Published by :
https://www.ijert.org/
An International Peer-Reviewed Journal

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

Design and Fabrication of A Multi Functional Smart Floor Cleaning and Sanitizing Robot with Air Blower System

Darshan V, Darshan Gowda C K,
Deekshith B, Deepak H N,
Students of Mechanical Engineering department
P.E.S. College of Engineering, Mandya
Karnataka - 571401

Dr. Mahendra Babu K J
Professor of Mechanical Engineering department
P.E.S. College of Engineering, Mandya
Karnataka - 571401

Abstract - **The purpose of this project is to clean the floors in colleges, hospitals, auditoriums, malls and workshops and sanitize them, thereby making it free from germs and other disease spreading organisms. The aim of this project work is to design and develop process for cleaning the floor having wet and dry surfaces. It is very useful for cleaning the wet as well as dry floors. In modern days interior decorations are becoming important in our life cleaning and sanitizing of floor is very important for our health and this floor cleaning and sanitizing machine reduces the effort required for cleaning. Hence this project is very useful in our day to day life. It is very simple in construction and easy to operate. Anybody can operate this machine easily. It consist of cotton cloth wiper and cleaning agent sprayer for cleaning floor .It also has a sanitizer spraying mechanism for spraying sanitizer on the floor . The overall cost of this machine is also cheap. Such type of machines is widely used for this purpose but they are working under different principles and the cost is very high. In recent years, floor cleaning machines are getting more popularity for cleaning large floor area in minimum time. However in India, which is a developing country requires large type of such machines to satisfy the cleaning needs.**

Keywords - ***Automated Floor Cleaning System, Wet and Dry Surface Cleaning, Floor Sanitization Mechanism, Disinfectant Spraying Unit, Mechanical Wiping Assembly, Low-Cost Cleaning Automation, Hygiene-Oriented Design, Large-Area Cleaning System.***

I. INTRODUCTION

In recent years, maintaining cleanliness and hygiene has become an essential aspect of both domestic and industrial environments. The demand for automation in cleaning systems has increased significantly due to the need for time-saving and efficient cleaning solutions. To address this need our project focuses on developing a Design and Fabrication of a Multifunctional Smart Floor Cleaning and Sanitizing Robot with Air Blower that can perform cleaning, sanitizing and drying operations simultaneously with minimal human effort.

This machine is designed to clean the floor using water and simultaneously sanitize it using disinfectant spray. The entire system is controlled wirelessly through a Bluetooth-enabled mobile application allowing the user to operate the machine remotely.

The project aims to reduce human involvement in floor cleaning tasks making it more convenient hygienic and effective. The system consists of two tanks — one for water and another for sanitizer — along with two pumps and two nozzles for spraying. A motorized cleaning brush removes dirt and dust while an air blower helps in drying the cleaned surface. The integration of Bluetooth technology ensures smooth communication between the mobile device and the machine's control unit.

This project not only promotes automation but also contributes to maintaining hygiene standards in homes hospitals, schools and offices. It is a cost-effective, user-friendly and efficient solution for modern cleaning requirements.

II. LITERATURE REVIEW

A. Autonomous Floor Cleaning Robot

Year: 2025
Authors: A. M. Guruprasad et al.

In this study, the authors developed an autonomous floor cleaning robot capable of both manual and automatic operation. The system used ultrasonic sensors for obstacle detection and included an IoT-based control feature for remote monitoring. A solar panel was also integrated to improve power efficiency and reduce dependency on frequent charging.

The project highlighted how sustainable energy and automation can be combined for modern cleaning systems, making the design eco-friendly, reliable and highly user-efficient. The robot demonstrated stable motion control and efficient cleaning results on different floor types.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

B. Design and Development of a Smart Floor Cleaning Robot Controlled by Mobile App.

Year: 2025
Authors *:* Richard Sarpong et al.

This paper presented a smart floor cleaning robot that can be operated using a dedicated Android mobile application. The robot performed wet cleaning operations and used IoT-based communication for connectivity, allowing users to schedule and monitors the cleaning process remotely. The system emphasized affordability, user-friendly control and improved cleaning performance compared to manual methods. The researchers also suggested integrating sanitizing and drying mechanisms in future work to enhance hygiene and efficiency.

C. Automatic Floor Cleaning Robot.

Year: 2024
Authors: Mr. Roshan kerkar et al.

Cleaning the floor is an important task which takes a lot of time; sometimes we assign people for cleaning and pay them money. But due to the advancement of technology households are becoming smarter and more automated, which provides convenience for the people. There are various vacuum cleaners are available in the market but they do not include wet cleaning and operate manually.

D. Design and Implementation of IoT-Based Floor Cleaning Robot for Healthy Environment.

Year: 2023
Authors: Dr. S. Kavitha et al.

This research focused on building an IoT-enabled floor-cleaning robot that can be monitored and controlled remotely. The robot used sensors for obstacle detection and ensured complete cleaning coverage. It helped reduce manual effort while maintaining hygiene. The design was energy-efficient and user-friendly. The integration of IoT provides valuable insight into how your Bluetooth system could later be upgraded to full remote operation

E. Fabrication of an Autonomous Floor Cleaning Robot Using Sensors.

Year: 2022
Authors: Akash Murai et al.

This project focuses on building an autonomous robot equipped with ultrasonic and infrared sensors for obstacle detection. The robot performs sweeping and mopping tasks automatically.

It uses rechargeable batteries for long operating time and efficient coverage. The system demonstrates good adaptability in various environments. It represents an improvement in autonomous household cleaning solutions.

F. Autonomous Floor Cleaning Robot.

Year: 2021
Authors: Vijayalaxmi S. et al.

Cleaning the floor is an important task which takes a lot of time; sometimes we assign people for cleaning and pay them money. But due to the advancement of technology households are becoming smarter and more automated, which provides convenience for the people. There are various vacuum cleaners are available in the market but they do not include wet cleaning and operate manually. So, the main purpose of our project is to design an autonomous floor-cleaning robot to make the cleaning task much easier and to include dry and wet cleaning in one design. This robot is designed to clean homes, schools, offices, it is created to make the job easier.

G. Summary of Literature Review

Based on the above literature Review it is observed that many researchers have developed floor cleaning robots using Bluetooth, Arduino or IoT-based control systems to minimize human effort and improve hygiene. Recent studies have also introduced sanitizing and drying mechanisms to enhance cleaning performance. Based on these advancements the present project focuses on the Design and Fabrication of a Multifunctional Smart Floor Cleaning and Sanitizing Robot with Air Blower System that can efficiently clean, sanitize, and dry floors automatically. The robot operates wirelessly through a Bluetooth-enabled mobile application. This system ensures time-saving operation, reduced manual effort, and improved hygiene at an affordable cost.

III. PROBLEM IDENTIFICATION

In daily life cleaning floors manually takes a lot of time and effort. Traditional cleaning methods often fail to remove all dust, germs and moisture, leaving the surface unhygienic. People who clean manually are also exposed to dirt and infections. Existing robotic cleaners are costly and usually perform only one function at a time. Therefore there is a need for smart affordable robots that can clean, sanitize and dry the floor automatically through Bluetooth control. To design and fabricate a multifunctional agricultural robot.

A. Manual floor cleaning requires more time and physical effort.

B. Traditional cleaning does not ensure complete sanitization and drying.

C. Humans are exposed to dust and germs during manual cleaning.

D. Most existing cleaning robots are expensive and have limited functions.

E. A smart Bluetooth-controlled robot is needed for automatic cleaning, sanitizing and drying.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

IV. OBJECTIVE

The objectives of this project are:

A. To design and fabricate a Multifunctional Smart Floor Cleaning and Sanitizing Robot with Air Blower

B. To integrate cleaning, sanitizing, and drying mechanisms in a single unit. Via an Android.

C. To enable wireless control of the robot's movements and functions via an Android smartphone.

V. METHODOLOGY

A comprehensive literature survey was carried out to study existing floor cleaning and sanitizing robots, focusing on their design approaches, control strategies, and sanitization techniques. Based on the insights gained, the objectives of the present project were clearly defined. The overall system layout was then designed by carefully arranging the motors, wheels, cleaning brushes, liquid tanks, and electronic components to achieve compactness, stability, and balanced operation.

A complete 3D CAD model of the robot was developed to visualize the structure, verify clearances, and incorporate necessary design improvements prior to fabrication. Subsequently, all required materials and components—including DC motors, wheels, Arduino microcontroller, Bluetooth module, water pump, air blower, and frame materials—were selected and procured according to the design specifications. The fabrication process involved constructing the base frame, mounting the drive motors, and integrating the cleaning, sanitizing, and drying mechanisms.

The water and sanitizing tanks, pumps, and air blower system were then assembled and interconnected to enable effective spraying and drying operations. Electrical wiring was completed, and Arduino programming was implemented to facilitate Bluetooth-based wireless control through a smartphone application. Finally, the robot was tested on various floor surfaces to evaluate its cleaning efficiency, sanitizing performance, and control responsiveness, followed by minor adjustments and fine-tuning to optimize overall system performance and ensure smooth and reliable operation.

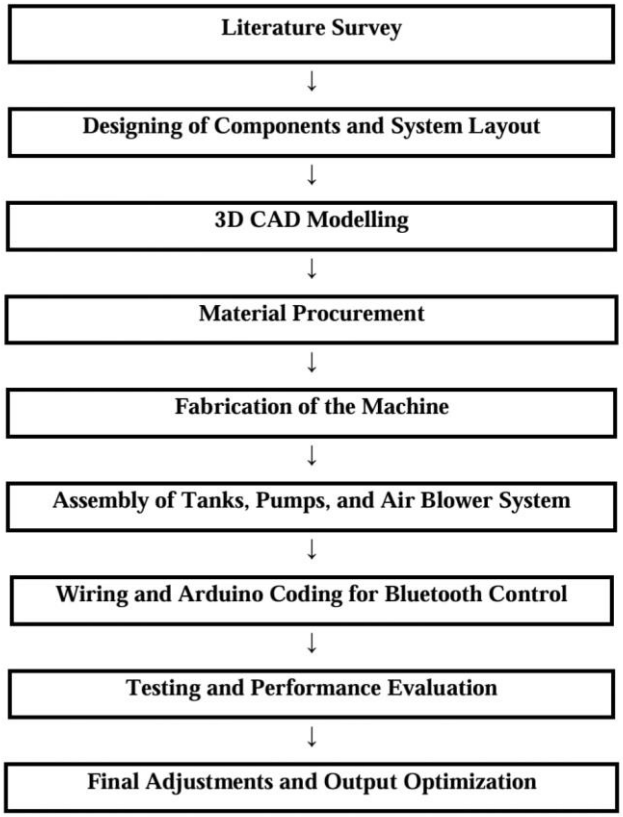


FIG.1: WORKING FLOWCHART.

VI. CONSTRUCTION

The construction of the Multifunctional Smart Floor Cleaning and Sanitizing Robot begins with the fabrication of a rigid mild-steel chassis that supports all mechanical, electrical, and electronic components. The robot is mounted on four wheels with two rear wheels driven by DC motors for movement and two free wheels for balancing. The Arduino UNO microcontroller and HC-05 Bluetooth module are installed on the control panel to enable wireless communication with an Android smartphone. A motor driver circuit is connected to the Arduino to regulate the direction and speed of the robot's locomotion based on user commands.

At the front of the robot a cylindrical mop roller made of foam or microfiber is mounted on a shaft and coupled to a high-torque DC motor. This motor rotates the mop continuously to scrub the floor surface during operation. A diaphragm pump is connected to the water/sanitizer container and delivers cleaning liquid onto the mop through a spray nozzle to ensure proper wetting for effective scrubbing. A second spray nozzle positioned at the front is used specifically for dispensing sanitizer to disinfect the cleaned surface.

Toward the rear of the robot a compact 12V blower is installed to dry the floor immediately after cleaning and sanitization ensuring a streak-free and slip-free finish. All components including the pumps, blower and mop motor

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

are powered by a 12V rechargeable battery with a regulated 5V output supplied to the Arduino and Bluetooth module through a buck converter. Relay modules are used to switch individual functions on and off based on signals from the smartphone application.

During operation the robot follows a systematic sequence. When the user sends a command through the Android app the Arduino receives it via the Bluetooth module and activates the corresponding motor driver to move the robot forward, backward, left or right. The mop motor rotates the cylindrical mop to scrub the floor while the diaphragm pump sprays water or cleaning solution as required. The sanitizer nozzle can be activated to disinfect the surface and finally the blower is turned on to dry the cleaned area. All operations—including mop ON/OFF spray ON/OFF blower activation and movement control—are executed wirelessly providing efficient contact-free cleaning and ease of use.

A. Chassis.

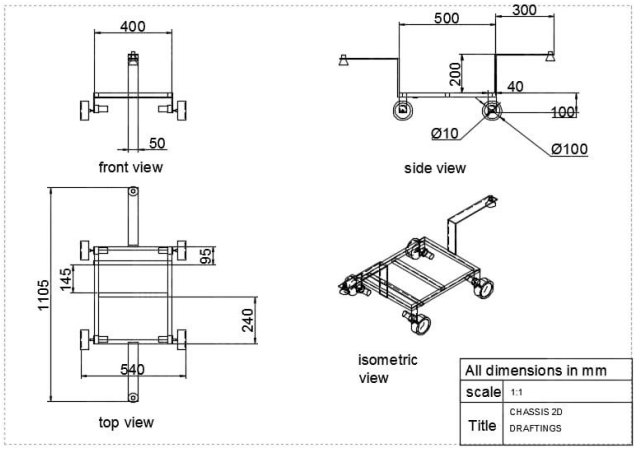
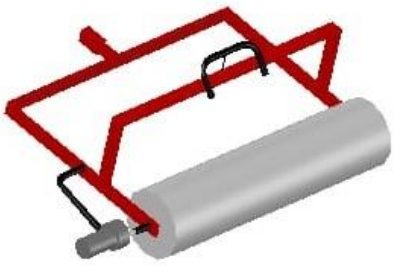


FIG.2: Chassis Cad Desing.

B. Mop Assembly



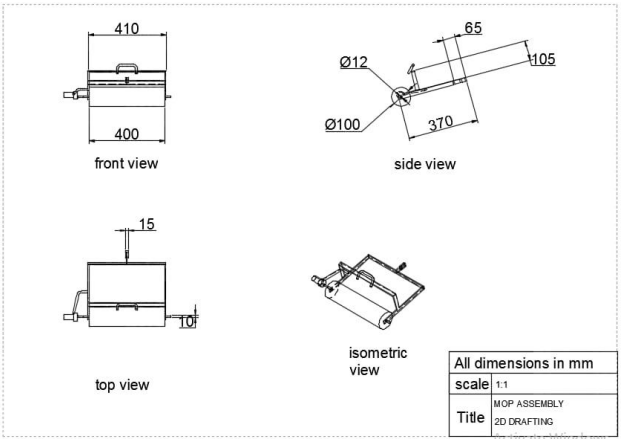


FIG.3: Mop Assembly Cad Desing.

C. . Final Assembly.

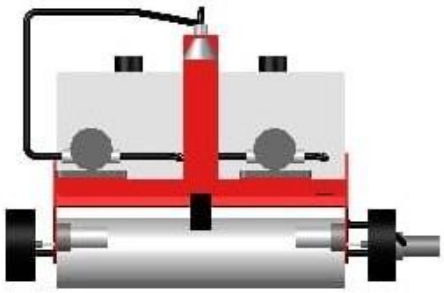


FIG.4: Front View.

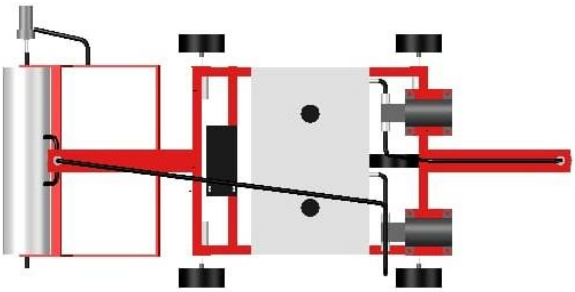


FIG.5: Top View.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

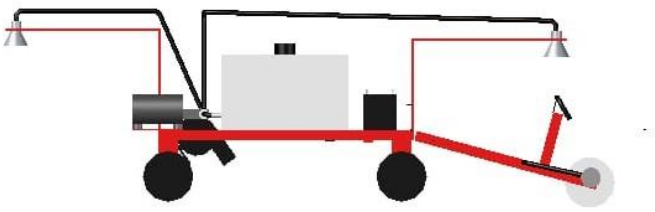


FIG.6: Side View.

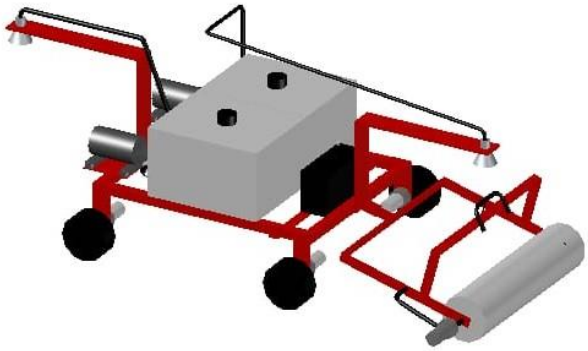


FIG.7: Isometric View.

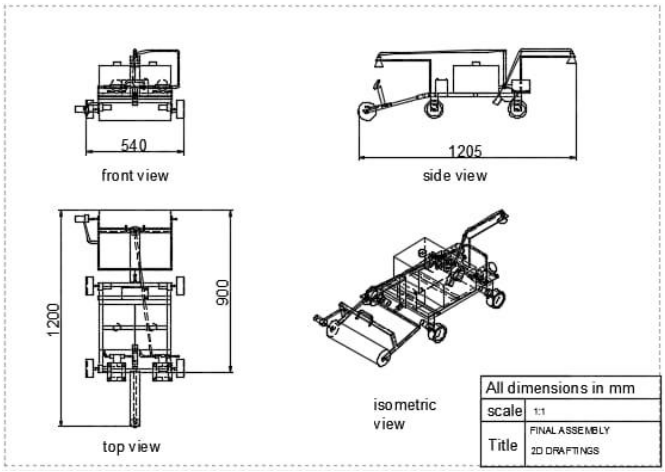


FIG.8: Final Assembly 2D Drafting.

VII. COMPONENTS

A. 20*20 MM PIPE
B. 2 MM SHEET METAL
C. DC MOTORS
D. 4 INCH WHEELS
E. FLAT BAR
F. MOP
G. COUPLER
H. CAN
I. PUMP
J. NOZZLE
K. AIR BLOWER
L. 12 VOLT BATTERY
M. BUCK CONVERTER
N. ARDUINO UNO
O. HC 05 MODULE
P. RELAYS
Q. PVC BOX
R. PAINT AND PRIMER
S. ULTRASONIC SENSOR
T. BUZZER
U. WIRES

VIII. DESIGN CALCULATIONS

A. SPEED OF THE ROBOT

Wheel diameter = 0.101m.
Circumference $C = \pi D = \pi \times 0.101 = 0.318m$.
At 60 rpm, distance per minute: $0.318 \times 60 = 19.151$ m/min

B. AREA OF SOLUTION SPRAYED/MINUTE

Speed of robot = 19.151 m/min
Width of spray = 0.30 m
Area sprayed per minute: =Speed×Width
Area sprayed per minute: =19.15×0.30=5.745 m2/min

C. AREA OF FLOOR MOPPED /MINUTE

Robot speed = 19.15 m/min (from earlier calculation)
Mop width = 30 cm= 0.30m
Area per minute=Speed×mop width
Area per minute: = 19.15×0.30=5.745m2/min

D. TOTAL POWER CONSUMPTION

12 V loads (currents)
4 DC motors × 2.0 A = 8.00 A
1 DC motor = 2.00 A
2 spray pumps × 2.0 A = 4.00 A
Blower = 2.50 A
Total 12 V current = 8.00 + 2.00 + 4.00 + 2.50 = 16.50 A
Power from 12 V loads = 12 V × 16.50 A = 198.00 W
V electronics (currents — all at 5 V)
Arduino UNO = 0.20 A
Bluetooth module (HC-05) = 0.03 A
relays = 6 × 0.07 A = 0.42 A
Ultrasonic sensor = 0.015 A
Piezo buzzer = 0.03 A

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

Total electronics current at 5 V = 0.20 + 0.03 + 0.42 + 0.015 + 0.03 = 0.695 A
Electronics power at 5 V = 5 V × 0.695 A = 3.475 W
Total system power = 198.00 W + 3.475 W = 201.475 W

E. BATERY BACKUP TIME

Backup time (hours) = Battery capacity (Ah)/Load current (A)
=7.5/17.195=0.436hours

F. BATTERY CHARGING TIME

Time = Battery Capacity/Current Supplied = 7.5/1.7=4.42 hours.

IX. FABRICATION

Process of Fabrication

A. Material Selection and Cutting – Mild-steel hollow rectangular pipes are selected and cut to required dimensions as per the CAD design.

B. Surface Preparation – Cut sections are cleaned to remove rust, dust, and burrs for proper welding and fitting.

C. Layout and Alignment – All sections are arranged on a flat surface and aligned accurately using measuring tools.

D. Tack Welding – Temporary welds are applied at joints to hold the structure and allow minor adjustments.

E. Final Welding – Continuous welding is performed on all joints, and cross-members are added to improve rigidity.

F. Motor Mount Design and Installation – Motor mounting brackets are fabricated and welded to the chassis.

G. Motor Coupling with Shaft – The motor shaft is coupled with the driven shaft using a suitable coupler for power transmission.

H. Drilling, Mounting, and Functional Fittings – Holes are drilled and mounts for mechanisms and accessories are installed.

I. Grinding, Painting, and Final Finishing – Welded joints are ground smooth and the chassis is painted for corrosion protection.

FIG.10: Fabrication

X. WORKING PRINCIPLE

The Arduino UNO receives all control commands from an Android smartphone via the HC-05 Bluetooth module. Based on the received instructions, the motor driver regulates the robot's movement in forward, backward, left, and right directions. A pump mounted at the front sprays the cleaning solution onto the floor to enable effective wet cleaning. The front cylindrical mop then rotates to scrub the wetted surface, removing dirt and stains efficiently. Simultaneously, an air blower operates while the robot is in motion to rapidly dry the cleaned area. At the rear side of the robot, a sanitizer nozzle sprays sanitizer onto the dried floor to ensure proper disinfection. An ultrasonic sensor continuously monitors for obstacles, and when an obstruction is detected, the buzzer alerts the user and the robot automatically stops to prevent collision. All functions, including movement control, mop operation, spray system, blower, and sanitizer activation, are controlled through the Android mobile application.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 02 , February - 2026

XI. RESULTS & DISCUSSION

A. Expected Outcome Results.

The machine is designed to be wirelessly operated using Android-based devices, ensuring convenient and user-friendly control through a simple and intuitive interface. Reliable motors and high-capacity batteries are used to provide efficient performance with extended backup. Lightweight, maintenance-free circuit components improve reliability and reduce maintenance requirements. The floor-cleaning mop and spray mechanism are designed for effective cleaning and maximum sanitization coverage. Overall, the machine has a compact, robust, and portable design suitable for both domestic and commercial applications.

B. Conclusion.

The Multifunctional Smart Floor Cleaning and Sanitizing Robot with Air Blower was successfully designed and fabricated to reduce manual effort and improve hygiene through automation. The robot efficiently performs cleaning, sanitizing and drying operations using a Bluetooth-controlled Android application. Its simple construction, cost-effective components, and reliable performance make it suitable for use in hospitals, colleges, offices and other public areas. The system provides a practical and user-friendly solution for modern floor-cleaning needs, with scope for future upgrades such as autonomous operation and smart navigation.

C. Future Scope.

In future developments, the robot can be upgraded to operate autonomously using advanced sensors and artificial intelligence, eliminating manual control. Self-charging through docking stations or solar panels can enable continuous operation. Mapping and smart route-planning features may also be incorporated to ensure efficient coverage and optimized cleaning paths. Additionally, IoT integration can allow remote monitoring and control through the internet. The system can also be enhanced with improved battery technology and high-efficiency motors to increase operating time and overall performance.

ACKNOWLEDGMENT

This project report on, is present form is not a singular effort. We would like to acknowledge the help and guidance given by our guide Dr. Mahendra Babu K J, our H.O.D. Dr. SRINIVASA M R, and project coordinator Prof. SOMASHEKAR B R, for great effort and help in our project. Without their help, this project work of ours would have been an uphill task. It has been made possible through necessary guidance and help from different quarters.

REFERENCES

[1] Guruprasad A M; Anusha; Meghana B M; Sanjana K T; Vaishnavi Kumar Volume 10, Issue 5| May – 2025 “Autonomous Floor Cleaning Robot”. https://eprint.ijisrt.org/id/eprint/1203/1/IJISRT25MAY1680.pdf

[2] Samuel Twun, Richard Sarpong, Alpha Agusah; volume 10, Issue 3| March-2025 Design and “Development of a Smart Floor Cleaning Robot controlled by a Mobile App”. https://www.researchgate.net/publication/390605459_Design_and_Development_of_a_Smart_Floor_Cleaning_Robot_controlled_by_a_Mobile_App

[3] Shreyash J. Sagaonkar, Aishwarya V. Patil, Shreyash R. Mulik, Sushrut H. Wagh and Swapnil H. Patil.Volume: 07 Issue: 05 | May 2020 . “Design & Fabrication of Bluetooth Controlled Robotic Floor Cleaning Machine”. https://www.irjet.net/archives/V7/i5/IRJET-V7I5313.pdf.

[4] Dr. S. Kavitha, J. Mahesh, G. Deepak Manohar, P. Arun Kumar, L. Mallikarjuna Rao. Volume 12, Issue 04 | April 2023. “Design and Implementation of IoT based Floor Cleaning Robot for Healthy Environment”. https://www.ijert.org/design-and-implementation-of-iot-based-floor-cleaning-robot-for-healthy-environment.

[5] Vijayalaxmi S. Kumbhar, Dnyaneshwari Jagtap, Mansi Kulkarni, Salim Lakade.Volume: 08 Issue: 05 | May 2021. “Autonomous Floor Cleaning Robot”. https://www.researchgate.net/publication/354629391_AUTONOMOUS_FLOOR_CLEANING_ROBOT

[6] Mrs .Shritika Wayker(Asst.Proffesor), Prashant Tiwari, Vishal Kumar, Kunal Limbu and Amay Tawade.Volume: 09 Issue: 01 | Jan 2022 . “Smart Floor Cleaning Robot Using Android”. https://www.irjet.net/archives/V9/i1/IRJET-V9I1125.pdf.

[7] Shubhangi Karhadkar, Bushra Pathan, Mrs. S.G.Watve , Volume 6, Issue 4| April 2019, “Smart Floor Cleaning Robot”. https://www.jetir.org/papers/JETIR1904Q24.pdf