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A Survey on Automatic Vacuum Cleaner for Commercial Places

Neel Shaileshbhai Desai[1]

UG Student, Dept. of Instrumentation and Control Engineering, Sarvajanik College of Engineering and Technology, Surat, Gujarat, India[1]

ABSTRACT: In commercial places, manual cleaning is taken over for decades with help of broom, vacuum cleaner and sprayer. But AUTOMATIC VACUUM CLEANER system is new way to maintain the commercial places. AUTOMATIC VACUUM CLEANER system will help management to keep commercial place neat and clean and by this endorse "SWACHH BHARAT ABHIYAN". Robotic system will use ultrasonic distance sensor to range the distance and by this reading it will decide its own manoeuvre. The system will be completely automatic with zero-man power. Robot will connect to main control room for interruptions with wireless serial communication. By this robotic vacuum cleaning system, we can maintain the commercial places like railway station, bus station etc. The whole system will use electrical energy so there will be no carbon emission. There are many robots out there but they are for only domestic use only but by this AUTOMATIC VACUUM CLEANER system we can emerge new way to cleaning at public places. This system has two option 1. Automatic and 2. Manually. Atmega 2560 will be used for the microcontroller and ESP8226 Wi-Fi module will be used for communication and connect the robot through internet(IOT). Manual function has been given to the robot for special situation. We cannot change the people's mentality to not to litter at public places but we can change the way of cleaning with help of AUTOMATIC VACUUM CLEANER frugal way.

KEYWORDS: Automation, Vacuum cleaner, Robotic, IOT, Commercial Places, SWACHH BHARAT ABHIYAN

I.INTRODUCTION

As we know vacuum cleaner is combination of electric and mechanical field. Since vacuum cleaner was invented, it has created vast market and created demand in public. Since the vacuum cleaner was invented there are many improvements occurred in vacuum cleaner technology like for cleaning better impeller design, for e□ciency better motor etc. But the main revolution started when the first robotic vacuum cleaner was invented ELECTROLUX in 1996.In 2002 IROBOT developed ROOMBA robotic vacuum cleaner and entered in vacuum cleaner market [1]. Robotic vacuum cleaner can be used 24*7 without any hiatus because it is machine.

Country like India is way back in robotics but we can utilize this robotic vacuum cleaning system in commercial places with help of sensors feedbacks. Main challenge is public places are crowed with peoples and to clean the place with avoiding the obstacles(people). Another challenge is dirt volume detection on floor to control the vacuum cleaner speed for e□cient cleaning. The main advantages of ROBOTIC VACUUM CLEANING is its ease of operation. The Operation of robot must be easy for the foreman interaction to robots. Many supporting sensor will be used for feedback like train is arriving on platform, so robot will stop because of rash at platform at train arrival time. Robot will be connected through wireless channel(IOT) for battery level information, interruptions and for emergency stop.4 powerful DC motor will be used with 12V DC battery for movement. Robot can also sense the level di□erence so robotcannot fall to track from platform or stairs

Robot can be controlled manually viaWIFI(IOT)channelwith help of ESP 8266 WIFI module. Sometimes situationgets hard for that hard situation manual option will be given to the robot. ESP8226 module will be used for controlling range of module is 100m but we can extend it with the repeaters so robot can be controlled with long distance.

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II. REALATED WORK

Today day by day robots are improving and robots are now used at many sectors like Agricultural, Industries, Military, Medical, Rescue team etc. Automatic vacuum cleaner is robot which will make work easier for the maintenance team at commercial places with low cost and more accurate cleaning. As mentioned first robotic vacuum cleaner was developed around 1996 ELECTROLUX. from that time to today lots of changing and improvement happened. Nowadays human operated cleaning machines are used at commercial places but for that we still require one foreman to control the machine. By this Automatic vacuum cleaner, we can do cleaning without man power at commercial place.

In 2002 the IROBOT developed the ROOMBA house cleaning robot after that many companies like Neato , Dyson, LG developed house cleaning robots but not for commercial cleaning base robot. So, at commercial place still we are using traditional way (Broom and Mop) to clean the place. But by this Automatic vacuum cleaner we can start new revolution at commercial places. Scenario at commercial places is not same as the home. Because robot at the commercial places surrounded by more obstacles and humans so it required different algorithm than house robotic vacuum cleaner. The capacity, power is also very high than the house robotic vacuum cleaner and the main thing is filtering at vacuum part is also different. There will be only one con for Automatic vacuum cleaner for commercial place is maintenance. Apart from that it is very helpful and frugal to clean commercial places

III.PROPOSED METHOD BLOCK DIAGRAM

IAs shown in Figure sensors are connected to the microcontroller. For serial communication ESP8226 module will be used. Motors and Battery will be connected to motor driver circuit and then to the microcontroller.IR will be used to detect train is arriving on platform. Ultrasonic sensor will be used for distance ranging. LCD display will be used for user to Robot interfacing. Atmega 2560 is heart of the system. It is capable for the enough fast processing and the for the I/O pins

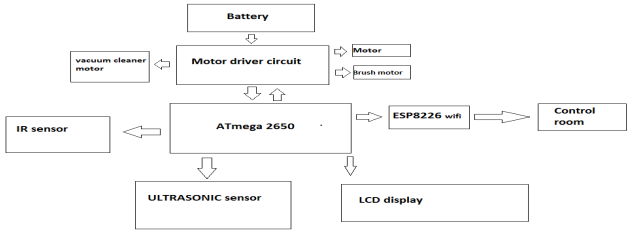

Fig.1 Proposed block diagram of Automatic vacuum cleaner

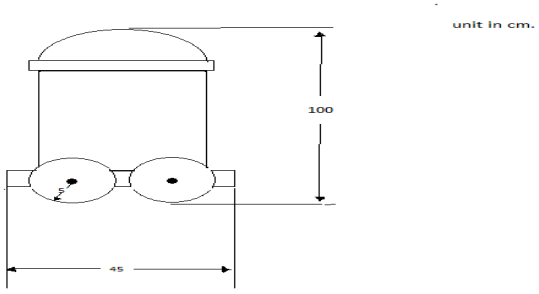

Fig.2 Proposed model of Automatic Vacuum Cleaner

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IV.METHODS OF PROPOSED DESIGN

As the discuss above robot will use sensor for feedback and it will decide its manoeuvre. First main sensor is ultrasonic sensor. There are three ultrasonic sensors have been used. The logics are
Interpreted below with help of diagram. The robot will range and detect the obstacle by the ultrasonic sensor. [2].

A. LEFT-FRONT OBSTACLE

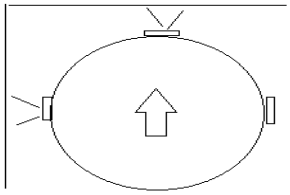

Fig.3 Left-Front Obstacle

When Robot is near by the any obstacle with less than 10cm its sensor with give feedback to microcontroller. When the Robot is covered in two direction as shown above in figure Left-Front side. When the distance is less than 10cm Robot will move 90 degree to right side and then proceed. First robot will check front sensor if there is obstacle then it will check other two sensors on side. If one of them show obstacle, then it will turn in opposite direction like in this scenario right side.

B. RIGHT-FRONT OBSTACLE

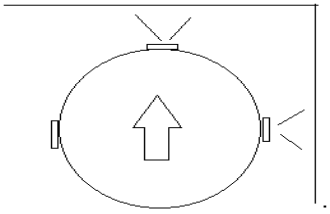

Fig.4 Right – Front Obstacle

As shown in figure when robot is surrounded by only in one direction like in front of wall it will check the obstacle with front sensor. If it detects the obstacle, then it will check both on side sensors if there is no obstacle in any direction

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at sides robot will take right turn. If it finds the obstacle with front sensor it will always take right turn.

C.FRONT – LEFT -RIGHT OBSTACLE

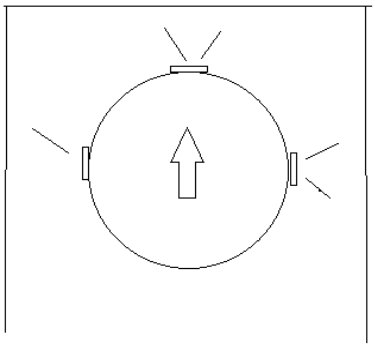

Fig.5 Front-Left-Right Obstacle

When robot is surrounded by three direction Right- Left -Front as shown above in figure. It will Start ranging normally when the front sensor detects the obstacle it will check side sensors when the side sensors are detecting obstacle in both direction robot will move in reverse and take 180 degree turn and then proceed ahead.

D. ONLY LEFT AND RIGHT OBSTACLE

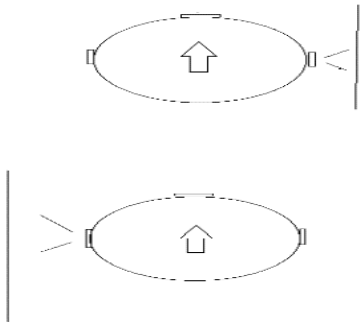

Fig.6 Only Left and Right Obstacle

When the Obstacle is only at left and Right first robot will check the with second loop it will direct check the two side sensors and if it detects the obstacle the robot will turn at opposite direction on obstacle at 10 degree and proceed ahead for cleaning.

E. LEVEL OBSTACLE

It is also necessary to avoid the level obstacle it can cause major damage to robot. If the robot is near by the track passage the ultrasonic sensor will detect if there is distance more than 10cm then the ultrasonic sensor will send signal to microcontroller and robot will reverse and avoid the level obstacle. Same situation will also apply to stair context if robot is nearby the stair then if will detect it and then avoid it.

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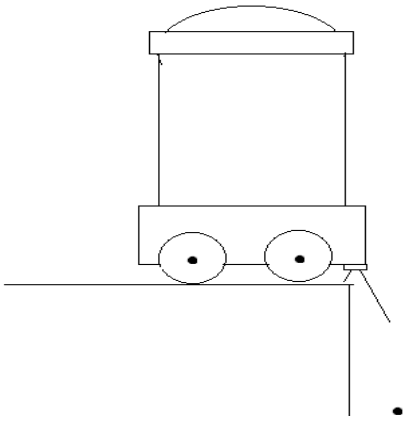

Fig.7 Level Obstacle

V. TRAIN PROXIMITY SENSOR

Fig.8 Train proximity sensor

As the normal situation at station when the train arrives on platform or bus arrives situation get tumult there. So at that time for safety robots will get stop. When the train is nearby IR sensor will send the feedback to microcontroller of robot via wireless channel(IOT) and robot will stop.

VI. MANUALLY CONTROL

For harsh situation like festival time rush at station will high so at that time Operator can control robot by the keypad from control room. One operator can operate one robot at time. Operator will get live feed from cameras on station and he can control it. But sensor will still engage to avoid obstacle. For manual control robot, will only move when the signal is transmitter from control room.

VII.CLEANING METHOD

Robot will use multiple layer cleaning. As robot, will use at commercial place vacuum pressure should be more than 10psi and the brush must use with high rpm motor to clean dust. First layer is vacuum cleaning, vacuum cleaner will

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clean all the micro dust by suction. Then roller brush comes as second layer, roller brush will rotate in direction of vacuum cleaner to make efficient cleaning for macro dust. By this method, we can remove the dust easily.

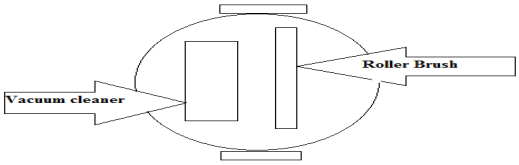

Fig.9 Cleaning Diagram Of Automatic Vacuum Cleaner

VIII. POWER SUPPLY

In Automatic vacuum cleaner 11.1V Li-Po battery will use. Li-Po battery is very light in weight and the give very high discharge. For movement 12v motor will use and for vacuum fan.

IX. APPLICATIONS

1 At railways station on platform for cleaning.

2 Robot can be use with manual mode at railway station, Bus station at harsh situation.

3.Robot can clean any corner or edge as it is program to run at six different scenarios.

X. CONCLUSION

This Automatic vacuum cleaner will provide efficient way for the cleaning at commercial places and will start new revolution at commercial places cleaning strategies. Ultrasonic sensors are very accurate with reading in range of 2cm to 400cm but for more accuracy we can use the image processing with camera mounted with distance sensor. Cost of only 8,000 rupees' robot will be which can be reduced with more research.
More algorithm will develop with more creativity with more manoeuvre of robot. Dust volume detection technology will need improvement for better cleaning. The security for web page required nowadays for IOT connection. More robust design will require for public places. Image process can be developed for better stability.

REFERENCES

1. Robotic vacuum cleaner ttps://en.wikipedia.org/wiki/Robotic_vacuum_cleaner
2. J-S. Gutmann, E.Eade, P.Fong and M.E. Munich. Vector field SLAM. IN Int. conf. on Robotics and automation (ICRA), 2010
3. G Tuangzhi Dai and Tiequn Chen.Design on measurement and control system of cleaning robot based on sensor array detetion.In IEEE International conference on control automation Guangzhou, CHINA-MAY 30 to June 1, 2007
4. J FrolizziC.Disalvo. Service robots in the domestic environment: A study of Roomba vacuum in the home". In int. conference on human robot interaction HRI, PAGE 258-265 March 2006
5. Youngkak Ma, Seungwoo Kim, Dongik Oh and Youngwan Cho's study on development of home mess cleanup robot McBot proved helpful There was an IEEE/ASME international conference on advanced mechatronics July 2-5, 2008, Xian, China.
6. Xueshan Gao, Kejie Li, Yan Wang, Guangliang Men, Dawei zhou and Koki Kikuchi. A floor cleaner robot using Swedish wheels.In IEEE

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ISSN (Online): 2278 – 8875

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international conference on robotics and biomimetics December 15-18, 2007, Sanya, China

7. J-Y. SUNG, R.E.Grinter, and H.I.Chrstensen, and L.Go.Housewives domestic robot technology int. Journal of social robotics, 2(4):417-429,2010

8. J Frolizzi C.Disalvo. Service robots in the domestic environment: A study of Roomba vacuum in the home". In int. conference on human robot interaction HRI, PAGE 258-265 March 2006.

9. H.Asada and J.-J E. Slotin, robot analysis and control, a wiley-interscience publication, 1986, pp. 29-49.

10. Nakju Lett Doh , Chanki Kim and Wan Kyun Chung ,‖A Practical Path Planner for the Robotic Vacuum Cleaner in Rectilinear Environments IEEE Transactions on Consumer Electronics, Vol. 53, No. 2, pp. 519-527, May 2007

11. Ming - Shaung Chang , Jung - Hua Chou and Chun - Mu Wu , ― Design and Implementation of a Novel Outdoor Road - Cleaning Robot ‖ , IEEE Robotics and Automation Magazine , Volume 24, Issue 1-2, pp. 85- 101, January 2010.

12. Haydar S¸ Ahin and Levent Guvenc ,―Household Robotics Autonomous Devices for Vacuuming and Lawn Mowing ‖, IEEE Control Systems . Magazine, Vol.25, Issue 3 , pp. 20-23, April 2007.

13. Soowoong Kim, Jae-Young Sim and Seungjoon Yang, ― Vision - based Cleaning Area Control for Cleaning Robots‖, IEEE Transactions on Consumer Electronics, Vol. 58, No. 2, pp. 685-690, May 2012