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Design and fabrication of writing robot

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Abstract - The project we have made an arrangement for writing a numerical letter. For that purpose we have used special arrangement called timer belt and pulley, DC motors and stepper motor. We used Cartesian type of robot to slide the tool in three axis x,y,z direction respectively .The timer belt is used for sketching tool to slide over the guide in x-z direction in that axis within the surface. Stepper motor to used to drive the timing belt. The proximity sensors are used for preventing variance between end effectors and supporting beam. The main process is the movement of end effectors. The movement is controlled by the ATMEL-AT89C52 microcontroller.

Index words-ATMEL, DC motors

I. INTRODUCTION

The embedded technology now its prime and wealth of knowledge available in mind blowing. The embedded system is used special purpose computer designed to perform a dedicated function. An Embedded system is fast growing technology in various fields like industrial automation, home appliances & automobiles, aeronautics etc. Embedded technology used pc or a controller to do the specified task and the programming is using assembly language programming or embedded c.

The AT89C52 is a low-power, high performance CMOS S-bit microcomputer with 4k bytes of flash programmable and erasable read only memory (PEROM).The device is manufactured using Atmel's high density non-volatile memory technology and is compatible with the industry standard MCS-51 instruction set and pin out.

The on-chip flash allows the program memory to be reprogrammed in-system or by a convectional non-volatile memory programmer. By combining versatile 8-bit CPU with flash on monolithic chip, the ATMEL AT89C52 is a powerful microcomputer which provides a highly-flexible and cost effective solution to be many embedded control applications.

II. LITERATURE SURVEY

[1] B. Gowtham et al made a study and concluded to write the letters using the robot arm in this provided space. He used timing belt, pulley and DC motor to slide the working tool in x-z direction.

[2] Markus Eich et al present the design a robot AILA mobile dual-arm and stated the design goal is to achieve a lightweight arm construction with a payload-to-weight ratio greater than one.

[3] Ying-Shieh Kung and Gua-Shieh Shu is discuss about the robot arm using SOPC (system-on-a-programmable-chip) and consists of a FPGA (Field programmable Gate Array).Then know the functions of the sequential control in one module performs. This paper shows the robot arm more compact, high performance and cost down.

III. COMPONENTS USED

1. Cartesian robot:

A Cartesian coordinate robot (also called linear robot is an industrial robot whose three principal axes of control is linear (i.e they more in a straight line rather than rotate. And its right angle to each other. This type of robot uses the x,y,z three dimensional . Coordinate system to control movement and location. Application for this type of robot is a computer numerical control machine (CNC machine)

and 3D printing. The simplest application used to milling & drawing and machine.

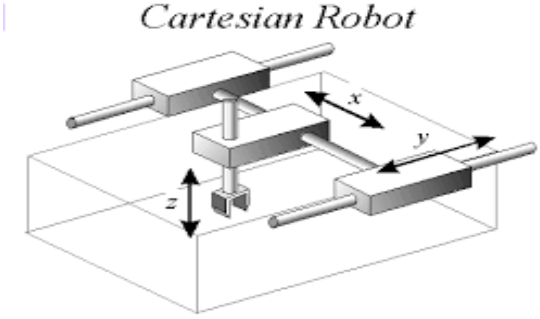

Fig.1 Cartesian robot

2. DC Gear Motor:

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types of rely forces produced by magnetic fields. Almost all types of DC motors have some internal mechanism, either electromechanical or electronic; the periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

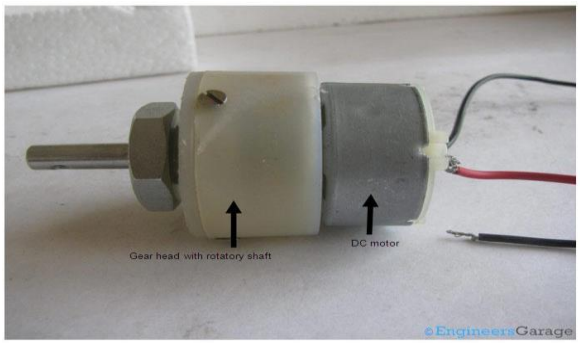

Fig.2 Dc motor

DC motors were the first type of widely used, since they could been powered from present direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range of, using either a variable supply voltage to be changing the strength of current in its field windings. Small DC motors used in tools and toys appliances. The universal motor can operate the direct current but its a lightweight motor used for portable power tools and appliances. Larger DC motors are used for propulsion of electric vehicles, elevator & hoists, in drives for steel rolling mills. The advent power electronics has made replacement of DC motors with AC motors possible in many applications.

In a gear motor, the energy output is used to turn a series of gears in an integrated gear train. There are a number of different types of gear motors, but the most common are AC (alternating current) and DC (direct current).

3. Timing Belt:

A timing belt is a non-slipping mechanical drive belt. The use of timing belt or chain instead of direct gear drive enables engine instead of direct gear drive enables engine designers to place the camshafts to be placed further from each other. A timing belt is usually a toothed belt a drive belt with teeth on the inside surface. A timing chain is a roller chain. Belt scratches and produces high power transmission capacity long operation life and accuracy of positioning repeatability.

Fig.3Timing belt

4. Proximity Sensors:

A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation and looks for it changes in the field or return to the signal. The object is being sensed often referred to as proximity sensor's target. Different proximity sensors and targets demand different sensors. The maximum distance that this sensor can detect is defined "nominal range". Some sensors have adjustments of the nominal range or means to report a graduated detection distance. Some of these processes as "thermo sensation".

Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between sensor and the sensed object. Proximity sensors are also used in machine vibration monitoring

to measure the variation in distance between a shaft and its support bearing.

Fig.4 Proximity sensor

5. Control Unit:

The controller is used for to controlling the motion of the robot. A microcontroller is a complete microprocessor system is built on an single IC. Microcontrollers were developed to compensate need for microprocessors. By the use of microcontroller a set of instructions can be stored. This means the idea of using a microprocessor for low cost products comes up often. But the typical 8-bit microprocessor based system, such as one using a Z80 and 8085 is expensive. Both 8085 and Z80 system need some additional circuits to make a microprocessor system.

Fig.5Control unit

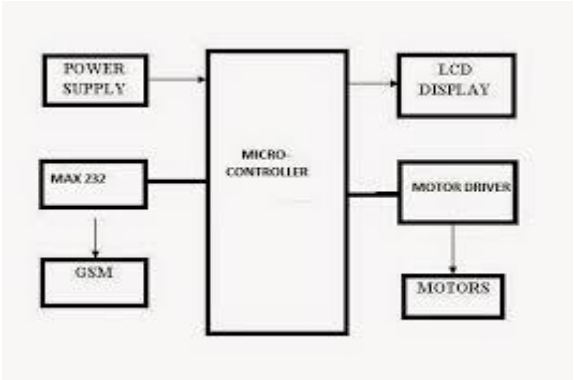

Fig.6 Block diagram

6. Atmel Microcontroller:

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 and 80C52 instruction set and pinout. AT89C52 is an 8-bit microcontroller belongs to 8051 family. It has 8KB of flash programmable and erasable read only memory (PEROM) and 256 bytes.

AT89C52 the endurance limit have 1000 write/erase cycle. It means that it can be programmed/erased maximum 1000times. A microcontroller has all or most of these features built-in to a single chip, so it doesn't need a motherboard and many components, LEDs for example, can be connected directly to the AVR its used to motor control and lighting &automotive battery management.

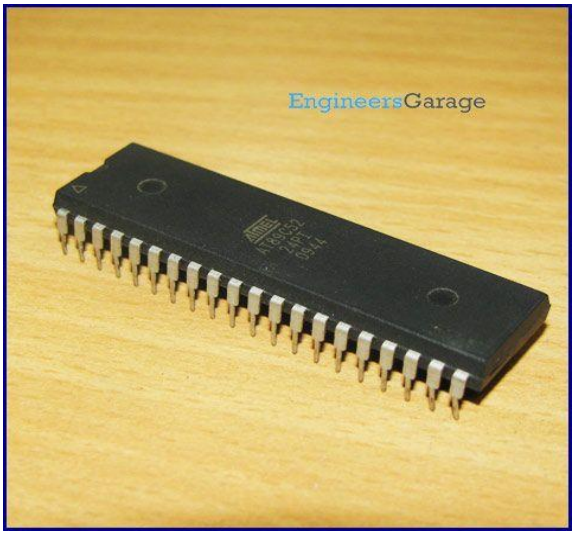

Fig.6Atmel microcontroller

IV. EXPERIMENTAL SETUP

An experimental set up is established. The experimental set up consists of main components are used DC motor, proximity sensor, timing belt, linear bearing.

V. WORKING PRINCIPLE

The main objective of this project is to write the letters using the robotic arm in the provided space. So we have used Cartesian robot. The main components used in this project are timing belt and pulley and stepper motor, gun type actuator, linear bearing arrangement. The working is as follows; timing belt and pulley used here to slide the working tool in x-z direction. Two timing belt and pulley is used here for achieving this. For guiding the tool in z direction linear bearing arrangement is used. Stepper motor is used here to drive the timing belt. The letters are pre-programmed in ATMEL micro controller. When a button is pressed the appropriate letter will be written in the work space.

VI. RESULT

Our fabricated project is used to write some forms of letters on paper, sheet metal, wood, aluminium plates. It has high accuracy because of using ATMEL microcontroller.

VII. CONCLUSION

The main scope of the project is writing the letter. Thus with the help of the microcontroller, timer pulley and DC motor the process has been fulfilled. By changing the end effectors it is used for painting operations, pick and place drawings etc. The future scope of the project is we can use audio sensor for controlling the robot through our voice.

VIII. REFERENCES

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