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Human body detection Underwater, water quality monitoring, and marine boundary surveillance using AI with help of marine robots

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Abstract
The work presented in this paper gives the details about the human body detection, underwater, water quality monitoring, and marine boundary surveillance using AI with help of marine robots. This paper involves designing and implementing an Aquabot, which travels underwater to detect possible human presence. This robot is expected to be extremely useful in human detection operations underwater during water accidents. Monitoring the marine borders is a very difficult task and the security at these borders is of high importance. In order to understand the global climate and environmental changes, marine exploration is necessary. This project helps in research areas for the purpose of various data collection, weather monitoring, and pH sensing. Using these data disaster prevention like tsunamis and earthquakes can be done. Garbage disposal facilities are absent in many places. Hence, dumping garbage into nearby water bodies has become a major issue. This type of dumping causes a negative impact on the environment, Aquabot provides applications for cleaning, weather monitoring, pH sensing, etc. The work given here is a mini-project that is taken up as a part of the curriculum completed by electronics and communication engineering students in the second year of the electronics & communication engineering department at Dayananda Sagar College of Engineering in Bangalore.
Keywords : Acquatic, Robotic, Sensor, pH, underwater, Detection, Human

1. A succinct introduction

First, a comparison of the various AQUABOT sensors is provided. An extensive analysis of the algorithms utilised for human detection follows [1].

2. Use of pH sensors to monitor the purity of the water

To determine if the water is acidic or alkaline, use the pH scale. The hydrogen ion concentration is translated onto the pH scale. the pH scale, which has a logarithmic range of 0 to 14. While a pH of 7 or greater is considered basic and a pH of 7 or less is considered acidic [12]. When the pH of the water is between 6.5 and 8, it is said to be pure, and when it is below 6.5 or beyond 8, it is seen to be impure. The hydrogen ion concentration falls by ten times as time goes on, pH levels rise, and the acidity of the water lowers [15]. A pH sensor may measure both the electrode and the reference electrode [3].

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3. Conduction of electricity

Conductivity affects the ability to evaluate the absorption of dissolved particles in water quality. The conductivity unit used to gauge water quality is Siemens per centimetre, also referred to as micro-Siemens per centimetre or S/cm [16]. The conductivity ranges for drinking water, ocean water, and well cleaned water are 5 S/m, 5-50 mS/m, and 5.5 S/m, respectively [4]. Water's electric conductivity is determined using a probe and metre. Two metal electrodes separated by one centimetre make up the probe of an electrical conductivity sensor. To the electrodes is given a steady voltage supply. The electrical conductivity of water is measured using the momentum that flows through it, which is directly connected to the retention of broken-down particles [5].

4. Sensor for turbidity

A turbidity sensor uses analytical methods to measure turbidity. They are highly useful and successful techniques for figuring out a solution's clarity and particle content, like water [14]. Turbidity sensors are used in many industries to track water quality, boost productivity, and cut waste. [6] The amount of light scattered by suspended particles in a liquid, such as water, is determined by turbidity sensors. Total suspended solids (TSS) and total dissolved solids (TDS) levels rise along with turbidity in a liquid. A liquid's turbidity can be measured using turbidity sensors, which is commonly done to evaluate the water's quality [7].

5. Sensor IR

Infrared sensors are one type of motion sensor that uses infrared radiations. Physical security, primarily intruder detection, is the main use of this gadget. By observing how an infrared light beam reflects off an item, infrared distance sensors can determine how far away it is. The distance is calculated by using the triangulation of the light beam [8].

6. Automated Arm

Robotic arms are mechanical devices that imitate human arms. Its various components strikingly resemble the wrist, elbow, and shoulder [13,17-22]. Because of the flexibility of the gadget, which works just like a human arm, the user can traverse rugged terrain. One arm of the robot is capable of scooping up different sorts of material with high precision and up to 98 percent purity. Its AI computer may be configured to distinguish different forms of garbage [9].

7. Algorithm R-CNN

The goal of R-CNN was to take an input image and produce a set of bounding boxes, each of which contained an object and its category (such as an automobile or a pedestrian) as well. Region-based convolutional neural networks have been used to follow things from a drone-mounted camera, find text in a picture, and recognise items. The first phase in the R-CNN process is to extract regions of interest (ROI), where each ROI is a rectangle that could represent the edge of an item in an image. This process is known as selective search [10]. Depending on the circumstance, there could be up to 2000 ROIs. After that, each ROI is loaded into a neural network to produce output features [12]. The output features of each ROI are analysed by a collection of support-vector machine classifiers to identify the type of item (if any) contained therein. R-CNN can now be used to complete other computer vision tasks. Fast R-CNN, Faster R-CNN, Mask R-CNN, and Mesh R-CNN are further R-CNN variants [11,23,24].

8. Conclusions

According to the research, a camera module and IR sensor can be used to find the body underwater. Ultrasonic sensors and artificial intelligence (AI) train the robot to recognise faces and trigger if the face is unknown, which aids in sea border surveillance. By providing datasets of other valuable objects, robots can be utilised to detect objects and assets besides the human body. It gathers floating

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trash with the aid of a robotic arm. It is affordable because it has all these characteristics in one package.

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