SMART MAPPING AND PREDICTION USING AGGREGATION AND ARTIFICIAL INTELLIGENCE(SMPAAI)

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Abstract - *Households of today are becoming smarter and more automated. Home automation delivers convenience and creates more time for people. Domestic robots are entering the homes and people's daily lives, but it is yet a relatively new and immature market. However, a growth is predicted, and the adoption of domestic robots is evolving. Several robotic vacuum cleaners are available on the market, but few deliver low cost and high performance. The purpose of this project is to design and implement a Vacuum Robot using Artificial Intelligence and smart mapping technology to clean the efficiently. Subject robot operates in autonomous mode as well as in manual mode along with additional features like scheduling for specific time and bagless dirt container with auto-dirt disposal mechanism. This work can be very useful in improving lifestyle of mankind. Vacuum Cleaner Robot is designed to make cleaning process become easier rather than by using manual vacuum. Vacuum Robot will have several criteria that are user-friendly.*

Key Words: **Vacuum Cleaner Robot, Artificial Intelligence, Smart Mapping Technology, Precision Cleaning, Methodical Pattern.**

1. INTRODUCTION

In recent years, robotic cleaners have taken major attention in robotics research due to their effectiveness in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc. Basically, robotic cleaners are distinguished on their cleaning expertise like floor mopping, dry vacuum cleaning etc. This project, "SMART AUTOMATIC VACUUM ROBOT USING ARTIFICIAL INTELLIGENCE (SMPAAI)", has been designed to appeal for the upper class and the upper middle-class households. Especially as an aid for working women. It will be an automated vacuum robot with manual and automatic controls and with its smart mapping SMPAAI maps the room just as it goes and moves away from anywhere marked "NO VAC" territory. There have been several ongoing research studies for embedding intelligence into their controls and applications. This integration of intelligence contributes to improvement in the usability of the appliances as well as to increase their lifecycle. In recent years, robotic cleaners have taken major attention in robotics research due to their effectiveness in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc..

2. EXISTING SYSTEM

2.1 IROBOT ROOMBA:

In 2010, iRobot launched its first floor vacuum cleaner robot named Roomba. Initially, iRobot decided to manufacture limited number of units but Roomba immediately became a huge consumer sensation.

Cleans an entire level of your home: With Smart Mapping and vSLAM® technology, the Roomba robot vacuum seamlessly navigates your home, keeping track of where it's been and where it has yet to clean.

Cleans until the job is done: Roomba robot vacuum cleans continuously for up to 75 minutes*, then recharges and resumes cleaning until the job is done.

Dirt, meet your match: The Roomba robot vacuum removes dirt from high traffic spots of your home using patented Dirt Detect™ Technology. Sensors recognize concentrated areas of dirt and prompt the robot to clean them more thoroughly.

Cleans on a schedule: Roomba® can be preset to vacuum up to seven times per week, meaning your home can stay clean every day.

Cost: $899

2.2 NEATO ROBOTICS:

The idea behind Neato Robotics – that robots can perform household chores as intelligently as humans – was born at Stanford's annual Entrepreneur's Challenge. Today, robot vacuums clean homes better than the competition – with smarter technology, more powerful suction, and bigger-is-better features that get the job done the way you would, or even better.

Cleaning System: Standard filters provide a very high cleaning performance.

Cleaning Coverage: High Performance filters provide a very high cleaning performance and good air filtration. Best for maximizes vacuuming performance.

Performance Filter Type: Ultra Performance filters provide a very high cleaning performance and excellent air filtration. Best for those concerned with allergies and for minimizing particulates in the air

Charging: One cleaning cycle includes 3 cleaning runs with 2 recharges of the battery. Square footage cleaned varies based on floor type, room layout, furniture, etc

Scheduling: Schedule can be set to clean 1 time per day, 7 days a week – The Neato app is required for D7, D5 and D3 scheduling. Requires Neato's SmartLife Edition App for iOS or Android .

Cost: $799.

2.3. DYSON 360 EYE:

In 2014, Dyson built a robot vacuum known as DC06 which was never released to the market due to its high price. In 2016, Dyson launched a new product named as Dyson 360 Eye which uses a different technology for path finding as compared to products manufactured by NEATO Robotics or iRobot.

360° Vision: The 360° Vision system can see a full panoramic view of the room - that's all the way around at once. It takes 30 images a second and stitches them together using SLAM (simultaneous localization and mapping) software to create a 360° panoramic view of the room.

Dyson Link app: Dyson Link gives you the ability to control, schedule and analyze data from your Dyson 360 Eye™ using a smartphone or tablet.The Dyson Link app, for iOS and Android, has been developed by Dyson to enhance the user experience and functionality of the Dyson 360 Eye™. Registering Dyson 360 eye using Dyson Link activates the 2 year warranty - providing you with free, award-winning customer support from Dyson experts. Dyson Link also enables Dyson 360 Eye™ to automatically download the latest software, ensuring your machine is as up to date as the Dyson research lab.

Charging Dock: Stores and recharges Dyson 360 Eye™ so it's ready for use whenever you need it.

Cost: $999

3.LIMITATIONS OF EXISTING SYSTEM

Nowadays a lot of users are using manual vacuum systems that consume electricity.A vacuum cleaning robot works a lot like a traditional, manual vacuum cleaner. The main difference is that a robotic vacuum cleaner is equipped with brushes, which move the dust to the nozzle. Some robotic vacuum cleaners have extra brushes which collect the dust on both sides of the robot and brush this dust right into the nozzle. This feature allows the robots to sweep along walls and clean thus more effective. The effectiveness of a robotic vacuum cleaner is also determined by the quality of the suction mechanism and the brushes. In comparison with manual vacuum cleaners, the cleaning process of robotic

vacuum cleaners takes a longer time. It is slower and through its limited battery life it sometimes has to recharge within its cleaning round. Therefore completing the vacuuming of an entire room takes longer. This is something the consumer is well aware of and since the robot cleans mostly when the consumer is not at home, this should not be a problem.
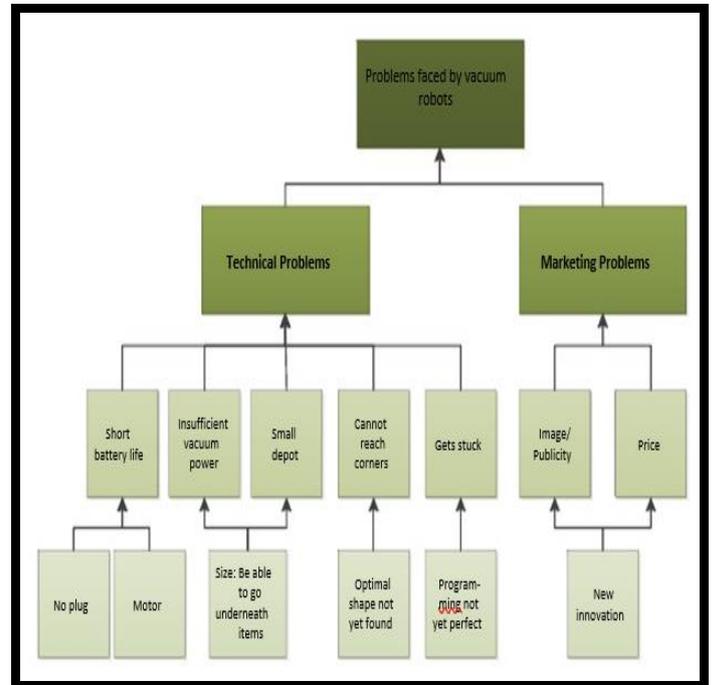

Fig -1:Problems Faced By Vacuum Robots

4. PROPOSED SYSTEM

The vacuum robot is powered by batteries and can work autonomously to clean up the dust. It is equipped with 3 proximity sensors for front, left and right direction to detect the obstacle and appropriately changing the path and also 1 ultrasonic sensor on the bottom of the bot prevent it from falling off the edges such as the top steps of stairways and additional features like auto-dirt disposal. SMPAAI have internal acoustic-based dirt sensors that allows them to detect particularly dirty spots (zones having excess particulates) and focus on those areas accordingly.

The vacuum robot i.e. SMPAAI can also be accessed by using an app that allows the user to schedule it for specific time from anywhere at anytime and will also provide manual control if required. You can start ,schedule and monitor the room, view cleaning coverage. Plus, receive Push Notifications when your robot completes a cleaning job. SMPAAIs spin flow power clean technology combines potent suction and precision brushes to leave hard floors, carpet and even baseboards immaculately clean.
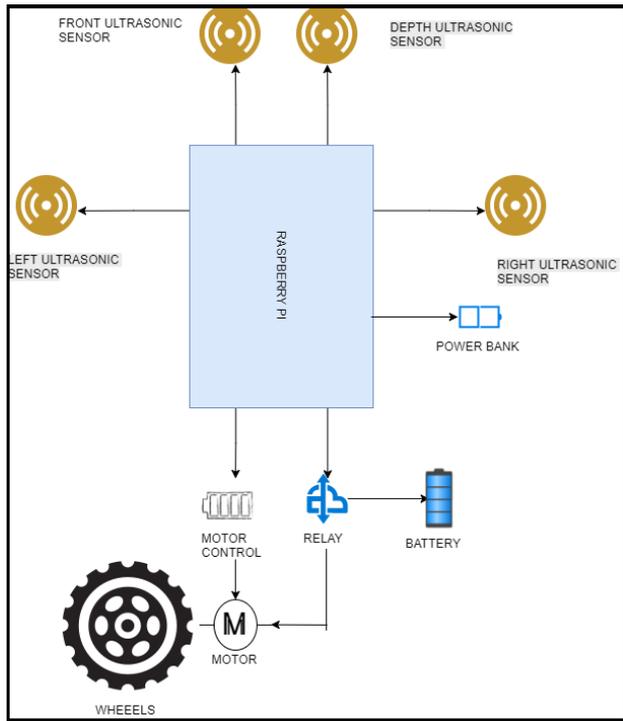
Fig -2: Block Diagram

[1] Raspberry PI:- The RASPBERRY PI is the heart, which makes the system automatic. It reads the signals from the ultrasonic sensors. It then processes the data and controls the movement of robot by giving signals to the motor control.

[2] DC Power Unit:-This block consists of a 9V rechargeable battery and a voltage regulator. The power requirements of the system are strictly met without putting the system at risk during high loads.

[3] Relay:- A relay is used in addition with raspberry pi which is also connected with rechargeable 9V battery that provides linear current to the motor in order to prevent it from the risk of damage to the circuit from back electromotive force(EMF).

[4] Motor Control:-Motor Control is used in addition with raspberry pi to control the movement of wheels.

[5] Ultrasonic Sensors:- Ultrasonic sensors work on ultrasonic sound waves. An ultrasonic wave is transmitted ,it hits an object and returns back. The time consumed till the wave returns to the origin is used to calculate the distance. An ultrasonic sensor on the bottom of the bot to prevent it from falling off ledges such as the top steps of stairways.
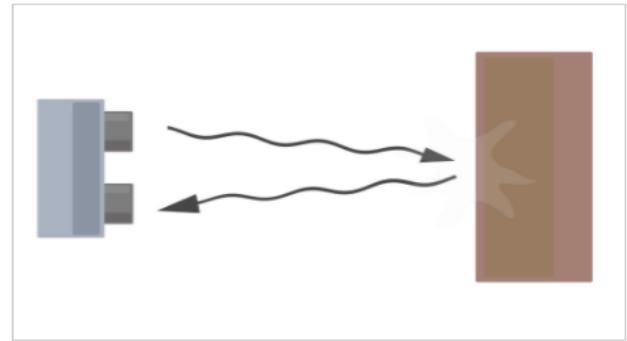

Fig -3: Ultrasonic Sensor Operation

5. COMPARATIVE ANALYSIS

A robotic vacuum cleaner is an autonomous electronic device that is intelligently programmed to clean a specific area through a vacuum cleaning assembly. Some of the available products can brush around sharp edges and corners while others include many additional features such as wet mopping and UV sterilization rather than vacuuming. Some of the available products are discussed beloW

FEATURES	ROOMBA	NEATO-XV	DYSON-EYE360	SMPAAI
OPERATING TIME(HR)	2	1.5	1.5	1.2
CHARGING TIME(HR)	4	3	3.5	2
SCHEDULING	YES	YES	YES	YES
BATTERY INDICATOR	YES	YES	YES	YES
AUTO DIRT DISPOSAL	NO	NO	YES	YES
REMOTE CONTROL	YES	YES	YES	YES
RETURN TO BASE	YES	YES	YES	YES
COST(INR)	51000	45000	63000	20000

Table -1: Comparative Analysis Between SMPAAI and Existing System.

6. CONCLUSION

This paper describes the integrated use of different fields oriented towards the design of complete floor cleaning mobile robot. The design of the robot is discussed, and the

compatibility between human being and cleaning robots is analyzed with the conclusion that robot operation can be probably must be isolated from human beings. However, these errors can be minimized when an external reference can be used as a trajectory feedback, thus making this robot an ideal platform for the implementation of vacuum robots.

ACKNOWLEDGEMENT

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