International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 5, July-August 2020 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

TIDDY - An Artificial Intelligence Based Floor Cleaning Robot

Bhumika T J[1], Harshitha U[1], Meghana S[1], Dr. Ganashree T S[2]

[1]Student, [2]Associate Professor,
[1,2]Department of Telecommunication Engineering,
[1,2]Dayananda Sagar College of Engineering, Bengaluru, Karnataka, India

ABSTRACT

"Maid in India" is more important than "Made in India" in modern society. Nonetheless, in the hustle and bustle of the present world, cleanliness has been ignored. To make life of humankind easier, with assistance of machines and innovations a floor cleaner is introduced. TIDDY, the floor cleaning robot is both a self-sufficient and manual controlled cleaning machine used to accomplish the act of cleaning by methods of its wet and dry modes. Keeping the surrounding clean is just not an aspiration but an action. Hence, TIDDY helps to keep the surrounding neat and tidy. Cleanliness is most important for physical well-being and a healthy environment. It has bearing on public and personal hygiene. This is made budget friendly keeping in mind the different economical classes in society. With the additional features of artificial intelligence and voice recognition, it is made cost-effective.

KEYWORDS: *Arduino Mega 2560, Voice Recognition, Automatic and Manual operations*

How to cite this paper: Bhumika T J | Harshitha U | Meghana S | Dr. Ganashree T S "TIDDY - An Artificial Intelligence Based Floor Cleaning Robot" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-5, August 2020, pp.478-480, URL: www.ijtsrd.com/papers/ijtsrd31847.pdf

IJTSRD31847

INTRODUCTION

It is believed that "Cleanliness is Godliness" and also "Time is Money" for modern generation, hence cleanliness and time cannot be compromised. Cleaning requires time and effort from a person to achieve the cleanliness that is required for a good living. To have good health, one must have good hygiene. Practicing good hygiene will help in keeping micro-organisms like bacteria, fungi and viruses away. To maintain good hygiene, developing practices like regular sanitization, dusting, washing or cleaning everything with a good cleaner or disinfectant is necessary which will help keep the home or surroundings clean and with this one's health will also be maintained. Nowadays, with the hustle and bustle of modern city life people ignore the cleanliness and fail to maintain good hygiene. Time is precious as they say, so is health and hygiene. Housemaids, garbage collectors, janitors etc. are hired to perform such tasks. Many a times a maid or a janitor does not show up because of their personal problems, health issues and other commitments, but a floor cleaner device is always reliable and can be used anywhere, anytime by anyone.

Cleaning is an essential and often overlooked task, so developing a model using Artificial Intelligence to keep the floor clean will prove to be useful for the society. Artificial Intelligence has the ability to make the floor cleaner take decisions by itself on how to clean the place. It can scan the room size, identify the objects in its way and remember the routes efficiently. It can also identify walls and stairs and decide as to how to move about in coming across such obstacles while cleaning. Along with that, it has voice recognition ability to understand the voices and act accordingly. This will prove to be a device which can be used anytime, anywhere and by anybody for the cleaning purpose.

LITERATURE SURVEY

[1] Sweepy – The smart floor cleaner is basically suited for household purpose which has smooth flooring. It performs both sweeping and moping simultaneously saving time and power consumption. It is made user friendly by performing both automatic and manual modes. It uses mpu6050 for navigation. It uses Bluetooth technology and hence cannot be accessed from a distant place or if it is out of range.

[2] Smart floor cleaning Robot (CLEAR)- It performs both manual and automatic mode for specific scheduled time. It uses bagless dirt container with auto dirt disposal mechanism. This can also be used for industry purposes which might be toxic for human involvement. Nevertheless, it lacks features of AI, IoT and voice recognition.

[3] Design and development of floor cleaner robot- This proposed system is based on AT89S52 microcontroller. It is made wireless using RF modules. An LCD display is used to display all the information about the robot. However, it does not support Artificial Intelligence and usage of IR sensors is not effective.

[4] Design and implementation of smart floor cleaning robot using android app- It uses a robotic arm for cleaning and is based on Arduino Uno. It uses IR sensors for obstacle detection and is manually controlled by an android device through an app. The drawbacks include usage of IR sensors and the tiny waste particles will be left behind. Also, this system can be used to only pick up the objects and carry them within the Bluetooth range.

[5] Mopping module design and experiments of a multifunction floor cleaning robot- This is made eco-friendly as it follows the principle of low carbon environment protection. It is developed based on the idea of reconfiguration and function modular. This also overcomes residual water problems. However, it is not effective as it lacks automatic and manual mode operation and the technology is outdated.

[6] Social impact of a systematic floor cleaner- A survey has been done on all the advanced floor cleaners and it has been found that it is very effective in providing a convenient lifestyle for their owners. 65% of the survey has proved that the participants using smart floor cleaners are healthier because of reduced allergies and respiratory problems. But this percentage can be improved by adding additional features of IoT and AI.

METHODOLOGY

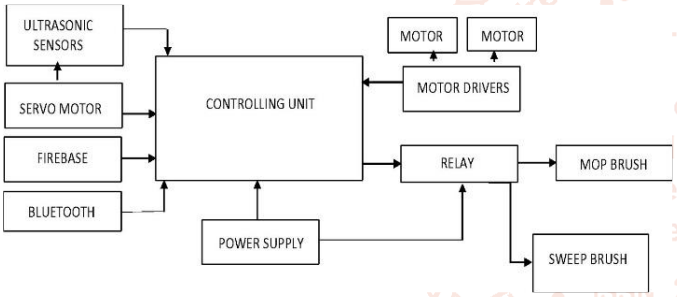

Fig 1: Block diagram of the proposed system

The block diagram of the smart floor cleaner proposed is as shown in the above figure. It has the controlling unit where all the sensors, motors and motor-drivers are interfaced. The power supply is provided to the controlling unit and also other components in the circuit using SMPS (Switched Mode Power Supply). Relay is used as switching circuit for the mop brush and the sweep brush. The mop brush is used for the mopping purpose and sweep brush is used for the sweeping purpose. These two brushes are controlled using the relay. Motor- drivers are used to drive the motors to make locomotion. The wheels are connected to the DC motors which are driven by the L298N motor driver module interfaced with the controlling unit. Two motor drivers are used for driving four DC motors. To make the proposed floor cleaner wireless, Bluetooth module has been used which is interfaced with the controlling unit. Once the connectivity is established between the phone app and Bluetooth module the floor cleaner can be controlled. Firebase is used for storing all the information about the users such as name, phone no, email, etc.

It is connected via a software app developed for the floor cleaner. Ultrasonic sensors are for detecting the obstacle as a hurdle in the path which the robot is moving. It is interfaced with the controlling unit along with the servo motor. Servo motor is used for the rotation of ultrasonic sensor from left to right or right to left.

WORKING

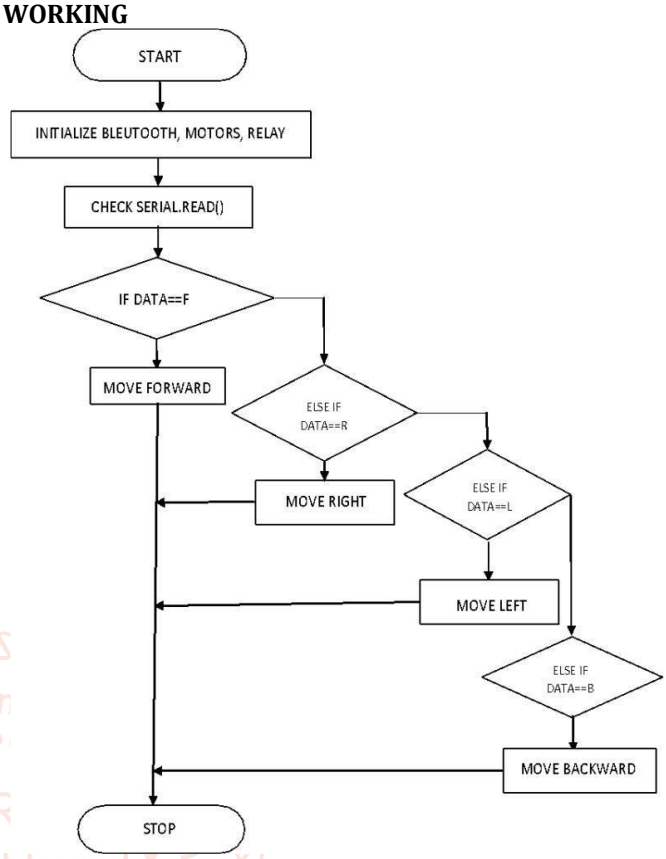

Fig 2: Flowchart representing the working of Tiddy

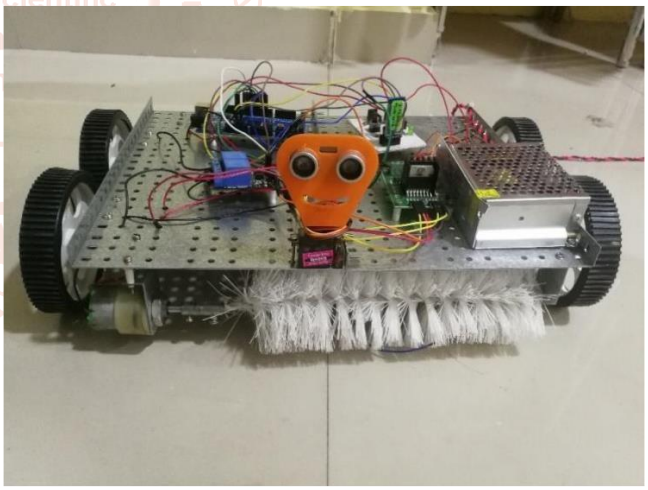

Fig 3: Actual model of Tiddy

The above flowchart shows the functioning of the robot manually with the help of the MIT App Controller. When the robot is turned on manually, the Bluetooth module on the robotic body needs to be connected to the user's phone before use. This accompanying technique is for the manual utilization of the robot. Before utilizing the application to control the robot through the user's phone, the Bluetooth connection needs to be established so it can be controlled with the help of the phone. After the Bluetooth is initialized, the motors and the corresponding relays must be provided with the connection. The motors are in-turn connected to the wheels of the robotic body. The motors run with the help of the power supply ranging up to 12-15V. The application controller is provided with four different keys namely: Forward, Backward, Left and Right respectively. Once the

Bluetooth, relay and motors are initialized it checks for the serial.read(). If (data==F), that is if the forward key is pressed on the app controller then the robot will move forward as per the commands given. If (data==R), that is if the right key is pressed on the app controller then the robot will move right as per the commands given. If (data==L), that is if the left key is pressed on the app controller then the robot will move left as per the commands given. If (data==B), that is if the backward key is pressed on the app controller then the robot will move backward as per the commands given. If none of the above command is given then the robot can even be operated in the automatic mode. There is another additional key on the app controller which is Stop, at any point of time if the user wants to stop the functioning of the robot then he has to click on the Stop button and the process will stop thereafter. The MIT App Controller also has the feature of voice recognition, where the robot will move when a voice command is given. The voice command is identified, processed and the action defined to that particular word if detected then task is performed otherwise the device tells the user that the action is not defined in its system.

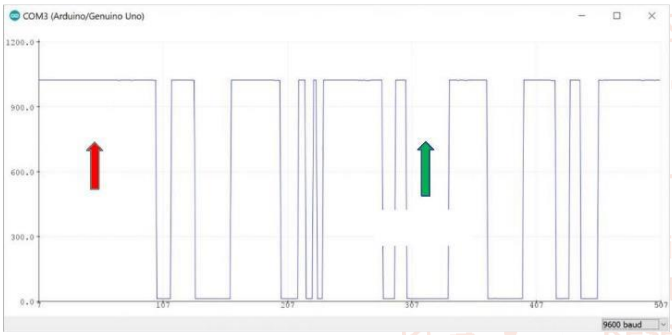

Fig 4: Simulation of ultrasonic sensors

This graph is the representation of Arduino IDE serial plot. X-axis represents time and Y-axis represents voltage level. Whenever voltage level varies, sensor receives the signal and same will be displayed on serial plotter using Arduino Serial. The graph is responsive which will be helpful to analyze the data by having same output window width.

CONCLUSION

In a nutshell, the major gaps of the existing systems can be bridged by the Artificial Intelligence based floor cleaner. In the existing system, the sensors that have been used are not very effective in object detection as the IR sensors do not detect black objects and light is often detected as an object. Ultrasonic sensors are more effective in object detection as it has an echo and trigger pin. The trigger pin sends signals and the echo pin receives the signals. If an object is detected then the signals will be able to indicate it and the distance of the object can be predicted by using a formula in the code. Hence usage of ultrasonic sensors will be more effective over the IR sensors. Introduction of Voice recognition mode to receive the instructions from the user and perform that particular task will make it easier and more effective. With the advancement of technology, introduction of Artificial Intelligence will prove to be efficient as it can remember the previously paved path and move accordingly in future. In this fast-moving world, introducing IoT in the floor cleaner will make it easier for the user to access it anytime from anywhere.

FUTURE SCOPE

1. Image processing can be implemented to detect the nature of the obstacle and decide the path.
2. Implementation of different languages as instructions to perform tasks.
3. Compact design using compact components.

References

[1] Sweepy– The Smart Floor Cleaner Varsha. P H [1], Lavanya V [2], Meghana K [3], Rohan P S [4], Sneha R [5], [1] Assistant Professor [2[[3][4][5] student, MVJ College of Engineering. 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control. https://ieeexplore.ieee.org/document/8437103

[2] Smart Floor Cleaning Robot (CLEAR) Uman Khalid1, Muhammad Faizan Baloch1, Haseeb Haider1, Muhammad Usman Sardar1, Muhammad Faisal Khan1,2, Abdul Basit Zia1 and Tahseen Amin Khan Qasuria11Faculty of Electronic Engineering. IEEE standard 2015. http://www.standardsuniversity.org/wp-content/uploads/Smart-Floor-Cleaning-Robot-CLEAR.pdf

[3] Design and Development of Floor Cleaner Robot (Automatic and Manual) Manreet Kaur, Preeti Abrol. International Journal of Computer Applications (0975 – 8887) Volume 97– No.19, July 2014 https://pdfs.semanticscholar.org/59be/a86b03a6470f25921 be23ae3c43f2463c810.pdf

[4] Design and Implementation of Smart Floor Cleaning Robot using Android App S Monika, K Aruna Manjusha, S V S Prasad, B. Naresh International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-4S2 March, 2019 https://www.ijitee.org/wp-content/uploads/papers/v8i4s2/D1S0054028419.pdf

[5] Mopping module design and experiments of a multifunction floor cleaning robot Yunbo Hong1 2, Rongchuan Sun1 2*, Rui Lin1 2 *, Shumei Yu1 2 and Lining Sun1 2 Proceeding of the 11th World Congress on Intelligent Control and Automation Shenyang, China, June 29 - July 4 2014 https://ieeexplore.ieee.org/document/7053581

[6] The Social Impact of a Systematic Floor Cleaner Jens-Steffen Gutmann Kristen Culp Mario E. Munich Paolo Pirjanian. Proceedings of the 2012 IEEE International Workshop on Advanced Robotics and its Social Impacts, Technische Universität München, Munich, Germany, May 21 -23, 2012 https://ieeexplore.ieee.org/document/6213398