescue scenarios.
- **2019-2021**: By this period, materials like carbon fiber or reinforced polymers might have been used, offering even greater resilience and longevity.
- **2023**: Modern rescue boats are likely highly durable, capable of operating in the harshest environments (e.g., stormy seas, extreme temperatures) for extended periods.

2) Speed & Efficiency –

Speed & efficiency refer to how quickly the boats can respond to emergencies and how well they use their energy,

- **2005-2007**: The speed of the boats was likely lower due to less advanced propulsion systems. Efficiency in terms of energy consumption was also a concern, as battery technology was less advanced.
- **2008-2018**: Speed and efficiency improved with better propulsion systems and more efficient batteries. These boats could reach victims more quickly and cover larger areas.
- **2019-2021**: By this time, there may have been innovations in aerodynamics, motor efficiency, and energy regeneration, making these boats both faster and more efficient in their operation.

- **2023**: Modern boats are likely very fast, perhaps reaching speeds and their efficiency has improved with advanced battery technologies and power management systems.

3) Accuracy -

Accuracy refers to how well the boat can follow precise commands, navigate in tough conditions, and reach a specific target.

- **2005-2007**: Early remote-controlled rescue boats were likely less accurate, relying on simple controls and basic navigation.
- **2008-2018**: Improved navigation systems (e.g. GPS) enhanced accuracy. The boats could be more precisely directed to the rescue site, and their sensors became better at detecting obstacles.
- **2019-2021**: During this period, autonomous features may have started to appear. The boats might have incorporated more precise GPS and navigation technology, along with AI-based systems that helped navigate in turbulent conditions.
- **2023**: Today's boats are likely very accurate, potentially integrating AI, GPS, and real-time data to navigate complex rescue scenarios.

8. CONCLUSION

The Remote-Operated Human Rescue Boat System project has successfully demonstrated its potential to revolutionize flood rescue operations by enhancing safety and efficiency. By utilizing remote-controlled boats, the system reduces risks to rescuers while enabling swift, precise, and efficient rescues in difficult-to-reach areas. Its adaptability to various flood conditions, coupled with real-time navigation and automated features, allows for rapid deployment and optimized use of resources. This innovative technology not only improves rescue operations but also offers a cost-effective solution in disaster-stricken areas. Looking forward, further advancements such as AI integration and drone support could further elevate its capabilities, ensuring even greater life-saving potential in future disaster response efforts.

9. ACKNOWLEDGEMENT

We wish to express our sincere gratitude to Mr. J. M. Meshram sir (HOD), Computer Engineering Department and our project guider, Dr. M. V. Lande sir. Also thankful to our Principal Dr. Atul B. Borade sir for their invaluable guidance and support throughout this project. My appreciation extends to the research team for their dedication and collaboration. I also thank [Government Polytechnic, Gadchiroli] for providing the resources for this work. This work would not have been possible without the contributions of all involved.

REFERENCE

[1]. Eugene, C. & Lim, J. & Nirmal, Umar & Lau, Saijod. (2019). Battery Powered RC Boats: A Review of Its Developments for Various Applications. Current Journal of Applied Science and Technology. 1-29. DOI:10.9734/cjast/2019/v33i530098.

[2]. Sarlak, Hamid & Abshenas, Saeideh. (2008). Design and construction of a remote control composite boat. DOI:10.13140/2.1.3706.9606.

[3]. Miranda, Johanne & Villadelrey, Vivien & Cruz, Febus. (2023). Design and Development of Remote-Controlled Boat with GPS Navigation for Water Quality Measurements. 1-6. DOI:10.1109/ICCCNT56998.2023.10306862.

[4]. Adake, Mr. (2019). Review Paper on Water Quality Monitoring System using RC Boat with Wireless Sensor Network. International Journal for Research in Applied Science andEngineeringTechnology.7.873-875. DOI:10.22214/ijraset.2019.1140.

[5]. Robertson, Douglas & Bucinell, Ronald. (2005). The Design and Construction of a Composite RC Boat Hull. DOI:10.13140/RG.2.2.34313.01128.

[6]. https://robu.in/product/flysky-fs-i6x-2-4ghz-10ch-afhds-2a-rc-transmitter-with-fs-ia10b-2-4ghz-10ch-receiver/?gQT=1

[7].https://en.wikipedia.org/wiki/Transmitter

[8].https://www.amazon.in/THEMISTO- passion-Themisto-RS-775-Replacement/dp/B07PT3LZR8?th=1

[9].https://en.wikipedia.org/wiki/DC_motor/

[10].https://en.wikipedia.org/wiki/Gear

[11].https://en.wikipedia.org/wiki/Lithium_polymer_battery

[12].https://www.radiocontrolinfo.com/rc-electric-boats/esc/

[13].https://robu.in/product/towerpro-mg995-metal-gear-servo-motor/

[14].https://www.a-m-c.com/servomotor/