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# DESIGN AND DEVELOPMENT OF AN IOT BASED AUTONOMOUS WATER WASTE COLLECTING SYSTEM USING SOFTWARE DETECTION METHOD

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**ABSTRACT:**

Waste management is nothing but the control or cleaning of wastes occurring on the surface of the earth. It helps keep our space hygienic. A lot of waste occurs in water, air and land. In general, water waste management is a key approach to the conservation of water resources and is defined as the collection, treatment and reuse of wastewater. In the sewage collection network, which is one of the critical infrastructures, undesirable performance can lead to various problems. Generally human power is used to remove all types of waste. An autonomous engine is used to replace it. A man-made resource was used to clean up waste. By using this process, this human power took more time to use. To overcome this drawback, we have developed an IOT based automatic waste cleaning machine which autonomously disposes wastes and runs only on renewable energy. Electrical control methods include total or partial disposal of plastic waste, including collecting, chaining, moving and storing plastic waste in water. Unlike Waste collection machines designed for specific functions in specific aquatic habitats, this autonomous machine is used for all types of aquatic habitats.

**KEYWORDS:**

**WASTE MANAGEMENT, AUTONOMOUS VEHICLE, RENEWABLE ENERGY SOURCE, IOT.**

## INTRODUCTION

Technology is advancing rapidly leading to advancements in various fields, be it connectivity or real-time applications. Nowadays a basic microcontroller used in microwave ovens can be used to trigger an automated robot to perform a specific action which could naturally ease life. The advancements in the blooming field of Internet of things have led to great advancements not only in the field of connectivity between things and automation, but by the combination of various sensors a difficult task can be made a lot easy to execute.

The Internet is a technology that has revolutionized all fields. The fledgling field of the Internet has blossomed. The use of the Internet to connect things is indeed the first step towards a modern futuristic society. By its general definition, the Internet is used to connect anything, anytime, anywhere.Using popular new technologies like cloud computing and deep learning can make the Internet of Things and connectivity and data processing more efficient. The combination of cloud computing, big data analytics and the Internet of Things is sure to revolutionize the world of science and technology.

The use of connectivity modules such as Wi-Fi, Bluetooth, ZigBee and other modules used for communication can send information and data between sensors and actuators to users, creating a connection between not just two things but everything. A single temperature sensor can be used to trigger a home air conditioner directly from your workplace via remote notification. Sensors and actuators play a big role in IoT

Water resources are an integral part of human life and are essential for the survival of life on this planet. However, in recent years, plastic and waste pollution in water bodies is increasing at an alarming rate, disrupting aquatic ecosystems, affecting water quality and blocking sunlight. Also, during the coronavirus pandemic, disposable masks, gloves and other biomedical wastes add to the contamination of existing water bodies. Inefficient management of biomedical waste leads to public health hazards and poses an even greater threat to the environment. Marine ecosystems are also threatened by marine debris, which can strangle, suffocate and starve animals. Waste management is one of the most growing challenges facing humanity, threatening to even uproot our existence. In this paper, we have proposed a product that can efficiently deal with the current problem of improper waste disposal in aquatic sites.

An autonomous machine that collects sewage and other floating debris in waterways. In modern technology, the waste is removed manually, which will create huge employment opportunities, but cleaning the human genitalia is very dangerous. But in some places bots are used to clean water bodies and this machine is manually controlled. By using the Internet of Things (IOT), it is possible to automate all cleaning processes. An automatic cleaning machine is the best idea for all spaces, it is highly efficient, labor-free and one time investment. It can reach all remote areas and highly polluted areas.

In our project the software is developed to control the whole machine. This software is connected to the machine through Internet of Things (iot). The machine has GPS, angle sensor, IR sensor, GSM, ultrasonic sensor and external components like camera, PVcell, motor controller, BLDC motor and Arduino Uno. The entire machine runs only on the renewable energy source of solar energy.

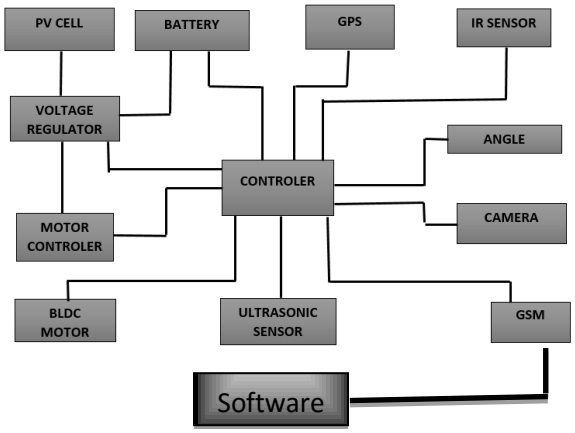
**EXISTING SYSTEM:**

At present, some places collect solid waste in the water using a cleaning machine. The machine collects a large amount of waste, but it is manually controlled, and this machine cannot be used for all aquatic sites. It consumes a large amount of fuel and the maximum labor requirement restricts it. Due to this, there is a possibility of harmful diseases to the workers working on the machine. The machine has a conveyor system which separates the solid waste from the sea and sends it to the machine

**PROPOSED SYSTEM:**

In this work we invented an autonomous machine. Works automatically without any labor. It works using IoT technology. A software is developed to control this machine, connected to the machine through IOT technology. The machine has external components such as GPS, angle sensor, IR sensor, GSM, ultrasonic sensor and camera, PVcell, motor controller, BLDC motor and Arduino Uno. GPS is used to navigate the machine. GSM is used to connect the machine to the software through IoT. IR sensor and ultrasonic sensor are used to detect the obstacle in front of the machine, microcontroller is used to control and process all the data from all the components. BLDC motor is used to move the machine and is used for conveyor. A conveyor in the machine collects the solid waste from the water and sends it to the storage area, and when the storage area is full, the machine sends a notification to the owner. The software works by using satellite mapping, which helps in locating and identifying the location of waste water bodies. The machine works using renewable energy source solar and battery, so there is no pollution from this machine.

**BLOCK DIAGRAM**




**BLOCK DIAGRAM OF AUTONOMOUS MACHINE**

**MATERIALS**

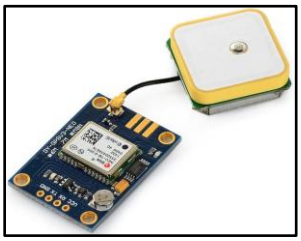
**ARDUINO UNO**

Arduino Uno is a microcontroller board based on ATmega328. It has 16 MHz crystal oscillator, 6 analog inputs, 14 digital Input/output pins (6 of which can be used as PWM outputs), a USB port, a power connector, an ICSP header and a reset button. It has everything needed to support the microcontroller; To use it, run a USB cable, AC-to-DC converter, or battery. The FTDI USB-to-serial driver chip is not used by the Uno, which differs from all previous boards. Instead, it has an Atmega8U2 configured to act as a USB-to-serial converter. The Italian word "uno," meaning "one," was chosen to immediately denote the Arduino 1.0 release. Moving forward, the reference versions of Arduino will be Uno and version 1.0. The Uno, the latest in the line of USB Arduino boards, serves as the benchmark for the platform.

**SENSOR**

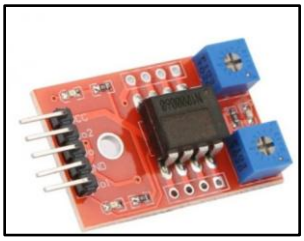
**GPS NEO-6M**

The Global Positioning System (GPS) uses signals sent by satellites in space and ground stations on Earth to accurately determine its position on Earth. The NEO-6M GPS receiver module uses USART communication to communicate with a microcontroller or PC terminal. It receives information like latitude, longitude, altitude, UTC time from satellites in the form of NMEA string. This string needs to be parsed to extract the information we want to use.



**ANGLE SENSOR**

SCA60C Angle Sensor with Arduino- This angle sensor can be used in robotics and other areas where you need to measure angle. SCA60C angle sensor is one of the main features of robotics, and in many applications you need to constantly know the position of the angle of some arm or some element in your robotics, this is a very cheap way. The viewing angle is 0 and 180 degrees and the resolution is 1 degree.

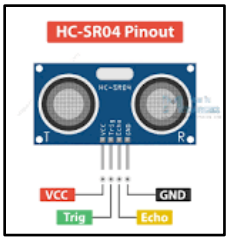


## IR SENSOR

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered in 1800 by an astronomer named William Herschel. When measuring the temperature of each color of light (separated by a prism), he noticed that the temperature beyond the red light was higher. IR is invisible to the human eye because its wavelength is longer than visible light (although it is still in the same electromagnetic spectrum). Anything that emits heat (anything with a temperature above about five degrees Kelvin) gives off infrared radiation.

## ULTRASONIC SENSOR

An ultrasonic sensor is a device that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that return information about an object's proximity. Ultrasonic sensors work by transmitting sound waves at a frequency above the range of human hearing. The sensor's transducer acts as a microphone to receive and transmit ultrasonic sound. Our ultrasonic sensors, like many others, use a transducer to send a pulse and receive an echo. The sensor determines the distance to the target by measuring the time intervals between sending and receiving the ultrasonic pulse. The working principle of this module is simple. It sends out an ultrasonic pulse at 40kHz, which travels through the air and bounces back to the sensor if there is an obstacle or object. By calculating the travel time and the speed of sound, the distance can be calculated. Ultrasonic sensors are the best solution for detecting clear objects. Applications using infrared sensors for liquid level measurement, for example, struggle in this particular use case due to target translucency. For presence detection, ultrasonic sensors detect objects regardless of color, surface, or material (unless the object is too soft. Wool absorbs sound.) For detecting transparent and other objects where optical technologies fail, ultrasonic sensors are a reliable choice.




## GSM

GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard developed by the European Telecommunications Standards Institute to describe protocols for second-generation (2G) digital cellular networks used by mobile phones using a GSM module or A. A GPRS module is a chip or circuit that is used to establish communication between a mobile device or computing machine and a GSM or GPRS system. Modem (modulator-demodulator) is an important part here. These modules are powered by a GSM module or GPRS modem and have communication interfaces (such as RS-232, USB 2.0 and others) for computers. A GSM modem can be a dedicated modem device with serial, USB, or Bluetooth connectivity, or a mobile phone that provides GSM modem capabilities.

## CAMERA

A camera is a device used to capture video, through which we can record or stream video.

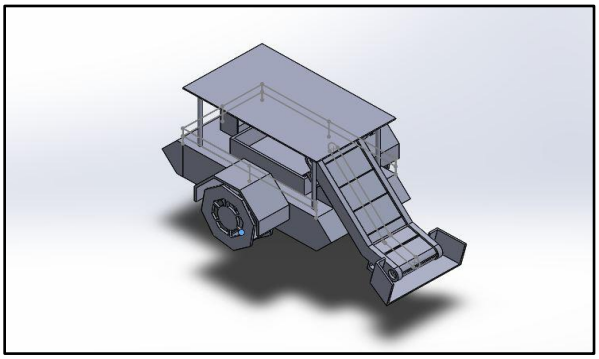
## BLDC MOTOR

A motor converts supplied electrical energy into mechanical energy. Different types of motors are in common use. Among these, brushless DC motors (BLDC) have high efficiency and excellent controllability and are widely used in many applications. BLDC motor has energy saving advantages compared to other motor types.

**CONVEYOR**

Conveyor is used to move anything from one place to another and it involves a mechanical process

**3D DIAGRAM OF ENTIRE MACHINE**



**SOFTWARE**

We develop software for this machine with mapping system. It has full control of the autonomous machine. All process data is viewed through this. The software detects the location of waste in the water and helps the machine navigate. We can see the direct process of this machine by camera.

**RESULTS:**

Using an autonomous machine will simplify the task of waste management in water sources. Now it is easy to collect solid waste in water. The machine works automatically using IoT and the machine works properly with high efficiency

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