

Design and Implementation of a Computer Controlled Bulldozer (CCB)

Subrata Karmoker, Kazi Shamsul Arefin and A. S. Zaforullah Momtaz

Abstract—Computer Control Bulldozer (CCB) has become admired in all over the world. The indispensable component of CCB is a programmable microcontroller based unit which is capable of driving basically stepper motors. This paper explains the method of interfacing the CCR with the programmed microcontroller which is used to control the robotic operations. As a sample robotic arm which can grab an object, rotated in all angles and release objects in desired place. Therefore, utilization of CCB is very famous in all over the world. Economically advanced country are utilizing for different purposes. In this paper a broad discussion of a CCB has been enclosed according to the perspective of Bangladesh. We also discussed various uses for hazard environment. Moreover, how it faces the challenges for our revolution.

Index Terms—Computer Control Bulldozer (CCB), Port 95nt, Parallel Port.

1 INTRODUCTION

THE first design was for experimental use on a human-size industrial robot arm called PUMA 560 used to explore issues in versatile object handling and compliance control in grasp actions (Bejczy & Jau, 1986). We see that some areas of a factor are very dangerous for workers and employees cause of huge sound or very high temperature. If we control a bulldozer for working purposes of these risky areas of a factory by controlling it from a safe control room then we can keep safe employees. Therefore, a country can play a great role in developing. Besides, the proposed CCB can control the quality of products during production precisely than human being. Hence more economical progress can be achieved in industrial production which certainly leads to be advanced country. Furthermore, the CCB can be made in low cost for broad uses using technology. Therefore, it will save the uses of foreign currencies and develop our thoughts for progress without depending foreign ready-made technologies. We can utilize CCB in the various sectors where it may difficult or risk serving for human like sensitive chemicals, explosives, gas cylinder recycling Company. The present economical condition of Bangladesh can be developed producing CCB in low cost that will lead to revolution.

2 PARALLEL PORT

A PC parallel port is an inexpensive and yet powerful platform for implementing projects dealing with the control of real world peripherals. The parallel port provides eight TTL outputs, five inputs and four bidirectional leads and it provides a very simple means to use the PC interrupt structure [13].

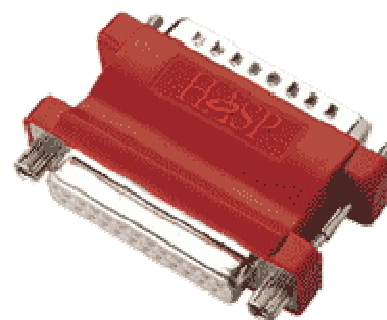


Fig. 1. Parallel Port Device

The Data, Control and Status lines are connected to their corresponding registers inside the computer. So by manipulating these registers in program, one can easily read or write to parallel port with programming languages like 'C' and Visual Basic [15]. The standard parallel ports are:

- Data register
- Status register
- Control register

A larger manual which deals with such topics as driver circuits, opt-isolators, control of DC and stepping motors, infrared and radio remote control, digital and analog multiplexing, D/A and A/D is available [16].

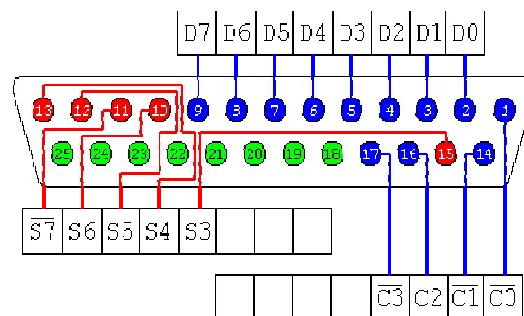


Fig. 2. Register with Port Sequence

The original IBM-PC's Parallel Port had a total of 12 digital outputs and 5 digital inputs accessed via 3 consecutive 8-bit ports in the processor's I/O space [14].

TABLE 1
PARALLEL PORT CONFIGURATION

Pin	Direction	Register-bit	Inverted
1	Out	Control-0	Yes
2	In/Out	Data-0	No
3	In/Out	Data-1	No
4	In/Out	Data-2	No
5	In/Out	Data-3	No
6	In/Out	Data-4	No
7	In/Out	Data-5	No
8	In/Out	Data-6	No
9	In/Out	Data-7	No
10	In	Status-6	No
11	In	Status-7	Yes
12	In	Status-5	No
13	In	Status-4	No
14	Out	Control-1	Yes
15	In	Status-3	No
16	Out	Control-2	No
17	Out	Control-3	Yes
18-25	-	Ground	-

- 8 output pins accessed via the DATA Port
- 5 input pins (one inverted) accessed via the STATUS Port
- 4 output pins (three inverted) accessed via the CONTROL Port
- The remaining 8 pins are grounded

3 DESCRIPTION OF OUR PROPOSED MODEL

CBB is a computer controlled machine. In this section, we discussed the electrical and mechanical structure of this model.

3.1 Electrical Structure

In figure 1, L283d, pin number 2, 3, 4, 7 are used to receive as input. These input pins are driven by computer Parallel Port and to drive motors.

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Date of Submission: 10 July 2011

L293d works as an amplifier. We used 12 volt in biasing voltage. Therefore when it conducts then we get output as 12 volt.

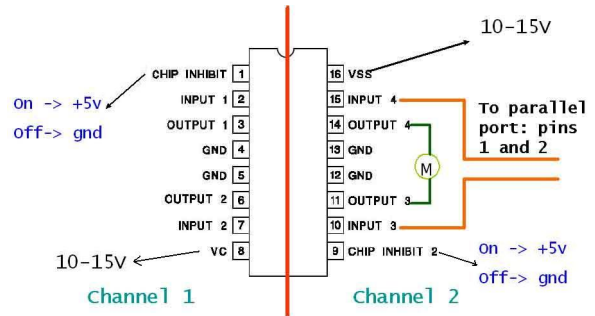


Fig. 3. Diagram of the L293d IC.

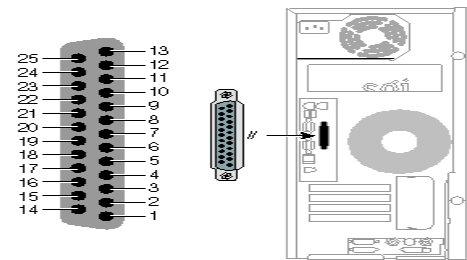


Fig. 4. Parallel Port with Pin number

We provide 5 volt inputs in Data Port (pin number 2, 7, 10 & 16) and get output from Status Port (pin number 3, 6, 11 & 14). These outputs drive the DC motors.

3.2 Mechanical Structure

We used 2 motors as car wheels. All motor are connected with 2 wheels. When a motor activated then wheels start keep moving at its direction. The position of a wheel is in the back side of the car and the position of another wheel is in the front side of the car. Both wheels are connected by a metallic straw with gear. Other 2 wheels are connected by the same system and 3rd DC motor is used to control the Crain. When motor rotate clock wise then the Crain moves up-ward and when the motor rotate anti-clock wise then the Crain moves down-ward.

3.3 Sample Code

```
while(1)
{
    ch = getch();
    word = word & 48;
    // move forward
    if( ch == '8' ) {
        flag = 0;
        word = word | 5;
        outputb(0x378, word);
    }
}
```

```

// turn left
else if( ch == '6' ) {
if( !flag ) {
word = word | 1;
}
else {
word = word | 2;
}
outportb(0x378, word);
}
// turn right
else if( ch == '4' ) {
if( !flag ) {
word = word | 4;
}
else {
word = word | 8;
}
outportb(0x378, word);
}
// move backward
else if( ch == '2' ) {
flag = 1;
word = word | 10;
outportb(0x378, word);
}
// up
else if( ch == '7' ) {
word = word | 16;
outportb(0x378, word);
delay(wait);
word = word & 15;
outportb(0x378, word);
}
// down
else if( ch == '9' ) {
word = word | 32;
outportb(0x378, word);
delay(wait);
word = word & 15;
outportb(0x378, word);
}
// start or reset the system
else if( ch == '5' ) {
word = 0;
outportb(0x378, word);
}
// take clockwise turn
else if( ch == '1' ) {
word = word | 9;
outportb(0x378, word);
}
// take counter-clockwise turn
else if( ch == '3' ) {
word = word | 6;
outportb(0x378, word);
}
// terminate the program

```

```

else if( ch == 't' || ch == 'T' ) {
word = 0;
outportb(0x378, word);
exit(0);
}
}

```

4 CONTROL SYSTEMS

Computer keyboard is used to control our CCB. In this section we described control system for unique key press through computer keyboard.

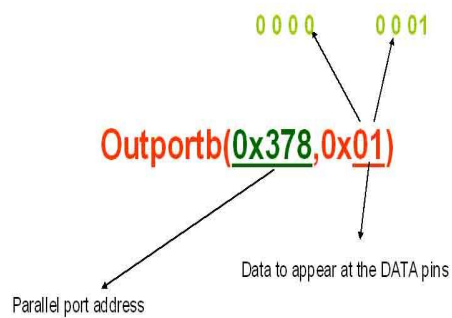


Fig. 4. Address of the Parallel Port.

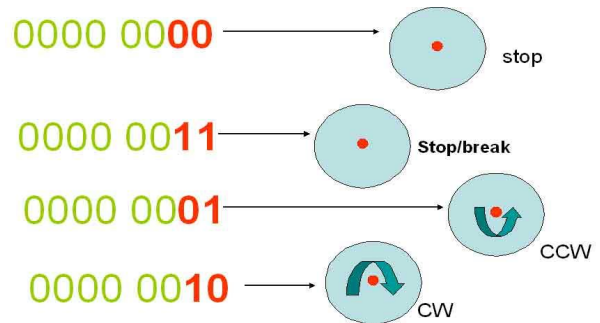


Fig. 5 Diagram of the Circles

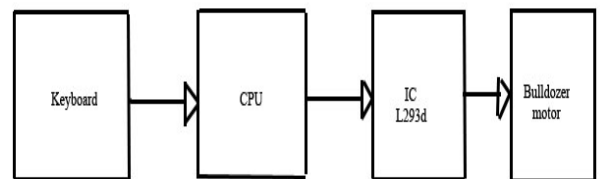


Fig. 6. Block Diagram of the System

- When we press "8" then 2 DC motors will rotate clock wise.
- As a result the bulldozer will move forward.
- If we press "2" then 2 DC motors will rotate anti-clock wise. As a result the bulldozer will move

- to backward.
- d. When we press "4" then the bulldozer will move to left side. Then right motor will rotate but then the left motor will remain switch off.
- e. If we press "4" and after that we press "8" then the bulldozer will move to backward left.
- f. If we press "4" and after that we press "2" then the bulldozer will move to the forward left.
- g. If we press button "6" then we can get result for right turn.
- h. If we press "3" then the crain move to upward.
- i. If we press "1" then the crain move to downward.
- j. When we press "9" the bulldozer can horizontally move round clock wise on its own axis.
- k. When we press "7" the bulldozer can move to horizontally round anti-clock wise on its own axis



Fig. 7. Picture of our proposed bulldozer.

TABLE 2
CONTROL SYSTEM THROUGH KEYBOARD

Pressing number of keyboard	Result
8	Move to forward
2	Move to backward
4	Move to left side
6	Move to right side
4 then 8	Move to backward-left
4 then 2	Move to forward-left
3	Crain move to upward
1	Crain move to downward
9	Bulldozer horizontally move clock wise
7	Bulldozer horizontally move anti clock wise

5 ADVANTAGES OF OUR PROPOSED MACHINE

- a. Cheap and Easily Affordable
- b. Low Energy Consumption
- c. Improved Worker Safety
- d. Increase Productivity
- e. Increase Quality of Product
- f. Increase Manufacturing Flexibility
- g. Reduce Manufacturing Costs
- h. Reduce Scrap
- i. Compete Better By Reducing Undesirable Tasks
- j. Decrease Floor Space
- k. Cluster Machining in One Cell
- l. Automatic Changeover for Different Products
- m. Re-Program Equipment for Different Process
- n. Stabilizes Production
- o. The device is attached with rechargeable battery. So it can run without electricity

6 LIMITATION AND FUTURE WORKS

To quest for the practical implementations of our proposed machine we made a toy sized bulldozer and worked with it in laboratory room where it shows the performance effectively.

We shall develop a CCB in real size where it will work in field.

7 CONCLUSION

The CCB can increase safety, reliability, production amount, profit, quality and quantity of products in a lot of cases. They can do jobs in dangerous situations and save lives of thousands of people. They do not care about the comfort of their environment. Human needs such as hunger or depression have no meanings for them. Besides, they do not get tired. Moreover, accuracy is so high and is in the range of millimeters or even micrometers. Our proposed CCB is a locally designed and developed which is competitive with the imported products. The similar mechanical tools are not available in Bangladeshi market. Therefore, it can be produce in less cost in mass scale in our country. This innovative

and effective idea can change the nation.

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