

# SMART BEACH CLEANER VEHICLE

Ankita Paste<sup>1</sup>, Prerna Pisal<sup>2</sup>, Ameya Shinde<sup>3</sup>, Tanvi Upaskar<sup>4</sup>, Dr. Baban U Rindhe<sup>5</sup>

<sup>1,2,3,4</sup> Student, <sup>5</sup> Head of Department

Department of Electronics and telecommunication Engineering  
K C College of Engineering and management Studies and Research,  
Kopri, Thane East – 400 603, Maharashtra, India.

***Abstract - The progress of various field of robotics improves people quality time and their environment. Garbage is major problem in worldwide attenuation. In this specific case it was implemented an autonomous robot capable to navigate sand, collecting cans and transporting them to the box which is held at the back side of the vehicle. In today's world the beach cleaning vehicles are used all over the safety and happiness of beach- goers. Developing waste collector robots is currently a research on efficient solution to the problem on the beaches.***

***Due to the difficulties faced in keeping the beach clean manually, we have come up with equipment which detects garbage using deep neural network. Then waste is collected through circular shovel forks along with the sand which falls back to the sand bed. Collection process is carried out by motors which are driven by rechargeable batteries. It will help us to keep beaches clean and save marine life from garbage pollution. This report contains detailed research and design thinking.***

***Keywords – coastal area, CNN, garbage collection, node MCU, revolution.***

## I. INTRODUCTION

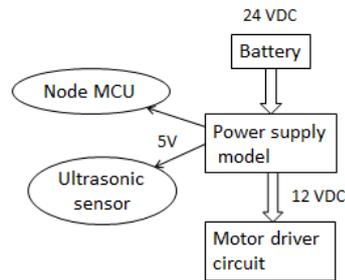
Beaches are main attraction of tourists, for attracting them the beach must be kept clean. For cleaning the beach, some cleaning machine must be used so we have come up with cleaning equipment which helps us to clean the beaches in less investing hours.

As today's era is moving towards being digitalized and automated, the youth want everything very easily and smart. Not only the youth but the people of all generation are getting attracted towards latest technology of "smart work". Anywhere you go, you heard this term - smart work. So we thought of it and adding more to it for our final year project. Nobody likes to wait for long waiting hours just to get good surrounding. To avoid this and to save time of our management of waste we are creating an application called "Smart beach cleaning robotic vehicle".

## II. PROBLEM DEFINITION

The coastal area beaches are main attraction for tourism, so in attracting tourists the beach must be kept clean. Indian beaches might not be exotic because they are littered many of the times. This model is implemented to remove garbage, plastic bags, waste bottles and other debris from beaches and make them safe and visually pleasing for beach visitors.

### III. IMPLEMENTED SOLUTION



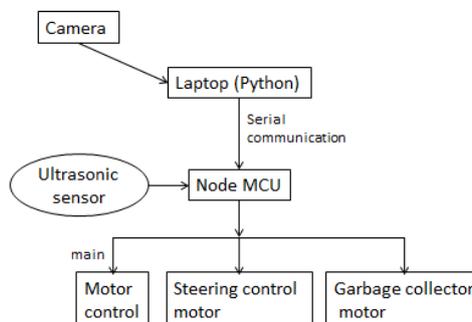
#### A. Block Diagram

Figure 1- Block Diagram of Power Supply

In power unit, we supply power to node MCU, ultrasonic sensor as well as motors. The battery in the vehicle is of 24V DC. The power requirement for node MCU and ultrasonic sensor is 5V and for motor it is 12V.

To convert 24V DC to 12V DC for motors, the voltage regulator LM 7812 is used. The LM7812 is three terminal positive regulator which takes an input voltage up to 35V and provide output of 12V. The second pin of IC is connected to ground.

To convert 24V DC to 5V DC for node MCU and ultrasonic sensor, the voltage regulator LM7805 is used. It is also a three terminal positive regulator first pin is input which is from



7V to 35V, the second pin is connected to ground and third pin is output which is 5V.

Figure 2- Block diagram of Control unit

Figure illustrated in above figure is control unit of model. 5-megapixel Logitech camera is connected at the front side of the vehicle so that it can detect the garbage using CNN. Detected signals are sent to the laptop and it is serially communicating with node MCU using Python programming.

Here node MCU is the brain of the circuit which controls the motors and sensor according to the direction and detection of garbage.

- Main motor control is used for forwarding and backwards direction movement.
- Steering motor is used for the left or right turn.
- Garbage motor is used to rotate circular shovels for collection of garbage.

If any Obstacle is observed by the ultrasonic sensor, node MCU immediately changes the direction of vehicle or motors are switched off & buzzer is on.

## B. Flowchart

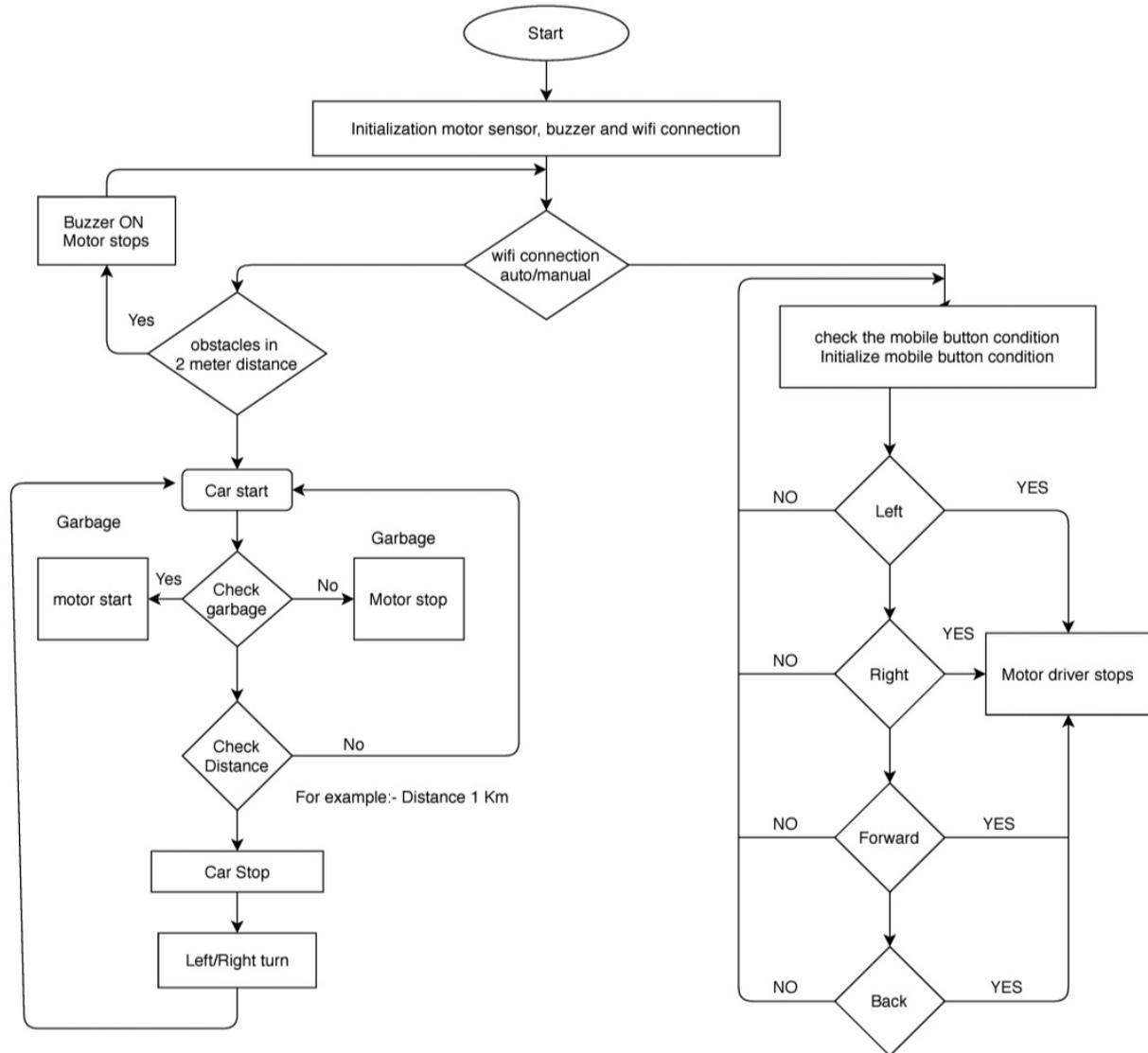


Figure 3- Flowchart of working

Once the machine is kept at its place. The machine is turned ON ‘This initializes motor, sensor, buzzer and WIFI connection and the machine gets connected to mobile phone through application using node MCU. Node MCU is main circuit of the system. It controls the motors with open cv python programming. The application is an open-end application which allows us to select the mode i.e. automatic mode and manual mode.

User has to select manual mode else automatic mode.

If automatic mode is selected by the user then machine communicates with the mobile application and application ask the user how much area has to be cleaned and user has to give input in the form of length into breadth measurement which is then converted by the machine itself in an appropriate area for which the machine is already been programmed.

After giving area as an input, At initial stage the machine checks if there is an obstacle present in 2-meter distance using ultrasonic sensor when someone is 2m ahead then these sensors will detect the person or animal and the car will stop. Also, if obstacles are present then buzzer starts and keep on buzzing until the path is cleared. The ultrasonic sensor is kept ON throughout. With the help of motors placed at back wheels the machine moves in straight direction until it covers the length of rectangle , the length is measured by an simple distance measurement circuit using ultrasonic sensor which is directly interfaced with node mcu using

blynk which is the most popular IoT platform. The distance measurement circuit measures the length travelled and commands machine to take U-turn. It is programmed in such a way that it changes its U-turn pattern by ceasing its left and right wheel alternately. So, the car moves in a particular manner, covering specific area automatically collecting garbage machine has camera installed in it exactly at front which scans the path simultaneously while moving. Camera takes Image continuously and send it to laptop. Using deep neural networks, the image is scanned to check the garbage. Once the garbage is detected laptop sends message to node mcu to start circular shovel fork which collects the garbage from ground. The wastage material is lifted by fork teeth and stored in collecting box. Once the collecting box is full, the waste materials are removed from the box. Circular shovel fork is kept ON for specific programmable time. After covering the given area, the machine stops automatically cleaning the beach area.

In manual mode each and every moment of machine is controlled by a software-based application which communicates wirelessly with node MCU mounted on vehicle.

Visually user have to check the garbage and then using movement buttons we have to collect the garbage. If obstacle is present then user has to manually press the buzzer button or stop button depending upon situation. Once the machine reaches at garbage location, we have to press the circular shovel fork button so that it starts the motor which rotates the circular shovel fork and collects garbage neatly cleaning beach area.

### *C. Hardware Description*

The machine looks similar to four-wheeled vehicle known as Go-kart. We have done some changes in physical model of kart basic frame measures 4 feet by 3 feet. Having two standing triangle shape frames of 4 feet height to support circular shovel which is placed in the middle of two triangular frames. We have installed node MCU, 4 batteries, 4 motors, circular shovel fork, temporary laptop placing stand, Rack and pinion, steering and garbage collecting tray all on our go-kart.

Machine is placed across the beach. Machine can be used on dry or wet sand. When using this method, a rotating circular shovel containing hundreds of fine forks through the sand and removes surface and buried debris while leaving the sand on the beach. Beach cleaner machine can remove materials ranging in size from small pebbles, shards of glass to larger debris, like seaweed and driftwood, floating waste like bottles and plastic cans. By keeping the sand on the beach and only lifting the debris, the machine can travel at high speeds. The sand and waste are collected via the pick-up fork of the vehicle, which leaves the sand behind. The waste is gathered in a collecting tray which is often situated at the top of the vehicle. Because sand and waste are lifted onto the forks, it allows time for the sand to sift through the forks and back onto the beach. The size of the materials removed is governed by spacing between two forks. Debris are collected into a window or garbage tray. The sand on the ground will be leveled up with the help of a 65-degree angled fork as the cleaning process continues and the lifted debris will be dumped into a separate can. Once the garbage CAN have been filled it could be emptied manually and that's all our project is going to be about.

## **IV. ADVANTAGES**

- i. In today's World of era we require skilled workers to operate machines. But this Beach cleaner robot machine is easy to operate. As skilled Worker is not necessary to operate the machine and our machine contain both manually and automatic operating modes.

- ii. The machine is environment friendly, because it is totally electrically driven, powered by rechargeable full isolated GEL batteries.
- iii. It reduces human efforts also More comfortable to use, moreover it is silent, robust and accurate.
- iv. By removing litter, unwanted seaweed, Floating waste like bottles, plastic cans, covers any kind of waste unwanted seaweed and other debris from the beach, municipalities and resorts are able to maintain their beaches with fewer invested hours.

## V. APPLICATIONS

### a. *Municipalities* -

Beach cleaners make keeping large beaches clean a manageable endeavor. Large, state-run beaches need to be clean and safe for beach-goers. High-volume beach traffic often results in excessive man-made litter, which presents safety and liability threats. Beach cleaners remove glass, cans, cigarette butts, syringes, and other potential hazards. They also make the beaches visually pleasing and increase tourism. Cleaning by hand often proves too costly and takes too much time to ensure quality beach conditions during peak seasons.

### b. *Contractors* -

Beach cleaning can be a lucrative business for contractors. Due to its unique niche market, contracting with a beach cleaner often fetches prices well-worth the effort. Beach cleaner machines minimize manual labor while maximizing effectiveness. Additionally, beach cleaner can also be used for other common landscaping applications, like stone picking, litter picking, seed-bed prep, and de-thatching. This makes a beach cleaner a multi-season investment for landscapers and other contractors.

### c. *Resorts* -

Beach cleaners are a necessity for resort owners that thrive on beach-goers. Especially when paying premiums for their stay, visitors demand pristine beaches and amenities. A mechanical beach cleaner ensures that visitors will get the best use out of the beach during their stay and return for more.

### d. *Individuals* -

Individuals who own private beaches, gardens or sandy areas can greatly benefit from a beach cleaner too. Self-propelled vehicle is easy to run, require little maintenance, and can ensure your sandy area is spotless with minimal effort.

## VI. CONCLUSION

Hence Smart Beach Cleaner Robotic Vehicle is implemented successfully. It will help us to keep the beaches clean and save the ocean life from garbage pollution. This system does not need more human labor. Also, this can reduce the direct contact of the human labor with the waste so there is no hazard for human labor. We concluded that the cleaning process of beaches needs to be upgraded with the latest engineering subsystem and most important to make beaches safe, comfortable and visually pleasing for beach visitors using the technology.

## ACKNOWLEDGMENT

We would like to express special thanks of gratitude to our guide Dr. Baban U Rindhe as well as our Project Coordinator Ms. Sushma Kore, who gave us the golden opportunity to do this wonderful project on the topic “Smart beach cleaner robotic vehicle”, which also helped us to learn new things and latest technologies. We would also like to thank our H.o.D. of EXTC – Dr. Baban U. Rindhe and Principal Dr. Vilas Nitnaware for providing us the opportunity to implement our project. We are really thankful to both of them. Finally, we would also like to thank our department staff members and our parents & friends who helped us a lot in finalizing this project within the limited time frame.

## **REFEREANCES**

- [1] Smith, Harris Pearson. (1955). Farm machinery and equipment. Tata McGraw-Hill, India, 519p
- [2] Hunt, D. (2002). Farm Power and Machinery Management, Laboratory Manual and Workbook, 7th Ed., Iowa State University: AMES IOWA.
- [3] RNAM Test Codes& Procedures for Farm Machinery (1955) Technical Series No 12 Economic and Social Commission for Asia and the Pacific Regional Network for Agriculture Krissanaerane, Suravej. (2005) Farm machinery and crop production management. Co-opthai printing, Bangkok.
- [4] DESIGN AND FABRICATION OF BEACH CLEANING MACHINE -Vivek Dhole, Omkar Doke, Ajitkumar Kakade, Shrishail Teradale, Prof. Rohit Patil. International Research Journal of Engineering and Technology (IRJET)' e-ISSN: 2395-0056 Vol.06 Issue 04, April 2019
- [5] ECO BEACH CLEANER- Amit kumar Yadav, Animesh Singh, M. A. Murtaza and Ajendra Kumar Singh. International Journal of Engineering and Management Research. e-ISSN: 2220-0758 Vol.08 Issue 03, June.