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Board Cleaning System Operated Via Mobile Phone

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Abstract: *The idea behind the paper is to simplify the manual use of duster which is quite tedious and dangerous to health. This came about as a result of the observation carried out during lectures.*

Its function is to clean the board automatically by giving a single command through android mobile phone. Basically entire assembly is mounted on board which is to be clean. The mechanism of the automated board cleaner entails a horizontal motion. The design is aimed at reducing the stress of manual cleaning. The duster which spans horizontally across the width of the board is to clean the board. Motor is Turns ON by giving a Single command through android mobile phone. The motor transmits energy which turns the shaft which intern drives the pulley. The duster is fixed to the vertical rod which is connected to screw. As the screwed rod rotated with the help of motor, duster connected to it moves. Duster moves horizontally along the plane, thereby cleaning the board.

Keywords: DPDT, ICSP, SMPS, UART

I. LIST OF ABBREVIATION AND SYMBOLS

DPDT : Double pole double throw
ICSP : In circuit serial programming
SMPS : Switched Mode Power Supply
Tx : transmitter
Rx : receiver
PWM : Pulse width modulation

II. INTRODUCTION

When we said teaching and learning process we will focus on teacher and student, who are person that delivering and receiving information and knowledge. Nowadays, there are many method which teachers can use to deliver their knowledge such as computer, note given by lecture or teacher and whiteboard or blackboard as medium to deliver the information to student. Until now many schools and universities still used whiteboard and blackboard as medium to deliver information to student. Thus, many developments or methods of cleaning whiteboard or blackboard were fabricated. Therefore some idea has appeared in my mind to develop the machine of cleaning whiteboard that called “automatic dustless Duster Machine”. This machine will develop to overcome some problems that happen in school or university Problem Associated with Whiteboard The increase in numbers of institutions and schools shows a sign of an increase of students entering their school every year. Sometimes the number of teachers in a school is not enough that will cause teachers to teach four or five times a day. This may lead to fatigue in teachers. They had to write the information that they want to convey to their students over and over again. A fix schedule in one day also can cause a fatigue to the teachers in cleaning all information that they write on the whiteboard. Sometimes, teachers or students they often forgot to clean the whiteboard after the class sessions. When the next class session is start teachers will complain when the board is not cleaned. Another problem is the mysterious loss of duster. This problem always happens to the primary school and secondary school. This will cause problem to clean a whiteboard. Lastly, the problem is the effect of permanent marker on human health. Permanent marker will affect someone whose has allergic reaction, possible ink poisoning and side effects from inhaling ink fumes. This is because the permanent ink is made from organic solvent. This paper focuses on the design and construction of attaching and detaching the dusters. The system automated whiteboard with the mechanism of consists of many small parts and mechanisms which are used efficiently for the working of the board.

III. LITURATURE SURVEY



I personally conduct a survey in college at 4:30pm and also taken the photographs of the board at the classroom and staff cabin and I found that almost all the boards in an classroom, office, staff cabin were not cleaned. I also observed the boards used at hostel mess, boards used at societies and the boards used by children. In most of the hostel mess, restaurants use white board to display the menu list. This boards needs to be cleaned on daily basis. It was observed that in most of the cases the cooks themselves clean board with their hands(without using cloth or duster) and use the same hands for cooking(without washing). This is the serious hygiene issue in Hostel mess. From the above survey it can be concluded that an effort needs to be taken to solve the above problem using technical knowledge hence our research is aims to develop automatic dustless duster using available technologies.

IV. BLOCK DIAGRAM

A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks. Design of this research is such that when command is given through android mobile phone, motor starts rotating. These motors are used to rotate the screwed rod which placed at top and bottom of the board. The duster is fixed to the bolts in horizontal screwed rod. When screwed rod rotated with the help of motor, bolt moves , and hence the duster.

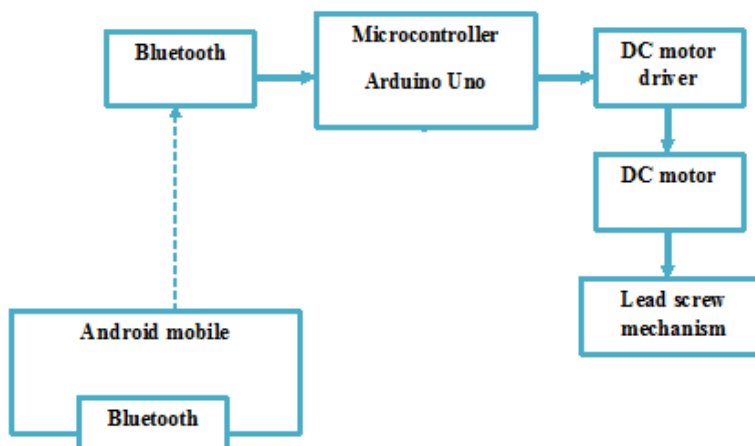


Fig.1: Block diagram of automatic dustless duster system

V. PROPOSED WORK

This system is intended to perform the task of cleaning the board is strived by following ways:

A. Software Part

- 1) Arduino programming

B. Hardware Part

- 1) *Vertical Structure*: For holding Duster in vertical direction
- 2) *Horizontal Structure*: For holding Screwed rod with its driving equipment like motor

C. Interfacing

- 1) Interfacing of hardware model and microcon-troller.

VI. COMPONENTS

A. AC-to-DC power



Fig.2: 12v dc power supply

Some DC power supplies use AC mains electricity as an energy source. Such power supplies will sometimes employ a transformer to convert the input voltage to a higher or lower AC voltage. A rectifier is used to convert the transformer output voltage to a varying DC voltage, which in turn is passed through an electronic filter to convert it to an regulated DC voltage. Motor driver requires 12v dc supply. while 5vdc is needed to Arduino board. This 12 is supplies from 12v SMPS and 5v is supplied by separate 5v adapter.

B. Bluetooth module

The voltage can be applied to these modules is from a minimum of 3.1V DC to a maximum of 4.2V DC for HC-05/HC-06 bluetooth module and a maximum of 3.6VDC for HC-09.

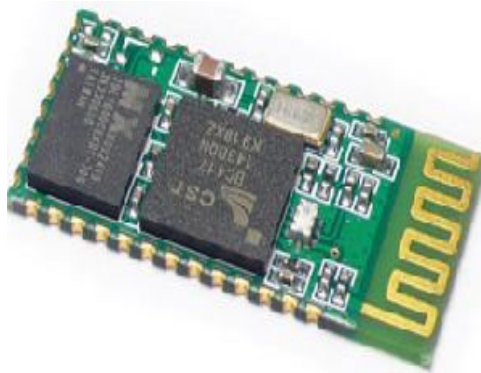


Fig.3: Bluetooth module

1) Pin outs of HC-06

- a) Pin 1: (UART TX - weak internal pull-up) UART data output
- b) Pin 2: (UART RX - weak internal pull-down) UART data input
- c) Pin 11: (RESETB) - connect to ground to reset, pullup-resistor of 10K recommended
- d) Pin 12: (VCC) Working range 3V1 to 4V2
- e) Pin 13: (VSS) Ground
- f) Pin 21: (VSS) Ground
- g) Pin 22: (VSS) Ground
- h) Pin 24: (PI01) ON when paired/connected, PULSING when not paired/connected
- i) Pin 26: (KEY - MASTER only): LOW for normal operation; HIGH erase pairing/connection information; after erasure, searches for new device to pair with/connect to randomly.

C. Arduino UNO

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (among these 14 pins, 6 pins can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

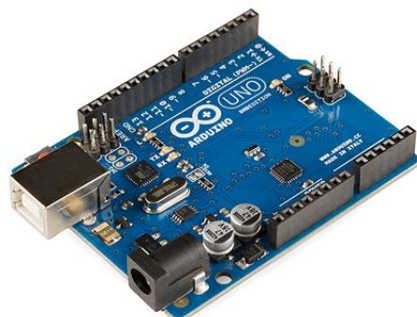


Fig.4: Arduino UNO

“Uno” means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.

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.

1) *Features*

- a) Input voltage (limits) 6-20v
- b) Digital i/o pins 14 (of which 6 provide pwm output)
- c) Analog input pins 6
- d) Dc current per i/o pin 40 ma
- e) Dc current for 3.3v pin 50 ma
- f) Flash memory 32 kb (atmega328) of which 0.5 kb used by bootloader
- g) SRAM 2 kb (atmega328)
- h) EPROM 1 kb (atmega328)
- i) Clock speed 16 mhz

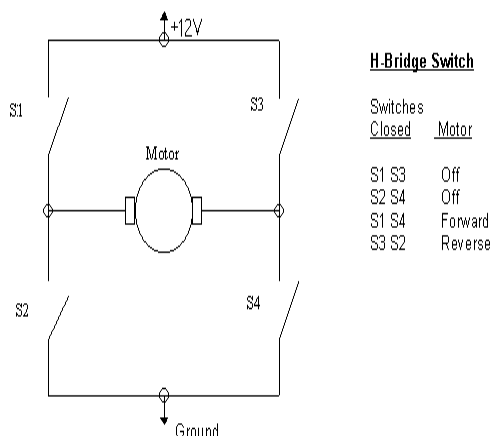
D. *DC Motor and driver circuit*

DC motor is a simple, robust electromechanical device which converts an electrical input into a physical, rotary output. The motor used at the output side is a 1000 R.P.M,12 Volt geared D.C. Motor. 2 DC motors are used to drive the screwed rod in clockwise or anticlockwise directions. To drive a dc motor, we need a dc motor driver. At a time two DC motors are driven by using this L298N DC motor driver. But, in our system we have to change the direction of rotation of screwed rod which is done by the changing the direction of the DC motors and at that time back EMF is generated. To protect the dc motor from a back EMF generated while changing the direction of rotation DC motor driver is used, it has an internal protection suit.

E. *Motor driver (L298N Module)*

An H-Bridge is a circuit that can drive a current in either polarity and be controlled by Pulse Width Modulation (PWM).

The name “H-Bridge” is derived from the actual shape of the switching circuit which control the motion of the motor. It is also known as “Full Bridge”. Basically there are four switching elements in the H-Bridge as shown in the figure below.



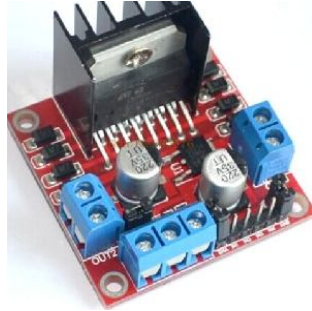


Fig.5: DC motor driver L298N

Pulse Width Modulation is a means in controlling the duration of an electronic pulse. Motors are rated at certain voltages and can be damaged if the voltage is applied to heavily or if it is dropped quickly to slow the motor down. PWM Allows constant flow. Motors will last much longer and be more reliable if controlled through PWM.

1) *Module Pin-outs*

- a) Pin 1: Motor A lead out
- b) Pin 2: Motor A lead out
- c) Pin 3: Motor B lead out
- d) Pin 4: Motor B lead out
- e) GND: Ground
- f) EnA: Enables PWM signal for Motor A
- g) In1: Enable Motor A
- h) In2: Enable Motor A
- i) In3: Enable Motor B
- j) In4: Enable Motor B
- k) EnB: Enables PWM signal for Motor B

F. *Screwed rod*



Fig.8: Screwed rod

A lead screw also known as a power screw or translation screw, is a screw used as a linkage in a machine, to translate turning motion into linear motion. Two rods are used to move duster in forward and reverse direction. One rod is placed at the bottom of the board and another rod is placed on the top of the board. Nut is inserted in screwed rod. Instead of using single nut in screwed rod two joint nuts are used to increase strength of nut.

G. *Duster*

Aluminium squared rod wrapped by sponge used as a duster. Length of Duster is chosen such a that the duster length is same as the width of board.

VII. CONNECTION DIAGRAM AND SEQUENCE OF OPERATION

A. Connection diagram

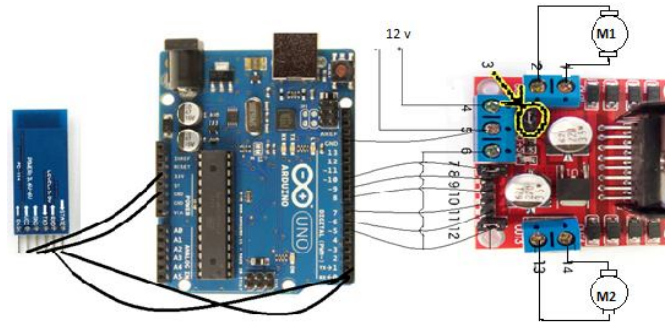
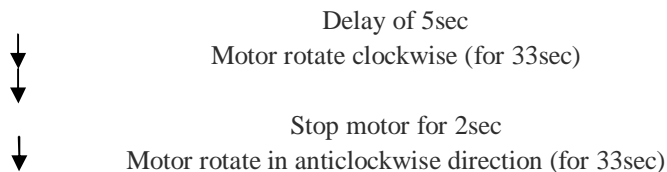


Fig.9: Connection diagram

The 12 Volt supply is connected to pin 4 and to pin5 of L298N module respectively. (positive terminal is connected to pin 4 and negative/GND is connected to pin 5.) Connect Arduino GND (pin 14) to pin 5 on the module as well to complete the circuit. Then connect the Arduino digital output pins to the driver module. (i.e digital pins D9, D8, D7 and D6 is connected to pins IN1, IN2, IN3 and IN4 respectively. Then connect D10 to module pin 7 and D5 to module pin 12 .

B. Sequence of operation

- 1) Step 1: Install BlueArd app in android mobile
- 2) Step 2: Upload program in microcontroller 328p on arduino board Via rs232 communication cable
- 3) Step 3: Make connections as shown in connection diagram
- 4) Step 4: Turn on Bluetooth in android mobile
- 5) Step 5: Pair mobile and Bluetooth module (HC-06) via Bluetooth arduino app
- 6) Step 6: Click on "GO"



- 7) Step 7: Stop the operation

VIII. SOFTWARE PROGRAMING

```
// connect motor controller pins to Arduino digital pins
// motor one
int enA = 10;
int in1 = 9;
int in2 = 8;
// motor two
int enB = 5;
int in3 = 7;
int in4 = 6;
void setup()
{
// set all the motor control pins to outputs
pinMode(enA, OUTPUT);
pinMode(enB, OUTPUT);
pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
```

```
pinMode(in3, OUTPUT);
pinMode(in4, OUTPUT);
}
void demoOne()
{
    delay(1000);
    // turn on motor A
    digitalWrite(in1, HIGH);
    digitalWrite(in2, LOW);
    delay(33000);
    // turn on motor B
    digitalWrite(in3, HIGH);
    digitalWrite(in4, LOW);
    delay(33000);
    // now turn off motors
    digitalWrite(in1, LOW);
    digitalWrite(in2, LOW);
    digitalWrite(in3, LOW);
    digitalWrite(in4, LOW);
    delay(2000);
// now change motor directions
    digitalWrite(in1, LOW);
    digitalWrite(in2, HIGH);
    digitalWrite(in3, LOW);
    digitalWrite(in4, HIGH);
    delay(33000);
    // now turn off motors
    digitalWrite(in1, LOW);
    digitalWrite(in2, LOW);
    digitalWrite(in3, LOW);
    digitalWrite(in4, LOW);
}
void loop()
{
    demoOne();
    exit(0);
}
```

IX. ADVANTAGES AND DISADVANTAGES

A. *personal safety*

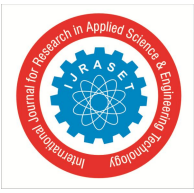
By using automatic dustless duster can reduced the contact with hazardous ink fumes in marker pen and thereby reduced the adverse effect on human health.

B. *Time saving*

Lecturer can deliver extra knowledge in the time which will require for cleaning the boards. Ultimately it saves lecture hours.

C. *Less Cost*

The mysterious loss of duster causes economical loss to institute.



D. Easy to Use

This Machine can erase the board with a single key pressed.

X. CONCLUSION

This paper provide the solution to this problems; and we have tried to achieve it by design and construction of automatic dustless duster system. Its function is to clean the board automatically by giving a single command through android mobile phone. The main disadvantage of manually cleaning the boards and it's health hazards are overcome in this research work.

XI. FUTURE SCOPE

Automatic cleaning boards with water sprinkler can be designed by adding relay and Water Pump. Relay is going to be used for controlling Water Pump. Due to the use of water, dust is not spread in the air.

XII. ACKNOWLEDGMENT

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