Research project on low cost automatic PCB drilling (LCAPD)

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Abstract

One of the most prevalent trends in today's society is the widespread of use consumer electronic devices. In fact, consumer electronics dominate almost any sector of the world's population. Consumer electronics have made life for the modern man more efficient, convenient and comfortable. In the market Electronic Devices cost is very high which is difficult for a common man to afford. The cost of the device depends upon developing charges. Many Electronics Developer use high cost Drilling CNC machine for creating PCB(Printed Circuit Board). In order to sustain in this competitive world, there is a need for innovative technology that can reduce the cost of final product. So the research focuses on the efficiency of PCB Drilling Machine and how it can overcome previous problem. The cost of the device is very less and by using LCAPD you can develop your own Printed Circuits board. PCB are used for particular Devices i.e Washing Machine, TV, Mobile etc. There are various advantages of using ie. Reduction of manpower, improved quality and is very useful for small scale electronics developers.

The research paper throws light on working of LCAPD system with the Circuits Diagram and Drilling points. This helps the system to read and coordinate and drill the point's at location and is ready for attaching any Electronics Component like Resistor, capacitor etc. Electronic knowledge is required for Developing PCB using LCAPD. It helps to overcome PCB making procedure like Cutting, Drilling, and Masking etc.

Keywords: CNC- Computer Numeric Controlled, PCB-printed Circuit board, capacitor , Resistor ,Cutting, Drilling, Masking.

Introduction

Controlling a machine tool by means of prepared program, which consists of blocks, or series of commands/numbers, is known as numerical control. Numerical Control [NC] for machine tools was introduced in 1950 by Prof. John T Parsons. The first CNC machine was built at the Massachusetts institute of technology [MIT] in 1953 by joint efforts of US Air force, MIT and the Parsons Corporation

The CNC machine basically entails three main regions:-
1] The control system,
2] The drives (driving elements)
3] The machine tool

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The LCAPD System is for making PCB In electronics Printed Circuit Board are used to mechanically support and electrically connect electronic components. PCB are inexpensive and can be highly reliable They require much more layout effort and higher initial cost than either wire wrapped or point to point constructed circuits But are much cheaper faster and high quality production.

II. LCAPD SYSTEM

LCAPD-(Low Cost Automatic PCB Drilling) system is a communication or handshaking between Hardware for LCAPD device and Software. These system are useful for small scale developers, In System You can provide Circuits Diagram and point you can select where drilling done. after drilling your PCB ready for placing Components like Transistors, Registers, Capacitors, Microprocessors IC's etc.

1] Procedure for Making PCB using LCAPD System

- First input the appropriate circuit diagram

- User can select x, y coordinate where drill the point

- Provides this x , y coordinate to the decoding controller trough USB to serial Converter

- X & Y ref. sensor can read coordinate and passes to controller

- Last step, with the ref. of x & y coordinate drill machine drills on copper plate at x & y coordinate.

- Same for milling.
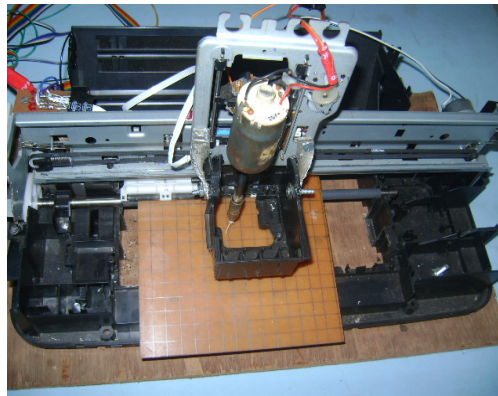
III. LCAPD Device

Fig. 1.1

LCAPD Fig 1.1 shows copper plate with Drilling Material. All the LCAPD Device made up of from wastage material i.e printer, stepper motor, 0.1 mm Drilling bit, 5 v motor, CD writer board from laptop. So LCAPD system total cost is 5000 Rs.

IV. Methodology

- *STEP-1 :- start*

  o Start the LCAPD system as well as start the LCAPD device

- *STEP-2 :- Importing the circuits diagram*
  o In LCAPD software you can import circuits diagram

- *STEP-3 :- select point where you can drill*
  o You can select coordinate where you can drill using mouse pointer

- *STEP-4 :- Start the lcapd device*
  o After selecting coordinating, start the LCAPD device and connect modem
    - *STEP-4(i) :-* if modem is not connected after 10 sec. then
      o Goto STEP-1
    - *STEP-4(iI) :-* if modem is connected before 10 sec. then

Goto STEP-5
- *STEP-5 :- lcapd system running*
  o After Running LCAPD start the actual communication between LCAPD software and hardware.
    - *STEP-5(i) :-*

Software:-"67" ASCII value send to device

Hardware:-receive ASCII value and send "O" to

LCAPD software.

    - *STEP-5(iI) :-*

Software:-Receive "O" value then send first

With syntax **xvalue, yvalue#** Coordinate for drilling

Hardware:-receive coordinate value, these value send

To printer drilling tools. Drill the point On copper plate, send "DONE" message to LCAPD software.

    - *STEP-5(iII) :-*

Software:-Receive "DONE" message then send

[Type text]

Next coordinate

Same as *STEP-5(iI)*

- *STEP-6 :- Stop the lcapd system*
  ### V. Hardware Component Use In LCAPD

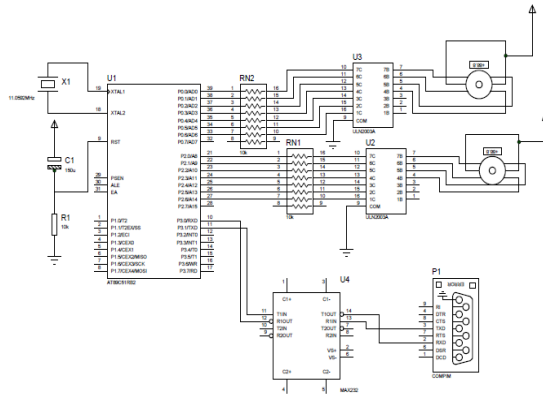 ### A. Circuits Diagram
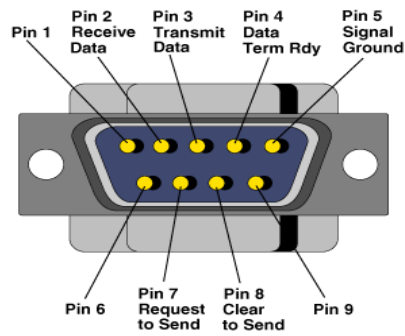

Fig.1.2

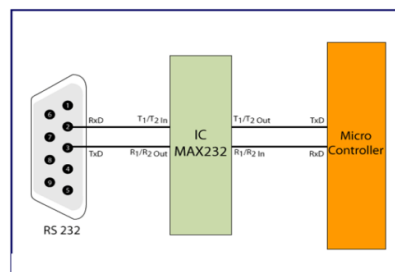### B. COM PORT

Fig. 1.3

C. MAX232

Fig. 1.3

Features

[Type text]

1] In line with all the technical standard   RS-232COnly requires a single 5V power supply

2] Chip charge pump with a boost, voltage, polarity reversal ability to generate 10V and-10V voltage V

3] Low power consumption, the typical supply current of 5mA The internal integration of two RS-232C driver

4] The internal integration of the two RS-232C receivers

MAX232 Applications

1] Portable Computers

2] Low-Power Modems Interface

3] Translation Battery-Powered RS-232 Systems Multidrop RS-232 Networks

D. Stepper Motor

Common special or custom features of **Stepper motors** include shaft modifications, connectors, wire length, conduit boxes or terminal boxes, molded cables, and shielded cables

Two Type Of Stepper Motor

1] Bipolar

a bipolar **stepping motor** has 4 wires coming out of it. Each pair of wires is connected to the ends of two coils. The wires must be toggled between ground and voltage, which is usually accomplished via a set of transistors.

2]Unipolar

Unipolar **stepper motor** has 5 or 6 wires. The extra wires are referred to as "common." They are located in the middle of the two coils and consistently **supply** voltage to the coils. The 4 wires that are located at the ends of the coils now switch between unconnected and ground.
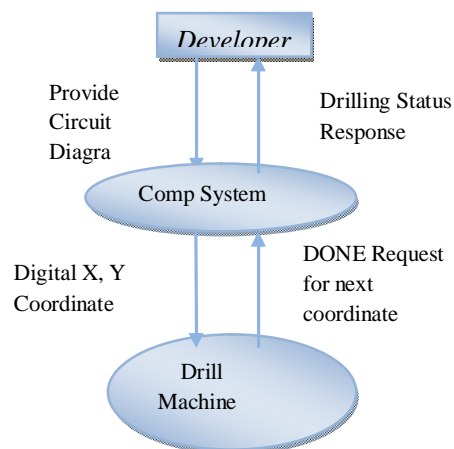

Fig 1.4

E. Drill Bit

FEATURES

1. Power: 12V

2. Mini Press PCB Drilling with 0.8mm Drill

3. This is a high quality PCB drill bit of diameter 1 mm.

4. Use it to drill holes in PCBs for voltage regulators, power transistors, MOSFETs, etc

5. This drill bit perfectly fits into our PCB Drill

Fig. 1.5

VII. System OVERVIEW

Developer

Provide Circuit Diagra

Drilling Status Response

Comp System

Digital X, Y Coordinate

DONE Request for next coordinate

Drill Machine

VIII. Advantage

- *Man Power Decreases*

In LCAPD System, only single PCB developers need for making System, but Traditional PCB System use two or three persons for making PCB.

- *Saving Time*

Traditional PCB System gives 3-4 Days for making PCB, but LCAPD System gives 1-2 Hours for making PCB.

- *Cost effective PCB making*

LCAPD Total Market Cost is Rs.1200/- and Traditional PCB making system is 20,000/-.

- *Very useful for small scale of electronics developers*

LCAPD Total Market Cost is Rs.1200/- and advantage is that it is useful for Small Scale PCB Developers.

o *Quality maintain*

LCAPD System require only drilling point , result is that Accurate PCB create and you can place component where drill is completed and you can make your own PCB.

IX. Future Enhancement

1.3-D Drilling or CNC machine

    a. In Future Enhancement, I will develop 3-D Drilling Machine

    b. 3-D containing X, Y, Z axis

2.PCB size increases

    c. In Future Enhancement, I will Increase the PCB size, In LCAPD system PCB size is 10x10 cm.

3. 3-D Drilling Machine

X. Test Case

Test No	Diagram Name	Drilling Points	% Done	PCB Drilling Completed/NOT
1	Capacitors	10,20	100%	Completed
2	ledpcb	20,40	100%	Completed
3	Transistors	10,50	100%	Completed

Capacitors-PCB after Drilling Completed
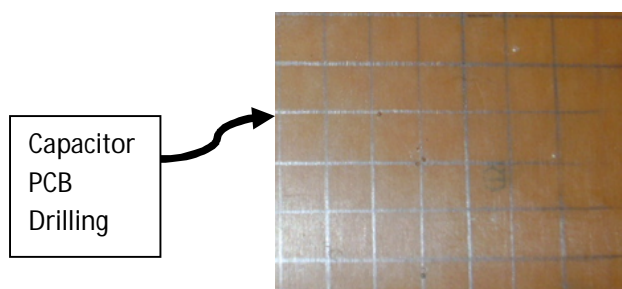

Capacitor PCB Drilling

Fig. 1.6

X.Result
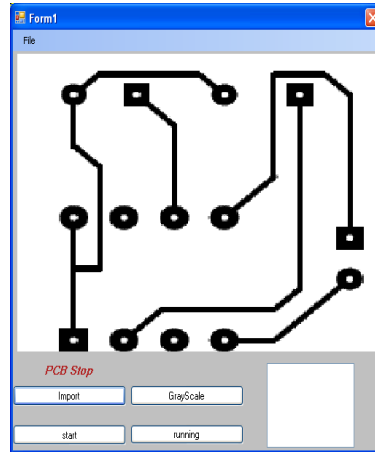
1] import image

Fig. 1.7
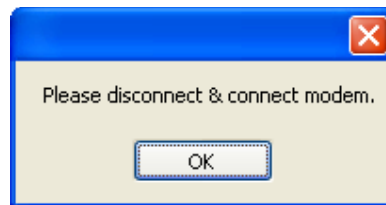
2] Connect the modem

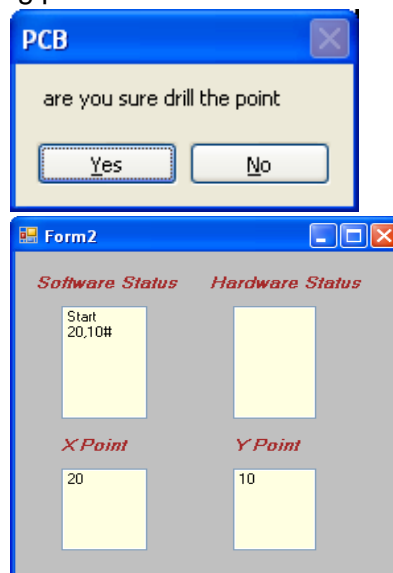Fig. 1.8

3] select drilling point

Fig. 1.9

4] Receives drilling points in cm
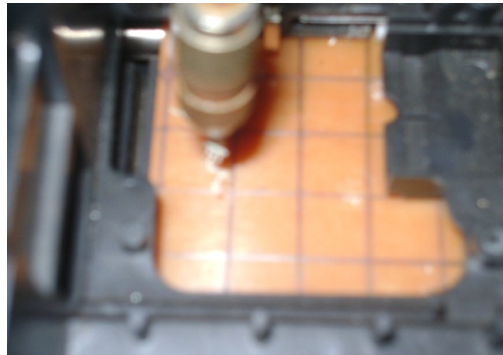

Fig. 1.10

5] Drill the point

Fig. 1.11

XI.Conclusion

LCAPD **useful** for small scale home developer for making PCB in many electronics devices. Because LCAPD system is very low Coast and Easy to use**.**

XI.   References

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