REVIEW ARTICLE

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3D PRINTER USING GLUE GUN

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ABSTRACT

3D printing or additive manufacturing (AM) is any of various processes of making a three-dimensional object from a 3D model or other electronic data source primarily through additive processes in which successive layers of material are laid down under computer control. We are using the basic idea of 3D printing. We are inputting the X, Y and Z co-ordinates of the object through Visual Basic by interfacing computer and microcontroller serially.We are using glue gun as an extruder for printing and glue stick material for forming an object which is of silicon. In industry X-Y plane is constant (i.e. arms for X-Y plane are not moving) and Z axis caused for forming an object in 3 dimensional by putting layers on layers. But in proposed system Z axis is constant and X-Y plane is moving.

Keywords— additive manufacturing; Visual Basic ; Glue gun

INTRODUCTION

We use 2D (2 dimensional) printers for taking a print of an image. Output of 2D printer is an image which does not have any volume. Thus 2D printing technology has this limitation. Instead of 2D printers if we use 3D (3 dimensional) printer, we can get a furnished product as an output.3D printing or additive manufacturing is any of various processes of making a three-dimensional object, through additive processes in which successive layers of material are laid down under computer control. Materials other than ink are dispensed from printer type nozzles onto moving platform and layers of patterns resulting in 3D objects are created. The amount of material, the rotation of the platform and the design of the object is controlled via graphic design software.
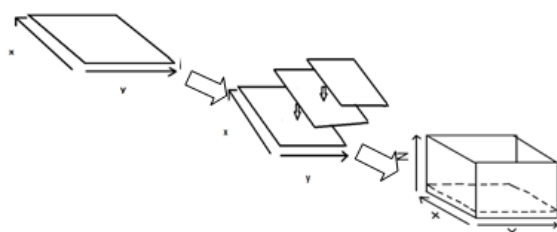

Fig.1.

II. Basic Idea

In the 3D world, a 3D printer also needs to have instructions for what to print. It needs a file as well. The file, a Computer Aided Design (CAD) file is created with the use of a 3D modeling program, either from scratch or beginning with a 3D model

created by a 3D scanner. Either way, the program creates a file that is sent to the 3D printer. Along the way, software slices the design into hundreds, or more likely thousands, of horizontal layers. These layers will be printed one atop the other until the 3D object is done.

Existing 3D printing system

It all starts with making a virtual design of the object you want to create. This virtual design is made in a CAD (Computer Aided Design) file using a 3D modeling program (for the creation of a totally new object) or with the use of a 3D scanner (to copy an existing object). A 3D scanner makes a 3D digital copy of an object. To prepare a digital file for printing, the 3D modeling software "slices" the final model into hundreds or thousands of horizontal layers. When the sliced file is uploaded in a 3D printer, the object can be created layer by layer. The 3D printer reads every slice (or 2D image) and creates the object, blending each layer with hardly any visible sign of the layers, with as a result the three dimensional object.

Methodology used in proposed system

We are using the basic idea of 3D printing in our project. Instead of using scanner or CAD software we are inputting the co-ordinates of object which we want to make through Visual Basic. We are interfacing serially computer and microcontroller to get inputted co-ordinates of X, Y and Z axis. According to the inbuilt program in microcontroller, dedicated stepper motors for X, Y direction will perform the action. And the same action will repeated for Z co-ordinate. Instead of extruder for printing we are using glue gun .material for forming an object we are using silicon material. To hold the trigger of the glue gun we are using DC motor.

Literature survey

We referred IEEE journal papers and websites regarding of 3D Printing. From the reference papers we take the concept of 3d printing.

Material survey

In industry, printing inks are chosen according to the need and kind of object that has to print. For example

- Colloidal ink
- Fugitive ink
- Nanoparticle ink
- Polyelectrolyte ink
- Sol-gel ink

The printing inks which are mentioned at above can be used only for industrial purpose and which cannot be used in our system due to following reasons:

- Having high melting points of used material,
- Mechanism used in industry for ink drop,

Having high cost of the material

Hence we have surveyed for different materials like soldering metal, plaster of Paris, clay, sealing wax (lakh) etc. but these materials proved unbeneficial. We decided to use Glue stick (of silicon material)with glue gun for printing a 3d object. The specifications of glue gun and silicon material are as follows:

Glue gun:

- Adjustable Temp. (248 F to 425 F)
- Accepts the 7/16" glue sticks
- Stroke adjustment screw allows same amount of glue per squeeze
- Lighted on and off switch
- Ergonomic trigger design for less effort
- Durable reinforced body stands up to years of use!
- Heavy Duty Blow Molded Plastic Storage Case
- Grounded Cord
- Softening point: 178 degrees F
- Open time: approx. 40 seconds
- Color: frosty clear
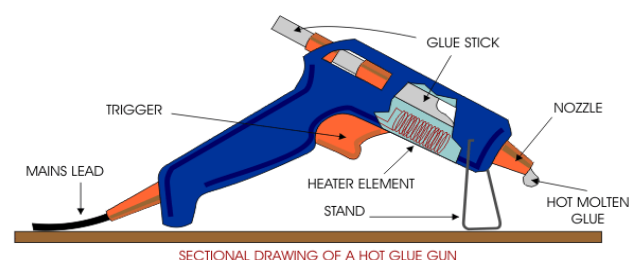- Sizes: 7/16" and 5/8" diameter, 4" and 10" length

Fig 2 Glue gun

Glue stick:

- Softening point: 178 degrees F

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- Open time: approx. 40 seconds
- Color: frosty clear
- Sizes: 7/16" and 5/8" diamet4" and 10" length

Fig.3 Glue stick

Block diagram

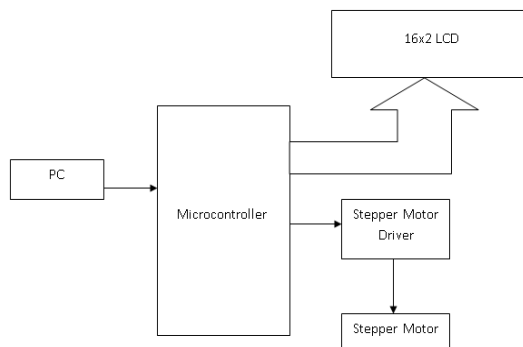Following figure shows the block diagram of proposed system.

Fig.4 Block diagram

Hardware description

- Computer or Desktop: To get the co-ordinates of an object with the help of Visual Basics PC is used. PC hyper terminal is serially connected with the microcontroller.
- Microcontroller: We are using ARM 7(LPC 2138) as a microcontroller. We select this microcontroller because of availability of I/O pins is more and sufficient memory for programing purpose.
- Stepper motor: We are using stepper motors for controlling the action of arms for rotation X, Y and Z direction.
- Stepper motor driver: It is a driving circuit required to activate the stepper motors.
- LCD: LCD is interfaced with microcontroller. LCD is used for initialization purposes.

Software description

- ORCAD: ORCAD is a software used for PCB designing and layout.
- Visual Basic: Visual Basic isa third-generation event-driven programming language and integrated development environment (IDE) from Microsoft. Using GUIin visual basic the x,y and z co-ordinates are serially inputted to the controller. The Visual Basic 6.0 version can be used.
- Keil: Keil provides a broad range of development tools like ANSI C compiler, macro assemblers, debuggers and simulators, linkers, IDE, library managers, real-time operating systems and evaluation boards for Intel 8051, Intel MCS-251, ARM, and XC16x/C16x/ST10 families.
- Flash magic: Flash Magic is a tool which used to program hex code in EEPROM of micro-controller. Flash magic supports several chips like ARM Cortex M0, M3, M4, ARM7 and 8051.

VI. Algorithm

- Initialize the LCD.
- Taking serial inputted coordinates of x,y,and z axis.
- The coordinates of object showing on LCD.
- Also the DC Motor will controlled through the signal provided by ARM processor to DC motor driver.
- According to value of x,y, and z coordinates ARM processor will calculate step size and decide the direction of motion.
- The control signals generated by ARM processor causes the action of stepper motors

VII. Result and Conclusion

- Geometrical shapes such as rectangle and square can be created.
- 0.3 mm can be the minimum thickness of the layer.

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