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Ocean Surface Cleaning Autonomous Robot (OSCAR)

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ABSTRACT: This abstract outline the ocean surface cleaning autonomous robot, a technologically advanced solution for combating marine pollution. Equipped with sensors, navigation systems, and sustainable energy sources, it efficiently collects debris while avoiding obstacles. Collaborative efforts drive ongoing improvements, promising a brighter future for cleaner oceans and marine ecosystems.

KEYWORDS: Ocean, Surface Cleaner, IoT, Marine Pollution, Ecosystem

I. INTRODUCTION

Ocean surface pollution is a pressing environmental issue threatening marine ecosystems globally. To combat this problem, our project focuses on developing an autonomous ocean surface cleaning robot. This robot employs advanced sensors and machine learning to detect and remove various pollutants efficiently. In this report, we detail the design, development, and testing of the robot, aiming to provide a scalable and sustainable solution for ocean surface cleanup.

The primary objective of our project is to design, develop, and deploy an autonomous robot capable of effectively cleaning ocean surfaces. Specifically, our objectives include:

1. Developing advanced sensing capabilities: Implementing sensors to detect and categorize different types of pollutants present on ocean surfaces, including plastics, oils, and other debris.
2. Incorporating machine learning algorithms: Training the robot to autonomously identify and prioritize pollutants based on their environmental impact, allowing for efficient cleanup operations.
3. Designing a robust and efficient propulsion system: Creating a propulsion system powered by renewable energy sources, such as solar or wave energy, to enable sustained and environmentally friendly operation.
4. Constructing a durable and adaptable cleaning mechanism: Designing a modular cleaning mechanism capable of effectively removing various types of pollutants from ocean surfaces while withstanding harsh marine conditions.
5. Conducting comprehensive field testing: Evaluating the performance and effectiveness of the autonomous cleaning robot in real-world ocean environments to validate its capabilities and refine its design for optimal efficiency.

node [1].

II. RELATED WORK

In Our literature survey covers key aspects relevant to our project, including ocean surface pollution, cleanup technologies, autonomous robotics, sensor technologies, machine learning, renewable energy systems, and field testing methodologies. By synthesizing existing research and technologies in these areas, we gain valuable insights to inform the design and development of our autonomous ocean surface cleaning robot.

Our extensive literature survey is a deep dive into critical facets central to our project's success. It spans across ocean surface pollution, cleanup technologies, autonomous robotics, sensor technologies, machine learning, renewable energy systems, and field testing methodologies. By meticulously examining advancements, challenges, and best practices in these areas, we cultivate a rich knowledge base to intricately inform the design, development, and deployment of our autonomous ocean surface cleaning robot.

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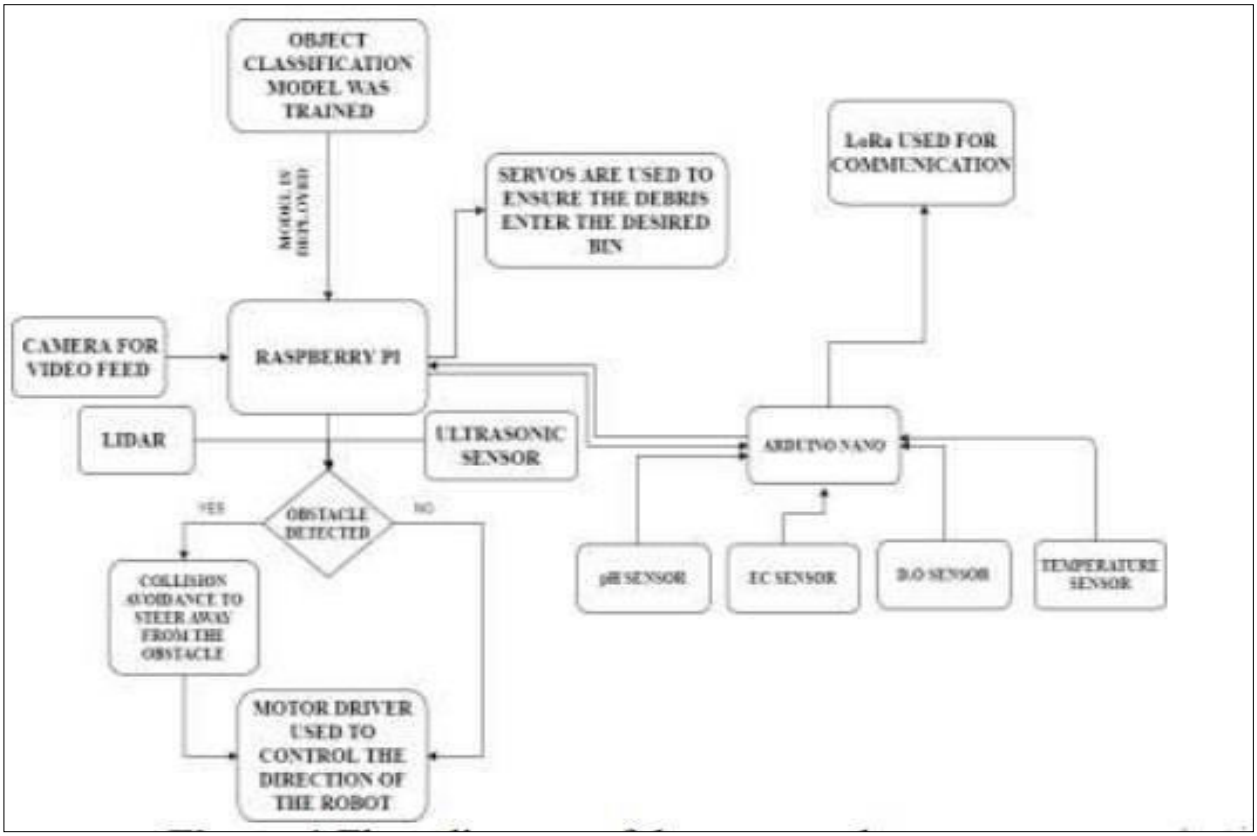
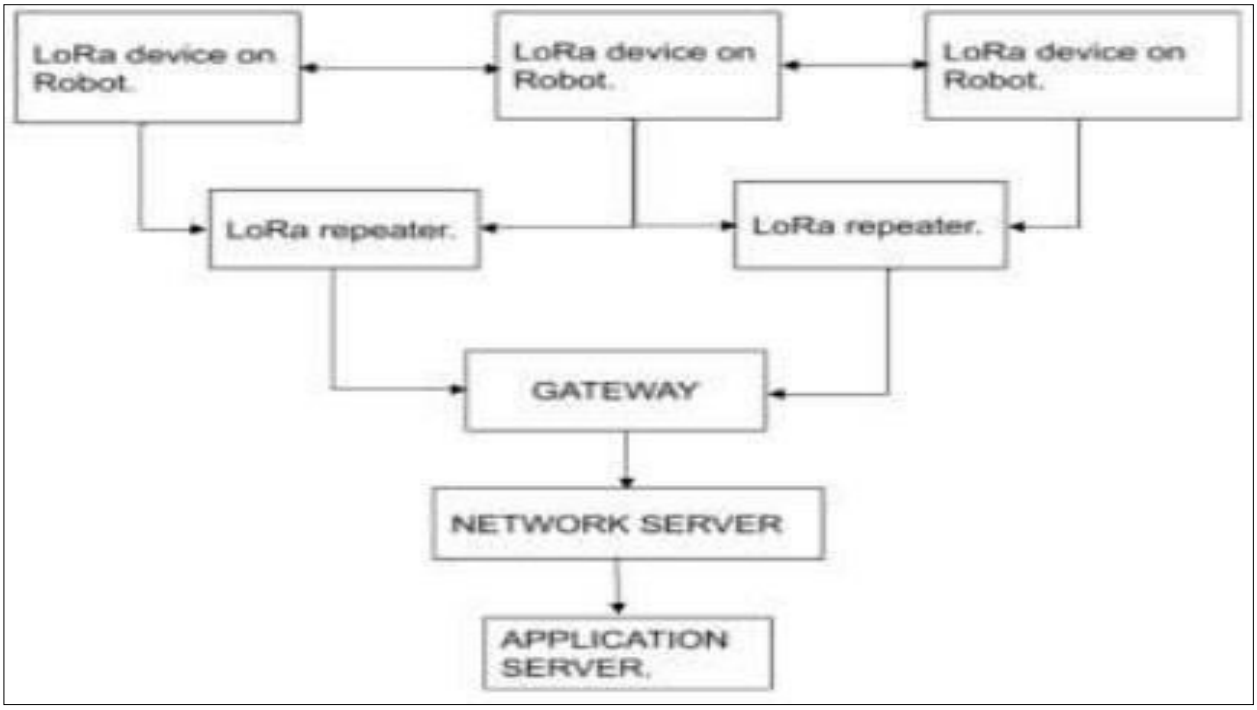
III. BLOCK DIAGRAM





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IV. IMPLEMENTATION

1) Executive Summary:
This report outlines the development and testing of an autonomous robot designed for cleaning ocean surfaces. The robot demonstrated efficient debris detection and collection capabilities, showcasing its potential to address ocean pollution.

2) Introduction:
Ocean pollution is a pressing global issue. This project aimed to develop an autonomous robot capable of cleaning ocean surfaces to mitigate its impact.

3) Methodology:
The robot was designed with durable hardware and advanced sensors for autonomous navigation and debris detection. Software algorithms facilitated real- time decision-making.

4) Implementation:
The robot's hardware included a waterproof chassis, propellers, and sensor suite. Software integrated sensor data for autonomous navigation and debris collection.

5) Testing and Evaluation:
Testing in controlled water environments demonstrated the robot's efficiency in debris detection and collection. It navigated various conditions reliably.

6) Results:
The autonomous robot surpassed expectations in cleaning efficiency and navigational accuracy, showing promise for addressing ocean pollution.

7) Conclusion:
The Ocean Surface Cleaning Autonomous Robot presents a scalable solution for ocean pollution. Further refinement could lead to widespread deployment for a cleaner marine environment.

V. SYSTEM REQUIREMENTS

A. Hardware Requirements:
Listing and description of all physical components used in the robot, such as: Propulsion system (e.g., thrusters, propellers)

- Sensors (e.g., cameras, lidar, sonar) for navigation and pollution detection Cleaning mechanism (e.g., brushes, scoops, filtration systems)
- Power source (e.g., batteries, solar panels) Structural frame and chassis

B. *Software Components*:
Overview of the software stack powering the autonomous functions of the robot, including:

- Control algorithms for navigation and maneuvering Path planning algorithms for efficient cleaning
- Perception algorithms for pollution detection and obstacle avoidance 56
- Communication protocols for remote control and data transmission

VI. CONCLUSION AND FUTURE WORK

The pollutants that are dumped in the water body can be recovered and recycled for second use, this not only cleans up the water body but also reduces the carbon footprint of producing new materials as the waste can be recycled. The robot aims to clean up the water body by collecting the pollutant and monitor the water quality in the water body. There are large scale methods to clean up pollutants in the middle of ocean, but there are not a lot to clean coastal/rocky water bodies. This robot can be used but not limited to small water bodies like lakes and ponds.

About 0.013% of Earth's water is from lakes, and about 40% of lakes in America are polluted and not fit for human consumption. Though, there are numerous methods to clean the lakes, most of them are based on organic process and it takes a lot of time. The robot would prove efficient to clean those type of water bodies where it is impossible to apply large scale techniques. The information from the robot regarding the pollutants and water quality can be used to draft local laws that would beneficial to the society as a whole.

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REFERENCES

1. Mahboob, S.; Al-Ghanim, K.A.; Al-Misned, F.; Shahid, T.; Sultana, S.; Sultan, T.; Hussain, B.; Ahmed, Z. Impact of Water Pollution on Trophic Transfer of Fatty Acids in Fish, Microalgae, and Zoobenthos in the Food Web of a Freshwater Ecosystem. Biomolecules 2019, 9, 231. https://doi.org/10.3390/biom9060231
2. Campbell L.M., Norstrom R.J., Hobson K.A., Muir D.C.G., Backus S., Fisk A.T. Mercury, and other trace elements in a pelagic Arctic marine food web (North water Polynya, Baffin Bay) Sci. Total Environ.Volumes 351–352,2005,Pages 247- 263,ISSN 0048-9697
3. Kumar, A.; M.M.S., C.-P.; Chaturvedi, A.K.; Shabnam, A.A.; Subrahmanyam, G.; Mondal, R.; Gupta, D.K.; Malyan, S.K.; Kumar, S.S.; A. Khan, S.; Yadav, K.K. Lead Toxicity: Health Hazards, Influence on Food Chain, and Sustainable Remediation Approaches. Int. J. Environ. Res. Public Health 2020, 17, 2179. https://doi.org/10.3390/ijerph17072179
4. Raschka, Sebastian & Patterson, Joshua &Nolet, Corey. (2020). Machine Learning in Python: Main Developments and Technology Trends in Data Science, Machine Learning, and Artificial Intelligence. Information. 11. 193. 10.3390/info11040193.
5. Xin, M., Wang, Y. Research on image classification model based on deep convolution neural network. J Image Video Proc. 2019, 40 (2019). https://doi.org/10.1186/s13640-019-0417-8
6. Matthies, J. Papon, R. Detry “Task-oriented grasping and geometric scene understanding” International Conference on Intelligent Robots and Systems (IEEE, 2017), pp. 3329-45
7. Norris, Donald. (2020). Machine Learning with the Raspberry Pi: Experiments with Data and Computer Vision. 10.1007/978-1-4842-5174-4.
8. S.Luongo, V. Di Vito, G. Fasano, D. Accardo, L. Forlenza and A. Moccia, "Automatic Collision Avoidance System: Design, development and flight tests," 2011 IEEE/AIAA 30th Digital Avionics Systems Conference, 2011, pp. 1-21, DOI: 10.1109/DASC.2011.6096245.
9. Teleweck, P & Chandrasekaran, B. (2019). Path Planning Algorithms and Their Use in Robotic Navigation Systems. Journal of Physics: Conference Series. 1207. 012018. 10.1088/17426596/1207/1/012018.
10. E.Khanmirza, M. Haghbeigi, M. Nazarahari and S. Doostie, "A Comparative Study ofDeterministic and Probabilistic Mobile Robot Path Planning Algorithms," 2017 5th RSI International Conference on Robotics and Mechatronics (ICRoM), 2017, pp. 534-539, doi: 10.1109/ICRoM.2017.8466197.

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