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Marine Observatory Unmanned Boat

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Abstract: This project involves close observation of marine life using a remotely controlled boat. The motion of the boat is controlled using the Esp8266 microcontroller, which can be controlled using Wi-Fi. Additionally, mini-DC pumps are used for the motion of the boat, which is controlled using the Android app. Marine life is observed using two cameras, an Esp32 camera and an Android camera, which are being mounted on the boat to observe above water as well as inside the water, and both outputs of the camera are visible on the PC. The output of an Android camera is used to detect movement inside water using OpenCV, and data collected by cameras can be stored on a PC remotely.

Keywords – Esp8266, L298N Motor Driver, Mini DC Pumps ESP32 Cam, Android Camera, OpenCV, NumPy.

I. INTRODUCTION

"Marine Observatory Unmanned Boat" is a project that can be used to monitor marine life closely in their natural habitat without causing any disturbance to marine life. This project is twofold, first to control the motion of the boat [1] and second object movement detection and collecting data using cameras[2]. To control the boat, we use an Esp. 8266 microcontrollers [3]which gives us the flexibility to control the boat on a Mobile application using Wi-Fi and for propulsion of the boat mini DC is used. We created an interface in the mobile application such that it can consist of 4 buttons to maneuver the boat.

We use two cameras, an Android camera, and an Esp32 camera, to live stream and collect data. The Esp32 camera is only used for capturing images and live video streams[4]. An Android camera is used for object movement detection. An Android camera consists of a unique IP address that is being integrated into a Python program, allowing real-time access to the camera. To detect any movement, we first calculate the absolute difference between the current frame and the previous frame. If there is movement, it will display "movement" on the screen, and it will also create a green rectangular box around the object, which is in motion.

To view the object movement detection, we just have to run a Python program on Python idle where the IP address of the Android cam is integrated with the program. we just have to run where urllib library provides an interface that allows Python to access an Android camera via the internet. when the connection between the camera and Python idle is established we can see a video screen where we can view live streaming underwater and movement detection.

When an object moved by an android cam is detected it shows a green rectangular box around the object which is in motion and displays "movement" text on top of the screen. But what happens when there is no movement let us say the boat is static or activity inside water almost zero, then there will be no green rectangular boxes and on the top, it will show no movement.

Now to view above the water we just have to paste the IP addresses of the esp32 cam in the browser and streaming will be started. Now we can collect data by capturing images and storing them on whatever device we are using to stream feed from both cameras. Let us assume that we have to see or detect movement at the rear end of the boat or in other words back side inside the water, so what we have to do is just switch the camera from rear to front which also can be done remotely. This gives us the flexibility to cover a large area

II. PROBLEM STATEMENT

To provide a real-time observation interface for remote operators to monitor aquatic life observation.

III. MOTIVATION

When we say marine life, we mean life associated with marine entities such as the ocean, sea, lake, pond, etc. Our earth consists of 70% water, which means water has the potential to change every aspect of our lives. Heavy industrialization, globalization, increased human life expectancy, and a good health care system have given the earth a huge burden due to which various problems have arisen. Climate change is one of the reasons that threatens the earth's biodiversity.

The increased amount of toxic waste being released into water bodies has eliminated and endangered certain aquatic animals and aquatic plants. For example, studies show almost 80% of coral reefs have vanished due to the release of CO2 into the water by the manufacturing industry[5]. This directly affects aquatic life and also increases the temperature of the ocean, which results in an overall negative effect on marine life.

So there is a need for rapid restructuring of the way of life of humans, which can be helpful to control climate change and problems that affect marine life. For this, we need large amounts of data, and the data should be collected without any disturbance to the natural habitat of marine life[6].

“Marine Observatory Unmanned Boat” allows us to observe marine life closely and collect data that can be further used in studies, research, surveys, etc.

IV. BLOCK DIAGRAM

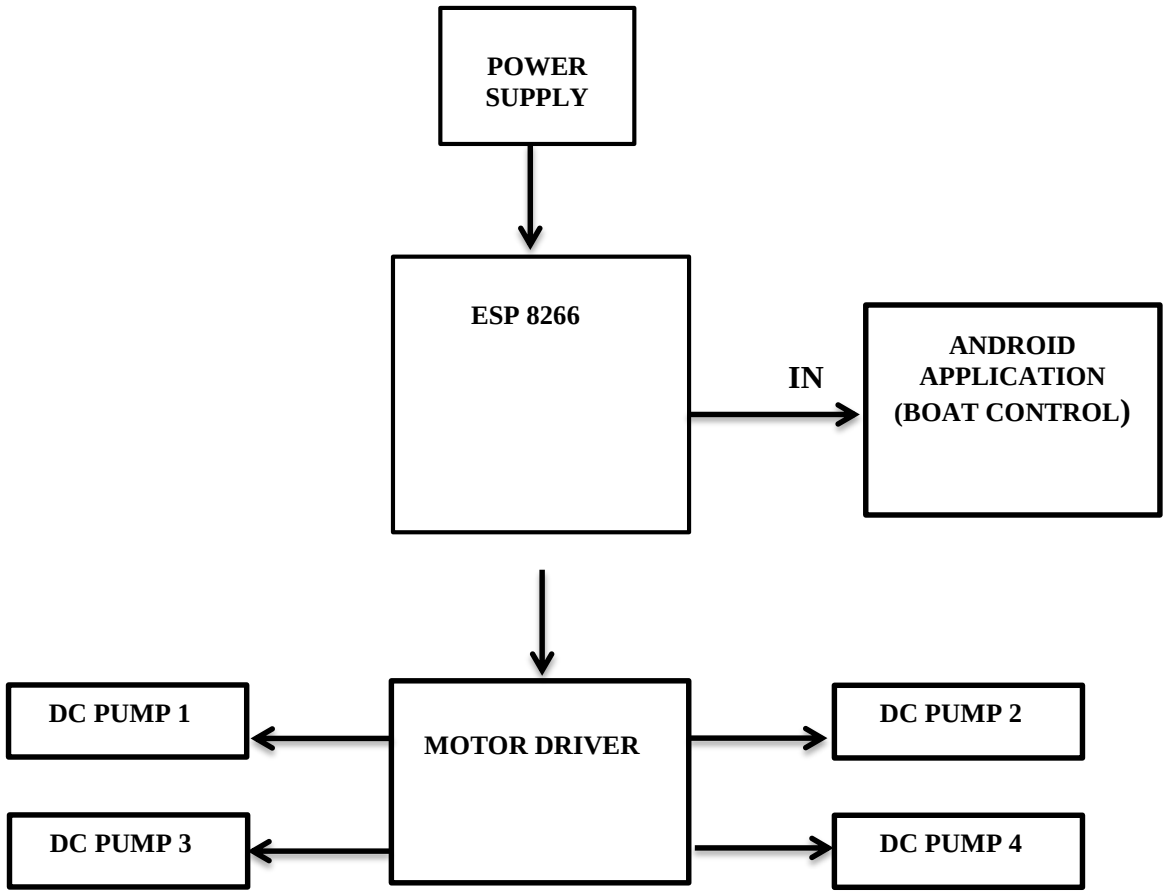


FIG 1:CONTROLLING MECHANISM OF BOAT

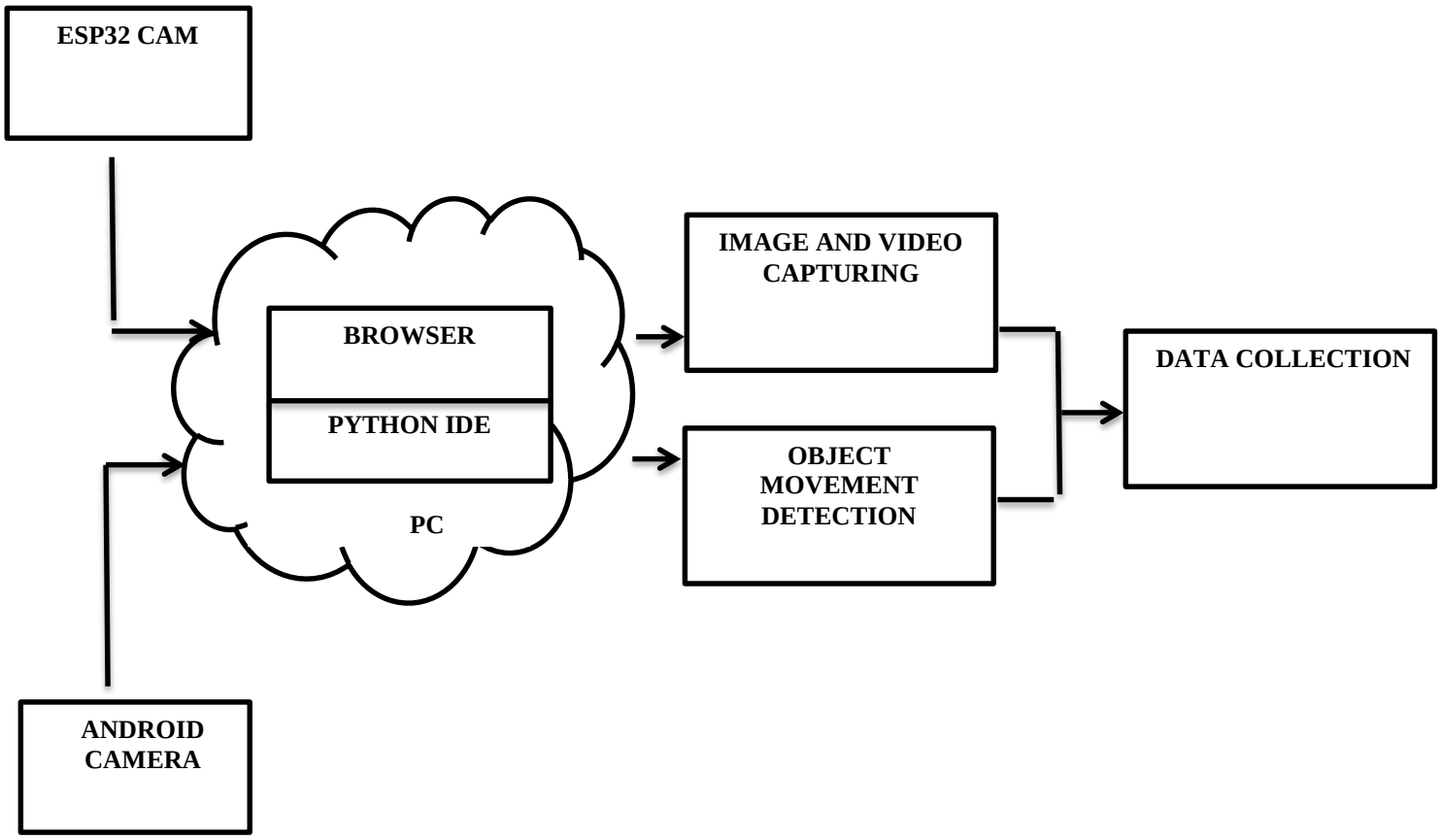
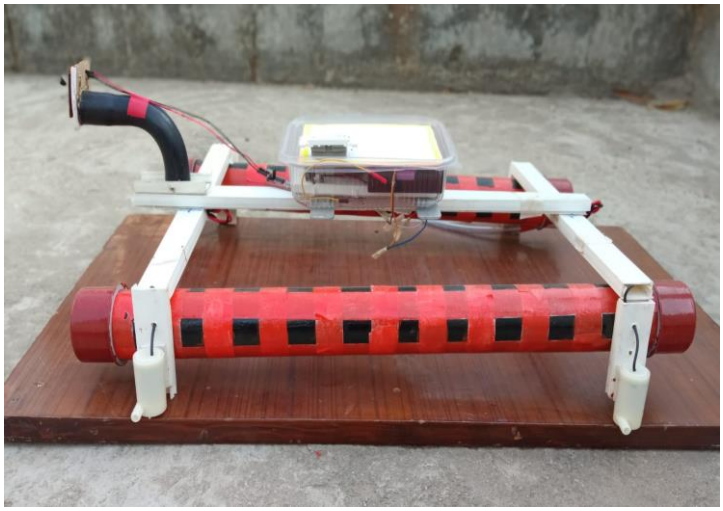


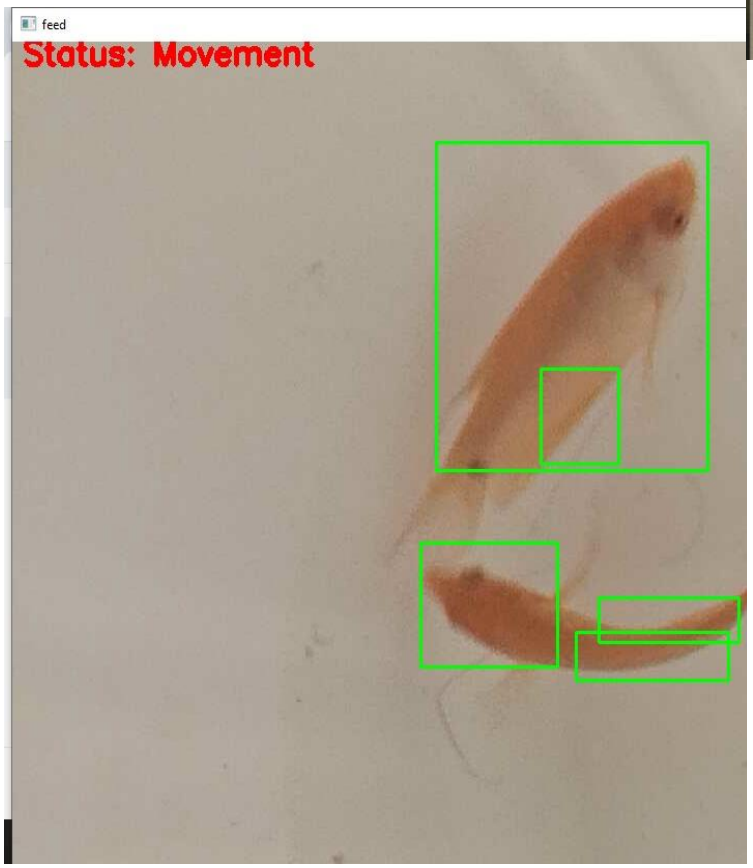
FIG 2: MOVEMENT DETECTION AND DATA COLLECTION

V. ALGORITHM

- STEP 1.Initialization
- STEP 2. Main Loop
- STEP 3. Image Processing and movement detection
- STEP 4. Remote Control
- STEP 5. Real-time Monitoring and User Interface
- STEP 6. Continuous Operation
- STEP 7. Data Analysis (Post-Mission)
- STEP 8.Reporting and Visualization
- STEP 9. Shutdown

VI.RESULTS





VII.CONCLUSION

The primary goal of our project, **"Marine Observatory Unmanned Boat,"** is to observe marine life closely without causing

any disturbance to their natural habitat. The project works in two phases: the first phase consists of controlling the action boat,

and the second phase consists of object movement detection and data collection. Collected data is stored on a PC or any other

device. Our project can play a crucial role in future studies, surveys, and research. Also, this project is scalable, which means

we can modify it as an application requirement.

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