

Design and Implementation of Android Application Based Washbasin Cleaning System

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Abstract: In the world of advanced technology and latest requirement taken into consideration here effectively created an advanced system i.e. Android Application based washbasin cleaning system. This system is useful to clean railway basin using brush cleaning and anti-germinant distribution which reduces chances of spreading of diseases. This system uses rack and pinion arrangement, rotating brush arrangement and anti-germinant distribution arrangement. This system is place on wall behind basin so that no wastage of space. To make concern of space this system uses special activator arrangement. Activator arrangement consists of shaft motor and coupling arrangement. This system is Based on android. Whenever customer or user want to clean basin then activator arrangement will activate and come on the top of basin, The rack and pinion arrangement which is mounted on activator arrangement will clean basin using motor and brush and coupling arrangement. Complete system Based by android application. To integrate complete system with android application used Arduino and motor driver module. This system can be used in Railways Toilet Cleaning, Hospitals, Public Health, shopping malls, House hold purpose, Complexes etc. This system having some advantages that are system reduces the chances of diseases spreading and make railway basin arrangement cleaned.

Keywords - Arduino, Android Application, Disease Prevention, Household Use, Public Health.

I. INTRODUCTION

The Android Application Based Washbasin Cleaning System is an innovative solution focused on improving hygiene and sanitation in railway washrooms and various public toilets particularly the basins, which are used frequently by passengers. Maintaining cleanliness in public transport environments, such as trains, is a significant challenge, especially during long journeys where washrooms and basins are in constant use. The manual cleaning process is often insufficient, as staff

can only clean the facilities when the train reaches certain stops, leaving the washrooms unsanitary for extended periods. To address these issues, this system integrates advanced technology with an automated cleaning mechanism. Its key feature is that it can be controlled remotely through an easy-to-use Android application, which gives railway staff the ability to monitor and manage the cleaning process from anywhere on the train.[1][2] This automation eliminates the need for constant manual cleaning, as the system is designed to clean basins at set intervals. This not only keeps the washrooms cleaner for longer periods but also ensures a more consistent level of hygiene throughout the entire journey. Additionally, the system is equipped with a detoxification feature. This is more than just a basic cleaning mechanism it actively works to sanitize the basin by eliminating harmful bacteria, killing germs, and removing unpleasant odour. This creates a healthier environment for passengers by reducing the risk of spreading diseases through contact with contaminated surfaces. The detoxification system, using disinfectants or sanitizing solutions, ensures that the basins are not just visually clean but also safe to use.[3][8]

II. PROBLEM IDENTIFICATION

No special cleaning arrangement in railway basins and washrooms: There is no dedicated system for cleaning the washrooms and basins automatically. Instead, cleaning is done manually, and often this happens only when the train reaches a station, so the washroom may remain dirty for a long time.

- Risk of spreading diseases: Since many people use the same washrooms and basins, they can become a hotspot for germs and bacteria. If they aren't cleaned frequently and properly, it increases the risk of spreading various diseases, especially in a confined space like a train.

- Lack of proper friction brush cleaning: Most washrooms in trains do not have a friction brush or scrubber system that can clean surfaces effectively. This means dirt, stains, and grime can build up, leading to unhygienic conditions. Scrubbing helps to remove tough dirt, but without it, the washroom and basin remain unclean.
- No arrangement to sanitize the basin and commode: Sanitizing involves killing germs and bacteria to make the space safer for users. Currently, there is no automatic sanitization system installed in train washrooms and basins. This lack of sanitization can lead to more germs staying on surfaces, increasing the risk of infections.

III. SYSTEM BLOCK DIAGRAM

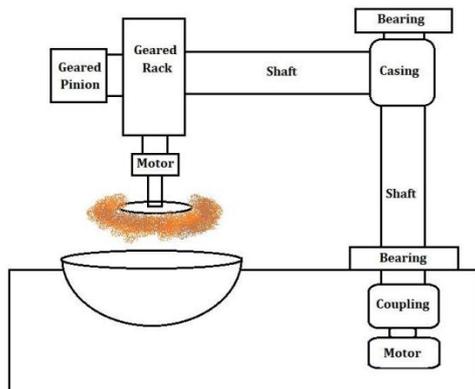


Figure 1: System Block Diagram

IV. WORKING

This system uses Arduino to control all systems. This Arduino consists of special microcontroller arrangement and code uploading arrangement. This Arduino uses special IDE for coding i.e. Arduino IDEO which is opensource tool. This complete system uses different arrangements that are Activator arrangement, Rack and pinion arrangement, Brush cleaning arrangement, water distribution arrangement, Android application arrangement and Arduino UNO arrangement. This system uses L298D motor driver module to rotate complete system clockwise and anti-clockwise direction and relay module to activate water pump. This project uses rack and pinion arrangement to clean basin and it is controlled by android application using wireless module i.e. HC05. This HC05 its Bluetooth module operated on 2.5 GHz. This complete system uses activator arrangement. This activator arrangement uses motor shaft and coupling arrangement. The rack and pinion cleaning arrangement is mounted on this

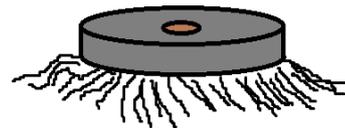
activator arrangement. This activator arrangement again controlled by android application. To control complete system this system uses Arduino. This Arduino uses microcontroller.

V. COMPONENTS USED

- Friction cleaning Brushes.
- Shaft
- High Torque DC Motor for brush cleaning
- High Torque DC Motor for Rack and pinion movement
- Casing
- Geared rack
- Geared pinion
- Water Pump
- Water and Pesticides Tank
- Arduino UNO
- Motor Driver
- Bluetooth Module (HC-05)

VI. COMPONENTS SPECIFICATION

- *Friction cleaning Brushes:* Friction cleaning brushes are mechanical cleaning tools that use friction to remove dirt, debris, or unwanted material from a surface.



- *Shaft:* A shaft is a rotating or stationary mechanical component that transmits power or motion between different parts of a machine.



- *High Torque DC Motor for brush cleaning:* A high-torque DC motor is a type of direct current (DC) motor designed to produce a high amount of torque (rotational force) at lower speeds.

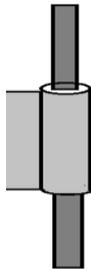


- *High Torque DC Motor for Rack and pinion movement:* A high-torque DC motor is well-suited for

driving a system of racks and pinions, which transforms motion from rotation to linear motion.



- **Casing:** The casing is a crucial component of a motor that serves multiple functions, including protection, heat management, structural support, and aesthetic presentation, all of which contribute to the motor's overall performance and longevity.



- **Geared rack:** A spur gear rack is a linear gear system that consists of a straight bar with teeth (the rack) that engages with a rotating gear (the pinion).



- **Geared pinion:** A geared pinion is a small gear that meshes with a larger gear or a gear rack, serving as a key component in mechanical systems for transferring motion and force.



- **Water Pump:** A water pump is an essential device for moving water in various applications, including agriculture, household use, and industrial processes.



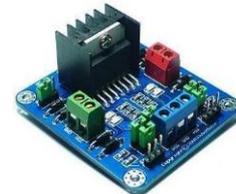
- **Water and Pesticides Tank:** A Water and Pesticides Tank is a container designed to store and dispense liquids, such as water or pesticides.



- The Arduino Uno is an open-source microcontroller board created by Arduino.cc that is based on the Microchip ATmega328P microprocessor. The board has a number of digital and analogue input/output (I/O) pins that can be connected to other circuits and expansion boards (shields).



- The function of a motor driver is to convert a low-current control signal into a higher-current signal that can power a motor. A motor driver is a current amplifier.



- HC-05 is a Bluetooth SPP (Serial Port Protocol) module that is easy to use and has a clear wireless serial communication format.



VII.APPLICATIONS

1. Railways Toilet Cleaning
2. Hospitals
3. Public Health Centre
4. Shopping Malls
5. House hold purpose
6. Complexes

VIII. CIRCUIT DIAGRAM

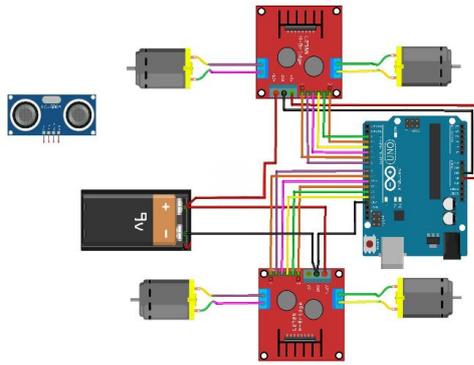


Fig. 2. Circuit Diagram

IX. ADVANTAGES

1. The proposed system is capable of thoroughly cleaning railway basins using a friction-based cleaning brush arrangement.
2. It features an activator mechanism that adjusts the brush to reach and clean the basin according to the user's needs, addressing the issue of limited space.
3. The system includes an anti-germ sprinkler distribution, reducing The risk Of spreading infectious diseases.
4. A wall-locking mechanism ensures no additional space Is required for The cleaning process.
5. An Android application enables wireless control of the cleaning process, eliminating the need for human contact.
6. It is optimized for power efficiency, conserving energy during use.

X. CONCLUSION

This project uses rack and pinion arrangement with clockwise anti clockwise rotation to make cleaning possible and to clean basin this system uses motor having 300 RPM which can able to rotate clockwise and anticlockwise direction. This system uses L298D Motor drive to make possible to rotate motor clockwise and anticlockwise. This basin cleaning system controlled by android application which is implemented by android application development tool (AADT). The arduino uses ATMEGA 328 Microcontroller. To code ATMEGA 328 Arduino uses Arduino IDE. Which helps to debug code and upload code directly. This activator arrangement uses motor having 60 RPM and 2KG torque. The rack and pinion arrangement uses 60 RPM motor with 0.5kg torque. The buzzer arrangement used to alert user that cleaning is going on. The L298D Motor driver helps to drive motor in clockwise and anticlockwise

direction. The power requirement of complete system is 12v and 4 amp.

XI. REFERENCES

- [1] Prof. Vijaykumar Bhanuse, Prof. Manisha Mhetre, Prashant Kale, Atharv Chavan, Sourabh Sandbhor "Efficient And Smart Railyway Toilet System", journal of emerging technologies and innovative research (JETIR), may 2023.
- [2] Pinki Banait, Arman Sheikh, Automatic Washroom Cleaning System, research gate, International Journal of Scientific Research in Computer Science Engineering and Information Technology, March 2019, DOI:10.32628/CSEIT19523.
- [3] Mr. Chaitanya, S. Telradhe, Mr. Krutik A. Dhablya, Mr. Yogesh D. Dukare, Ms. Manashri, G. Zade, Ms. Pratiksha P. Wagh, "Smart washroom cleaning system using hub technology" International Research Journal of Engineering and Technology (IRJET) 03, Mar 2020.
- [4] Naoya Shinoki, Kazuyoshi Wada, Akihito Hori, Tetsuo Tomizawa, Toshihiko Suzuki, Evaluation of Repeated Cleaning Ability of a Restroom Cleaning System for Scattered Urine, 2020 IEEE/SICE International Symposium on System Integration (SII), 12-15 January 2020, DOI: 10.1109/SII46433.2020.9026220, Honolulu, HI, USA.
- [5] Sandeep Sangwan, Nikhil Chugh and Pradyumn Kumar Tiwari, "Smart Toilet– An IoT Solution", International Journal of Advance Research in Science and Engineering, vol. 06, no. 11, November 2017.
- [6] W. Sherine Mary, S. Muthukumar, A. Manisha, K. Nandhini and R. Vanitha, "Assistant Professor Department of ECE Adithya Institute of Technology Coimbatore India Sensor Based Automated Washroom Monitoring System", Institute of Electrical and Electronic Engineers.
- [7] E. Elakiya, K. Elavarasi and R. P. Kaaviya priya, "Paper Implementation of Smart Toilet (Swachh Shithouse) Using Iot Embedded Sensor Devices", International Journal of Advanced Research Trends In Engineering and Technology (IJARTET), vol. 5, no. 9, March 2018L.
- [8] Shwetank Shekhar Singh, Rajwant Pandey, Pawan Kumar Agrawal and Vartika Dubey,

"Student IMS Engineering College Ghaziabad Uttar Pradesh Developing Smart Railway Toilets", International Journal of Advance Research and Development, vol. 4, no. 4.

- [9] W. Sherine Mary, S. Muthukumar, A. Manisha, K. Nandhini and R. Vanitha, "Sensor based automated washroom monitoring system", Proc. IEEE Conference on Emerging Devices and Smart Systems (ICEDSS 2018) 2-3 March 2018 Mahendra Engineering College.