BATCH NO:10

DATE: 16-04-2025

COLLEGE OF ENGINEERING
Since 1982
An Autonomous Institute

Affiliated to Visvesvaraya Technological University, Belagavi.
Approved By AICTE, New Delhi.
Recognized by UGC with 2(f) & 12(B) status.
Accredited by NBA and NAAC

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MVJ21ECP81-PROJECT PHASE-2 – REVIEW 2

RESCUE-READY UNDER WATER SURVEILLANCE DRONE WITH REAL –TIME CAMERA FEED"

Presented by,

1MJ21EC112	Rishabh Narendra
1MJ21EC114	S Lavanya
1MJ21EC156	Vani Kabadagi
1MJ21EC168	Yasaswitha Desu

Guided by,

Dr. Sonal Agarwal
Assistant Professor,
Dept. of ECE

COLLEGE OF ENGINEERING
Engineering A Better Tomorrow

OVERVIEW

- Introduction
- Motivation
- Literature Review
- Critical Observation
- Objective of the Project
- Methodology
- Proposed Design
- Results
- Reference

INTRODUCTION

Underwater drones, characterized by their submersible capabilities and advanced technology, represent a paradigm shift in our approach to marine environments. These remotely operated machines have the potential to revolutionize how we monitor and understand the oceans, while also addressing a myriad of challenges, from environmental conservation to maritime security. This literature review embarks on a comprehensive journey through the historical development, current applications, technological components, challenges, emerging trends, ethical considerations, and regulatory frameworks of underwater drones in the context of marine surveillance.

MOTIVATION

This innovative device enhances safety, efficiency, and effectiveness in emergencies and challenging underwater environments. Equipped with a real-time camera feed, the drone allows rescue teams to quickly assess submerged areas, locate missing persons, and identify hazards without risking human lives. Its mobility and precision make it indispensable for disaster response, such as in floods, shipwrecks, or underwater infrastructure collapses. Beyond rescue, it serves as a crucial tool for monitoring aquatic environments, detecting pollution, and ensuring maritime security. By bridging technology and human ingenuity, this advanced underwater drone inspires confidence in life-saving missions while fostering proactive conservation and safety practices.

LITERATURE REVIEW

Supriya S. Telsang et al. year 2024 [1] this paper is “Underwater Exploration and Cleaning Drone” This project introduces a novel underwater drone capable of remote-controlled movement and real-time communication. Equipped with a camera and sensors, the drone can sample and analyse water, providing real-time images, pH values, and turbidity levels. Controlled via Bluetooth technology, it facilitates underwater exploration, cleaning, and water quality monitoring.

Dr. Shivananda, N.S et al. year 2024 [2] this paper is “RC Under Water Exploration Drone” This paper discusses the design of an underwater drone equipped with a built-in camera providing live video feed, enabling real-time monitoring of the underwater environment. The drone is designed for underwater exploration and can be utilized in search and rescue missions.

LITERATURE REVIEW

Quan-Dung Pham et al. year 2023 [3] this paper is “UWA360CAM: A 360° 24/7 Real-Time Streaming Camera System for Underwater Applications” This paper presents UWA360CAM, a comprehensive system designed to provide continuous 360-degree real-time streaming for underwater environments. The system addresses challenges such as sensor resolution, wide field of view, power supply, optical design, system calibration, and overheating management, making it suitable for various marine applications.

Juan P. Martinez-Esteso et al. year 2023 [4] this paper is “Maritime Search and Rescue Missions with Aerial Images: A Survey” This survey examines the utilization of drones equipped with high-resolution cameras in maritime search and rescue missions. It discusses the effectiveness of various imaging technologies, including thermal and multispectral cameras, in enhancing the detection and rescue of individuals in distress at sea.

LITERATURE REVIEW

J. Mounika et al. year 2023 [5] this paper is “Under Water Surveillance and Rescue Drone with Camera” The primary objective of this research is to develop an underwater surveillance and rescue drone equipped with a camera to assist in saving individuals submerged underwater, inspecting damages beneath ships, and conducting underwater research operations.

Ishrat Jacy Meem et al. year 2022 [6] this paper is “Semi Wireless Underwater Rescue Drone with Robotic Arm” This paper introduces a semi-wireless underwater rescue drone equipped with a robotic arm capable of retrieving objects underwater. The drone features a 4K HD camera and waterproof lights to facilitate search and rescue operations.

LITERATURE REVIEW

Xiaomin Lin et al. year 2022 [7] this paper is “SeaDroneSim: Simulation of Aerial Images for Detection of Objects Above Water” This study presents SeaDroneSim, a simulation suite designed to create photorealistic aerial image datasets with ground truth segmentation masks for objects above water. The tool aims to facilitate the development of computer vision algorithms for UAVs in maritime search and rescue operations.

Tejas Nandurkar et al. year 2021 [8] this paper is “Underwater Surveillance Drone with Camera” The primary objective of this research is to examine the evolution and capabilities of underwater drones, also known as unmanned underwater vehicles (UUVs), equipped with cameras for surveillance purposes. The study discusses the design and implementation of such drones for real-time monitoring of underwater environments.

LITERATURE REVIEW

Agnieszka A. Tubis et al. year 2021 [9] this paper is “Risks of Drone Use in Light of Literature Studies” This article reviews the potential risks associated with drone usage across various domains, including underwater applications. It discusses safety concerns, regulatory challenges, and technological limitations, providing a comprehensive overview of the current state of drone utilization.

Md Jahidul Islam et al. year 2020 [10] this paper is “Simultaneous Enhancement and Super-Resolution of Underwater Imagery for Improved Visual Perception” The paper introduces 'Deep SESR,' a generative model designed to enhance and increase the resolution of underwater images simultaneously. Aimed at improving visual perception for underwater robots, the model employs a multi-modal objective function to address colour degradation, lack of sharpness, and feature loss in underwater imagery. Experimental evaluations indicate that Deep SESR outperforms existing solutions, offering real-time applicability for underwater robotic operations.

CRITICAL OBSERVATION / FINDINGS FROM LITERATURES

A rescue-ready underwater surveillance drone with real-time camera feed offers immense potential but also invites critical observation regarding its limitations and challenges. While it enhances safety and efficiency in underwater operations, its performance can be hindered by factors like water clarity, depth limitations, and strong currents, which may reduce visibility and maneuverability. Battery life and range also present challenges, as extended missions require robust power systems and reliable communication links. Additionally, reliance on real-time feeds depends on stable transmission, which can be disrupted in certain underwater conditions. The high cost of development, maintenance, and operation may limit accessibility for smaller organizations. To maximize its impact, continuous advancements in technology, affordability, and user training are crucial, ensuring it remains an effective and sustainable tool for rescue and surveillance missions

OBJECTIVE OF THE PROJECT

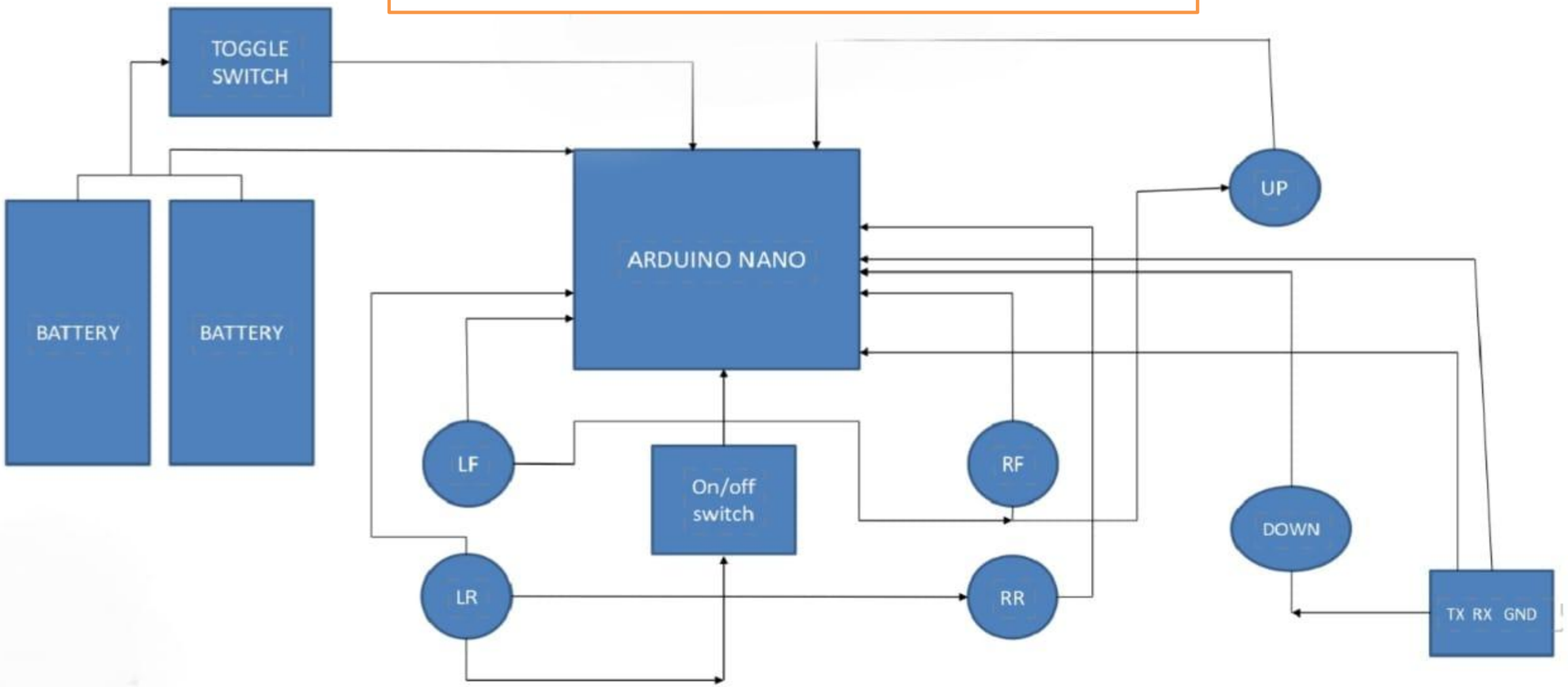
Project is to develop a robust, efficient, and accessible tool for enhancing underwater search, rescue, and monitoring operations. include ensuring the drone's durability to withstand harsh underwater conditions, such as strong currents, low visibility, and varying pressures. It also focuses on optimizing the drone's mobility, battery efficiency, and communication range for extended operations. The project seeks to prioritize user-friendly design for quick deployment and operation, making it an indispensable asset for disaster response teams, environmental monitoring, and maritime security

SCOPE OF THE PROJECT

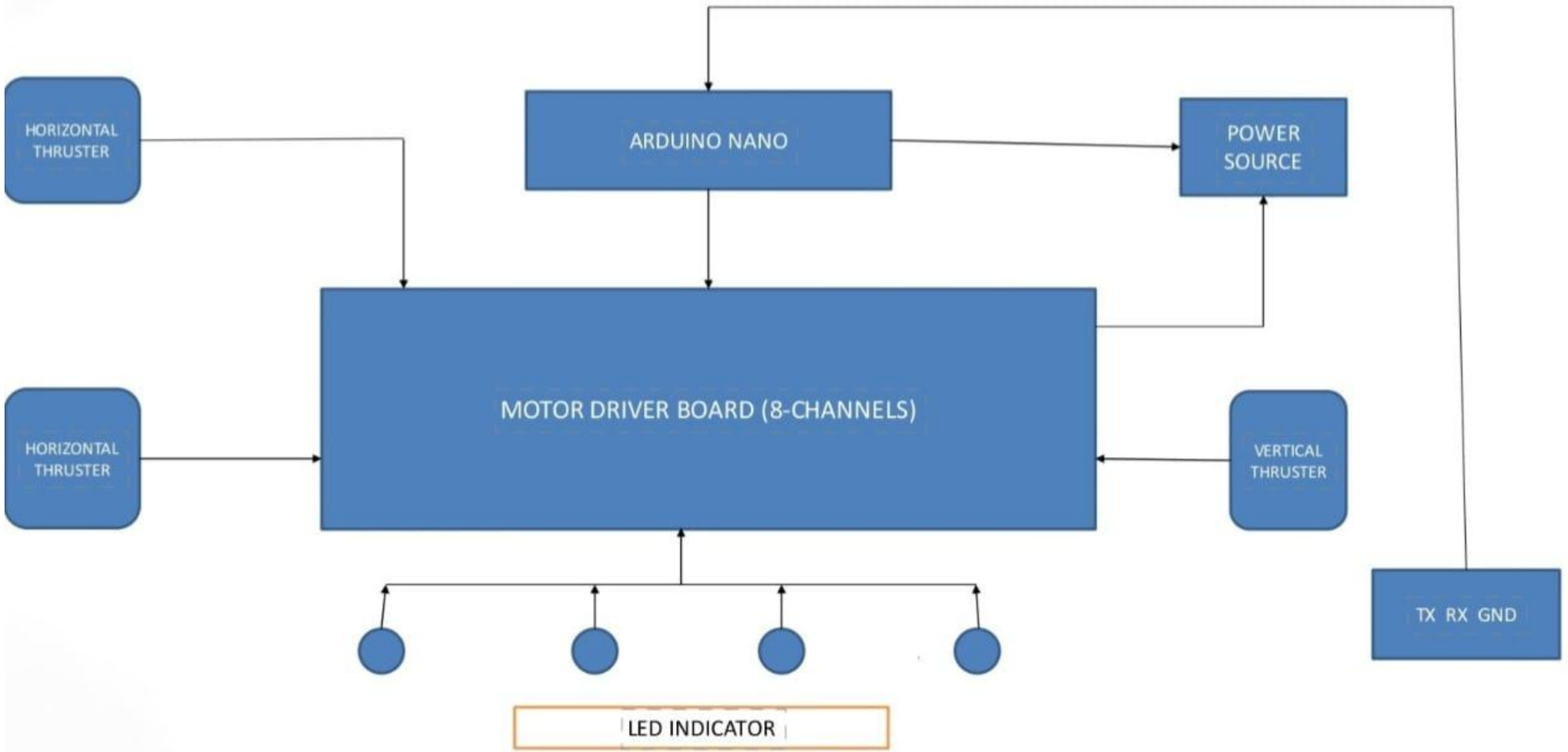
Its scope includes adapting to varying water depths, handling low visibility, and operating in strong currents. encompasses the design, development, and deployment of a cutting-edge device to address critical underwater challenges. the project aims to revolutionize aquatic rescue and monitoring practices, fostering safer and more sustainable operations.

METHODOLOGY

BLOCK DIAGRAM OF SURFACE CONTROLLER



BLOCK DIAGRAM OF ON BOARD CONTROLLER



PROPOSED SYSTEM

FIG: Outer framework

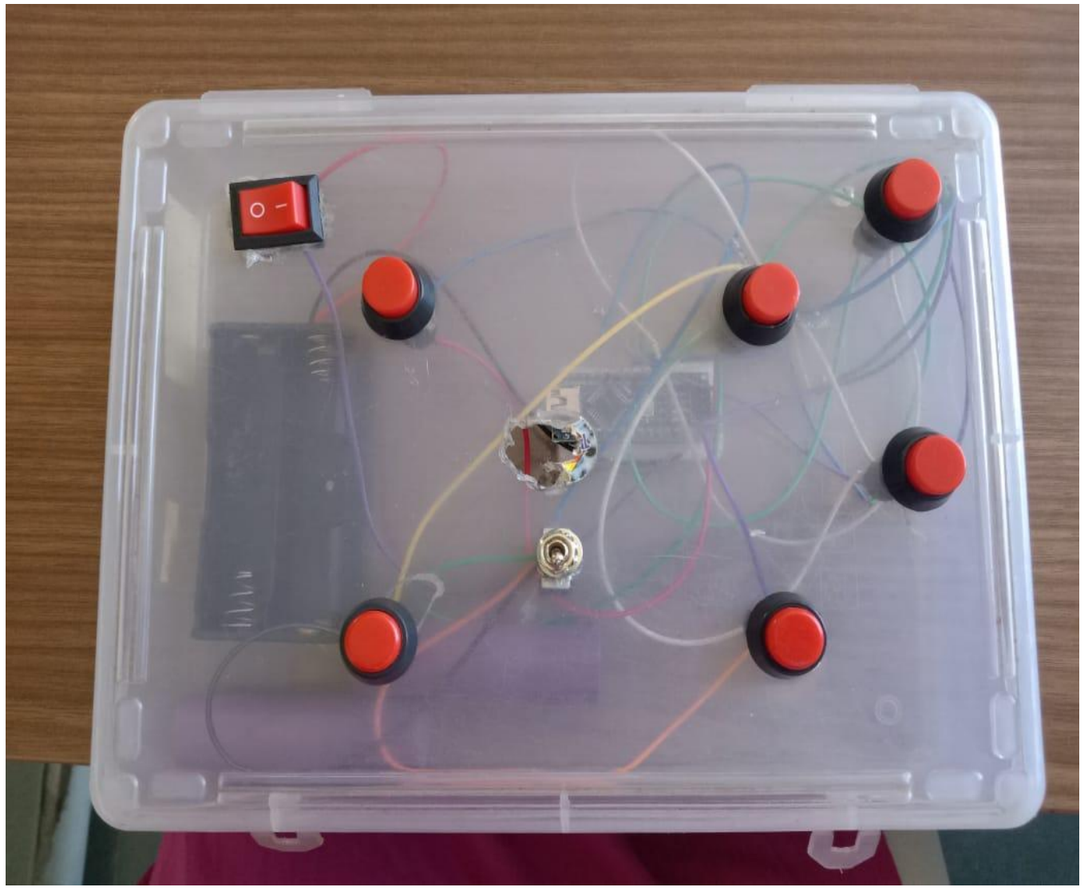


FIG. Surface controller

RESULTS

The current systems of rescue-ready underwater surveillance drones with real-time camera feeds are advanced devices designed for underwater exploration, rescue missions, and surveillance tasks. These drones, also known as ROVs (Remotely Operated Vehicles), provide real-time visual and data feedback to operators for enhanced situational awareness in underwater environments. Real-Time Camera Feed: Equipped with high-definition (HD) cameras capable of capturing clear visuals underwater .In navigation and Control: Controlled via a remote or mobile application. Uses advanced technologies like sonar, GPS, and gyroscopes for precise navigation. Additional Features: Robotic arms for picking up objects or performing tasks. Sensors for water quality testing (e.g., temperature, pH).

Reference

1. Telsang, S. S., Ranadive, I. P., Rane, C. D., Malve, T. V., Bagul, M. M., Rakshit, B. D., ... & Ramteke, S. B (2024). Underwater Exploration and Cleaning Drone.
2. Carpenter, C. (2023). Underwater Drones Promote Sustainability of Offshore Natural Resources Exploitation. *Journal of Petroleum Technology*.
3. Poornima, G., Pavithra, R., Praveen, M., Ragasurya, S., & Aashish, C. (2023, May). Design and analysis of 3D printed unmanned underwater vehicle. In *AIP Conference Proceedings* (Vol. 2492, No. 1). AIP Publishing.
4. Mattioli, M., Bernini, T., Massari, G., Lardeux, M., Gower, A., & De Baermaker, S. (2022, April). Unlocking Resident Underwater Inspection drones or AUV for subsea autonomous inspection: value creation between technical requirements and technological development. In *Offshore Technology.*

Reference

1. Elshahawy, M. A., Younes, H. A. W., & Al Hamlawi, I. (2021, December). Underwater Inspection Using ROV. In *Abu Dhabi International Petroleum Exhibition and Conference* (p. D021S040R001). SPE.
2. Deepak, B. D., &Al-Turjman, F. (2020). Aerial and underwater drone communication: potentials and vulnerabilities. In *Drones in Smart-Cities* (pp. 1-26). Elsevier.
3. Bogue, R. (2020). Robots in the offshore oil and gas industries: a review of recent developments. *Industrial Robot: the international journal of robotics research and application*.
4. Trslić, P., Rossi, M., Sivčev, S., Dooly, G., Coleman, J., Omerdić, E., & Toal, D. (2018, October). Long term, inspection class ROV deployment approach for remote monitoring and inspection. In *OCEANS 2018 MTS/IEEE Charleston* (pp. 1-6). IEEE.

THANK YOU