Floor Sweeping and Mopping machine Using Ultra-Sonic Sensor

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***Abstract*: Automatic floor cleaner is a system that enables cleaning of the floor by the help of highly stabilized and rapidly functionalized electronic and mechanical control system. Current project work targets to use automatic floor cleaner for large floor in house-hold purposes and office floors. The cleaning purpose is specifically carried out by continuous relative motion between a scrubber and the floor surface. During the cleaning and moving operation of vehicle a propulsion mechanism such as driven wheels and guide wheels for the dry tracking on the floor surface to be cleaned, scrubbing action is done by the scrubber directing water towards rear end. Preferably, a sweeper mechanism operated with such control system for sweeping of a debris-laden floor surface.**

I. INTRODUCTION

In this project, a new robot for floor-cleaning operations in a household environment is proposed. There are a huge number of articles dealing with different problems associated with mobile robots, most of which are applicable to the floor-cleaning problem. Conversely, this project describes the integrated use of different competencies oriented toward the design of a complete floors cleaning mobile robot, the most feasible domestic robotic operation. In the following sections the basic mechanical robot design, discussions about safety, details of motor control and robot control, and some functional tests are presented.

II. LITERATURE SURVEY

Automation is the major focus of current research and every major university has one or more labs that focus on this research. Robots are also found in industrial, military and security settings. Domestic robots are consumer products, including entertainment robots and those that perform certain household task. The problem with floor cleaning devices is that they are used in households for dry and wet cleaning but not as infection remover. So, it is only used in households and not in hospitals or small areas in public. The automatic floor mops like hydro robot are bulky and they also require large power and are used for commercial purpose. Traditionally floor is cleaned by hand using different handmade instruments. Initially it was being washed by different reed brushes. According to Egyptian houses were built of sundried mud bricks at times white-washed and the floors were stamped earth. The floor of the outdoor kitchen too was simply the ground baked stone hard by the sun. Unless it was raining, which happened only rarely, these floors were easy to keep clean by sweeping. Like most ancient Egyptian tools, these brushes did not have long handles which would have rendered their use less irksome, and required bending low when employing them.

For the help of mankind the first floor cleaner was manufactured during 1980s. In those equipment the aim was to wash the floor with less power utilization. There sweeping mechanism of mop is actuated by a timing motor which was controlled by the dc circuit. Here water is sprinkled on the mop and hence the wet mop is used to clean the debris from the floor. But the problem here was it can't use any chemical solvent or disinfectant. Again for soaking purpose only hot air is used. Again for moving the machine a worker has to be engaged. To overcome these conflicts current study was done to enable the cleaner move automatically throughout any kind of room. The moping mechanism is also modified to lessen the cost. In current study the mop is continuously revolving about a axis perpendicular to the motion of the cleaner which also helps in directing water on the floor backward. Instead of using a wet mop a sprinkle mechanism is used to make the floor wet which is scrubbed by the mop. A vacuum cleaner was used to soak dirty water from the floor surface and side by side cleaning the surface. For automatic motion of the cleaner mobile robotics is used. Mobile robots are a major focus of current research and almost every major university has one or more labs that focus on mobile robot research. Mobile robots are also found in industrial, military and security settings. Domestic robots are consumer products, including entertainment robots and those that perform certain household tasks such as vacuuming or gardening. From then on more sophisticated robot is designed for household equipment for automating the tasks including washing machine, micro woven. After that only the revolution of mobile robotics came to household usages.

III. PROPOSED MAJOR COMPONENT DESCRIPTION

Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE(Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino Uno comes pre-programmed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs

from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

GSM 800 Module

GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where the base station antenna is installed on a mast or a building above average rooftop level. Micro cells are cells whose antenna height is under average rooftop level; they are typically used in urban areas.

L293-D Module

The L293D is quadruple drivers. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. When the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

ULTRA-SONIC Sensor

Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor.

IV. Proposed Connection Between Components

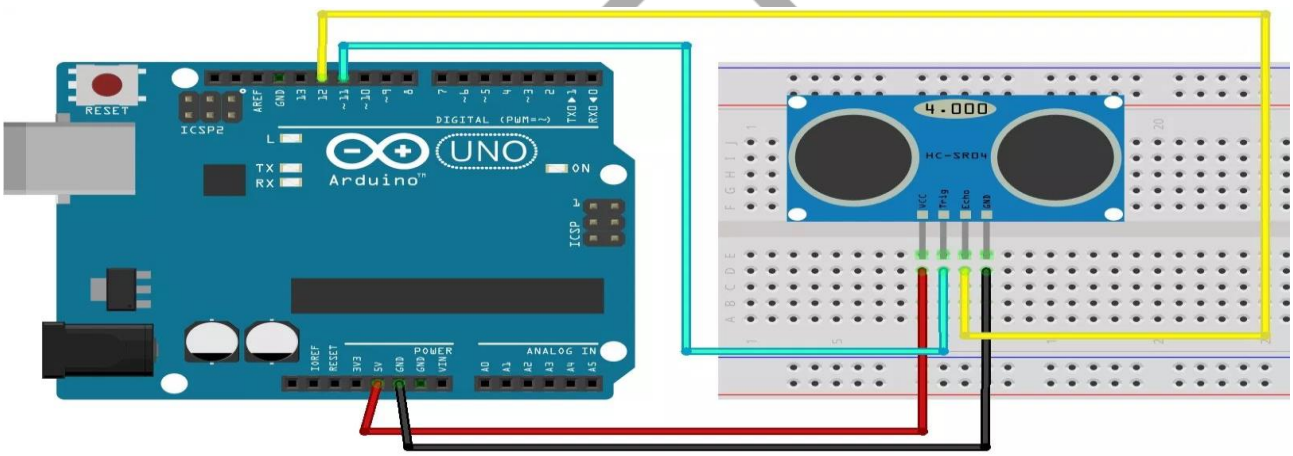

Figure 1 Connecting the wire with HC-SR04 ultrasonic sensor to the Arduino

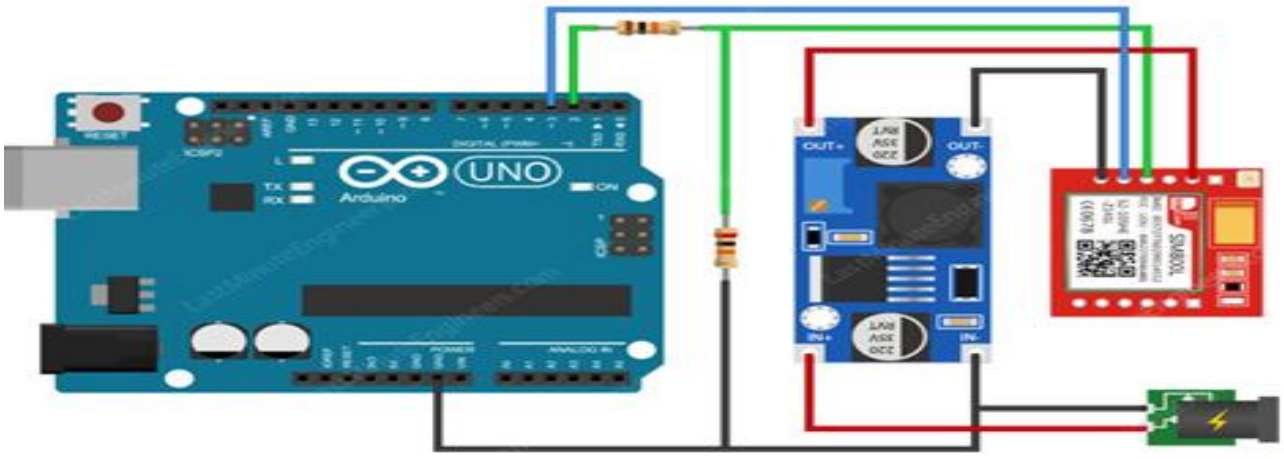

Figure 2 Wiring SIM800L GSM Module with Arduino UNO and buck convertor

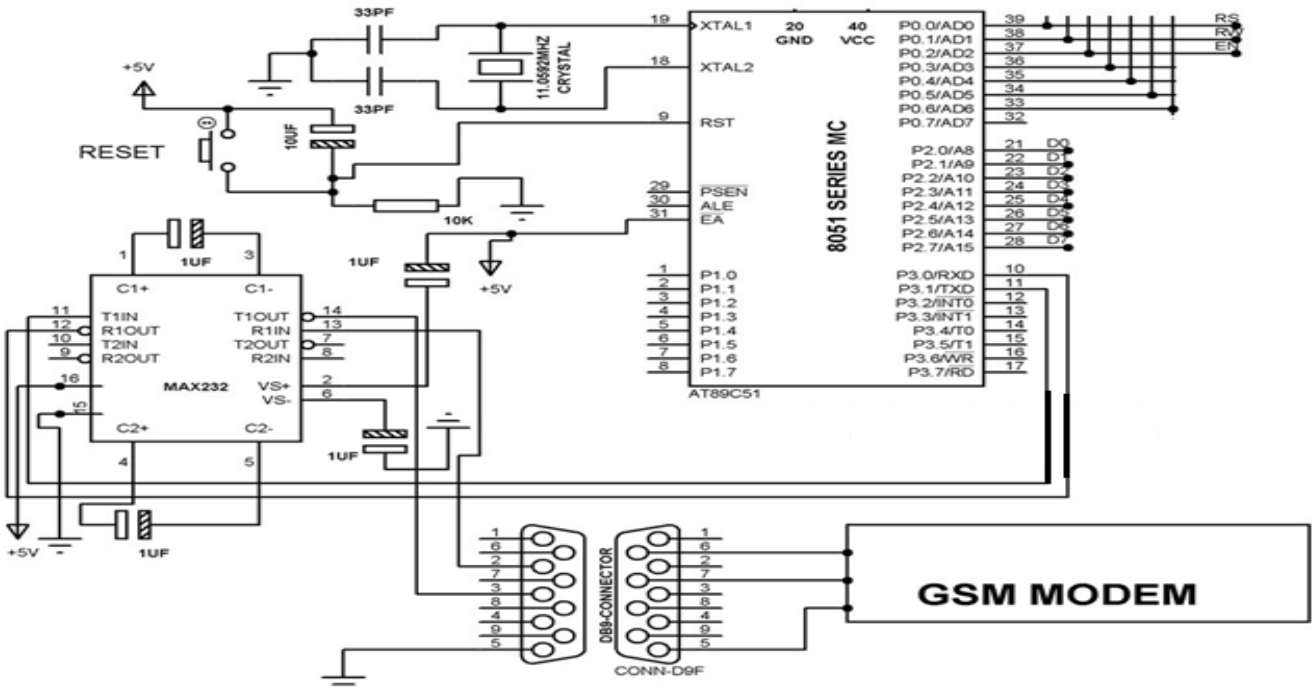

Figure 3. GSM modem connection with MAX 232 and 8051 MC

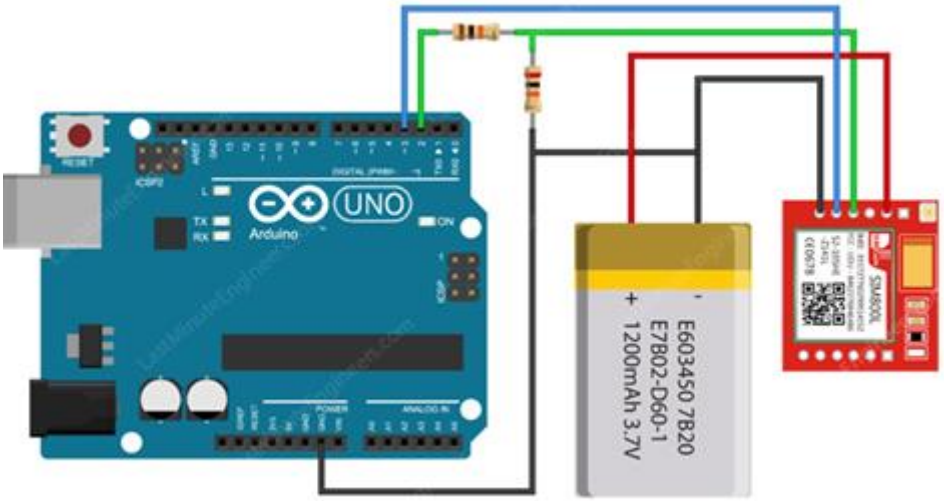

Figure 4 Connection between SIM800L GSM, Arduino and 3.7 V power supply

V. PROPOSED METHODOLOGY

1. First, we have to send the SMS from the mobile phone to the device.
2. SMS is going to be received by GSM module.
3. After that, Microcontroller is going to verify the message which was already dumped.
4. When the message is verified, it will further instruct the ARDUINO.
5. Arduino is going to give the commands to the motor drivers.
6. Ultra-sonic Sensor is going to detect the object and send all the data to Arduino.
7. Depending upon the data received by sensor, the motor drivers will instructs the motors to move in a particular direction.
8. Now, the brush will also start rotating.
9. Due to the clockwise rotation action of the brush, the dust is going to be collected in the bin.

10. On the back side of the device, a water container is added which will be connected through a pipe having multiple holes.

11. The water droplets that is coming out through the holes will be used by the mop to clean the floor.

V. APPLICATIONS

- Workshop Floors
- Factories and their parking area
- Airports
- Hospital highly infected area
- Hotels
- Shopping Complex
- Railway Stations
- Petrol Pumps oil containers
- Nuclear Power plant sensitive area

VI. CONCLUSION

The accepted product developed is fully operational and gives desired motion. It is being tested in a room which results in successful outcome. The scrubber design should be modified in future because the current design has few problems. Few of those are the motor is not detachable and the high rpm leads to vibration of the whole system. If these features will be modified, this will work well. This not only decreases cost but also increases reliability of the instrument. Overall the concept is very much helpful and there is scope of a lot of development in mechanical parts. The optimization will continue till achieving the best one. In the automation part the algorithm are designed to give 90% efficiency which is too high in current scenario. The development can be made in the field of sensing. But this product has the capability to detect as well as move in the direction of dust and thus resulting in better cleaning of floors. As a whole this is a successful product developed that can be used in current Indian house-hold.

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