Automatic Floor Cleaning Bot

Prem.R[1], Mohamed Abid Jafery[2], Mohamed Sameer.S[3]
[1, 2, 3] Dept of Mechatronics
[1, 2, 3] Sri Krishna College of Engineering and Technology

Abstract- *The aim of this project work is to develop and modernized process for cleaning the floor which is wet and dries the floor automatically, since cleaning of large area floors is a tedious work it helps to reduce the time and labour.This bot is compact in size, henceforth could be transferred to any location. The locomotion of the bot is maintained by rubber wheels for rear and all direction wheels for front. The machine is controlled by a microcontroller which makes the process automatic.*

Keywords- Automatic floor cleaning bot, vacuum cleaner, 8051 microcontroller, scrubber.

I. INTRODUCTION

In recent years, robots have been used for various cleaning purposes. Robots have various cleaning expertise like mopping, picking up the waste, wet floor cleaning, dry vacuum cleaning etc., Depending on the cleaning mechanism, these robots may have some advantages and disadvantages. Automatic floor cleaning bot has been designed for home,office and industry environments. This robot will be using water storage with anti-infection solution which is pumped with water pump motor. This bot cleans the area using a cleaning pad by spraying water on the floor. After cleaning the wet floor, Mop is used for efficient and effective wet floor cleaning purpose.The water cleaned places are dried using a heater coupled with blower.The automatic floor cleaning bot is simple, modern house holding device; even children can also operate it easily with safety.

II.DESIGN AND WORKING METHODOLOGY

A. DESIGN OF PROTOTYPE

All useful solution were examined at the beginning of design phase and then modeled by building with sufficient knowledge and confidence.A complete set of assembly and detailed drawing were prepared with operating procedures. All the components and the systems were fully specified. The cost analysis were conducted for prototype. Then, the prototype were fabricated and tested.

B. COMPONENTS DESCRIPTION

1. MOTOR

MOTOR (DC) An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left-hand rule. A direct current (DC) motor is a fairly simple electric motor that uses electricity and a magnetic field to produce torque, which causes it to turn. At its most simple, it requires two magnets of opposite polarity and an electric coil, which acts as an electromagnet. The repellent and attractive electromagnetic forces of the magnets provide the torque that causes the motor to turn.

2. VACUUM CLEANER

A vacuum cleaner, also known simply as a vacuum, is a device that causes suction in order to remove debris from floors, upholstery, draperies and other surfaces.It is generally electrically driven. The dirt is collected by either a dustbag or a cyclone for later disposal. Vacuum cleaners, which are used in homes as well as in industry, exist in a variety of sizes and models—small battery-powered hand-held devices, wheeled canister models for home use, domestic central vacuum cleaners, huge stationary industrial appliances that can handle several hundred litres of dust before being emptied, and self-propelled vacuum trucks for recovery of large spills or removal of contaminated soil.

3. HEATER AND BLOWER

Heater is equipment or a device which increases the velocity of air or gas when it is passed through equipped impellers. They are mainly used for flow of air/gas required for exhausting, aspirating, cooling, ventilating, conveying etc. Blower is also commonly known as Centrifugal Fans in industry. In a blower, the inlet pressure is low and is higher at the outlet. The kinetic energy of the blades increases the pressure of the air at the outlet. Blowers are mainly used in industries for moderate pressure requirements where the pressure is more than the fan and less than the compressor.

4. SCRUBBER

Scrubbers are type of floor cleaning equipment that are used to scrub a floor clean of light debris, dust, oil, grease or floor marks. These machines have either a rotary(disk) or cylindrical scrubbing head and an automated system for dispensing cleaning solution and then vacuuming it up.

5. TANK

Tank is used to store the anti-infection liquid which is poured in the floor when the bot moves in its necessary or required direction.

6. BATTERY

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact, for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. It is necessary that the overall system be optimized with respect to available energy and local demand pattern.

7. MICROCONTROLLER

The microcontroller 8051 which has member of 89c52 is used in this bot.It is an 8-bit microcontroller. This consists of 40 pin with 4 I/O ports. This has 4kb of ROM and 128 bytes of RAM storage..Crystal oscillator is used to generate frequency.

III.DESIGN CALCULATION

1. MOTOR CALCULATION

Total mass = 30kg

The load is uniformly distributed to 4 wheels = 30/4 =7.5kg

Force = mass × acceleration

F = 7.5×9.81

Force required = 74N

Total force = F+F(friction)

Ft = 74 + (0.3×74)

Ft = 96.2N

Torque = F × r

T = 96.2 × 0.01

T = 0.962N-m

Angular velocity = 5/10 = 0.5 rad/sec

Power = 0.962 × 0.5 = 0.481W

W = (2×3.14×N) / 60

So simplifying,

N=60rpm

2. SCRUBBER MOTOR CALCULATION

Scrubber Weight = 1 Kg

Force = Mass × Acceleration

Force = m × g

Force = 1 × 9.81

Force = 9.81 N

F1 = F + Ff

F1 = 9.81 + (0.3 × 9.81)

F1 = 12.753 N

Radius of scrubbe r = 0.15m

Torque,

T = F × r

T = 12.573 × 0.15

T = 1.887 N-m

T = 2N-m (aprox)

Choosing speed from motor specification using calculated torque, We get

N=150rpm.

IV. DETAILED OPERATION

The main components required for constructing the floor cleaning bot are DC motor, vacuumcleaner, scrubber, tank, heater and blower and electronic control unit. In this the motor is used as power drive ,to drive the vehicle and a seperate motor is used to rotate the scrubber. The vacuum cleaner helps to clean the minute particles of dust by sucking. The water tank has antI-infection liquid that is sprayed on the floor, after this the scrubber cleans the floor.

The bot consists of four wheel, two rubber wheels and two all direction wheels,the rubber wheels are connected to the motor and placed at the rear side which helps in movement of the vehicle and the directions are changed by the rotating motion of the motor, all direction wheels are placed in front to help the motion.

V. CONCLUSION

The prototype was tested on the floor and it cleaned the floor automatically in an effective manner when compared to manual cleaning. The human effort required for cleaning

large areas can be reduced by implementing this automatic floor cleaner. This project was designed and fabricated with an idea of simplifying and automating the process of floor cleaning. It was designed in such a way that it provides flexibility in operation and effortless cleaning at a reasonable budget. The design and fabrication was done in such a way that this machine could be operated by people of various age groups without any hassle. The automation helps the machine to operate without continuous human supervision. This project "AUTOMATIC FLOOR CLEANING BOT" is designed with the hope that it will be very much economical and helpful for industries, workshops and households.

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