

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Application of Micro Electro Mechanical Systems in Fabrication Industries.

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ABSTRACT

Micro electro mechanical systems (MEMS) technology is conceived to fabricate complex mechanical structures on a micro level. Bio MEMS, has surfaced as a subset of MEMS devices for applications in biomedical research, pharmaceutical and textile industries[1]. The bio MEMS industry is increasing speedily with a growth rate of 11.4%, with projected revenues of \$850 million to over \$1 billion. The textile industry, particularly in weaving areas, needs sensors to monitor for errors and to aid the automation of warp yarn repair. MEMS sensors are very powerful and are highly accurate. These sensors are inexpensive and are readily available. Currently in textile industry, the power supply was given to micro controller. When this process takes place, the rotatable cutter and MEMS are set in their positions. Stepper motors are used for horizontal and vertical movement of weaving cloth. The output is taken across rotatable cutter and output is recorded. To avoid a power deformation problem, MEMS hold this advantage.

Keywords: 8051 Microcontroller, MEMS, Stepper motors, Positional Transducer, Rotatable Cutter.

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INTRODUCTION

Small scale electro mechanical frameworks (MEMS) are essentially micrometer-scale gadgets which coordinate electrical and mechanical components. These are utilized as a part of assorted applications, similar to show innovations, sensor frameworks and optical systems. MEMS are attractive for some applications[2] for the reason that of their little size and weight, which allow frameworks to be scaled down. Notwithstanding the convenience advantage, another direct result of MEMS is the capacity to group manufacture, driving the expenses of these sensors to low levels. These sensors, when combined with sufficient hardware, give an extremely reasonable and a precise analytic choice, particularly to nations without a satisfactory restorative office infiltration. MEMS give an up and coming era of manufactured organs and organ help gadgets like liver, kidneys and endocrine organs by get together of a few number of microfabricated parts.

Manufacture process steps are turning out to be more intricate as coordinated gadgets, once thought better left to one next to the other gadgets in the MEMS[3] domain, are presently getting to be crucial as miniaturized scale reactor chambers, and as recognition plans get to be joined into the gadget itself. What's more, bundling for security and biocompatibility represents a huge test. Keeping in mind the end goal to furthermore investigate the difficulties and prospects of MEMS, we have underscored by depicting some principal innovations connected with all MEMS outlines and operations. To begin with, the points of interest and difficulties of material industry MEMS are talked about, especially in the weaving zones, needs sensors to screen for deficiencies and to help the computerization of twist yarn repair. As the creation process going ahead, there will be a shot of force dissipation at a specific time, which prompts miss happening in material manufacture. MEMS give a stage to overcome such broken twist yarns. At last, a few cases on general MEMS applications are focused.

Block Diagram and Its Description

Block Diagram

Manufacture of fabric in material industry without force dissipation should be possible with the assistance of MEMS. These MEMS are utilized to decrease the miss happening of manufacture when there is change or nonattendance of supply. MEMS[4] are associated with the controller which gives ADC output to the stepper engines with the assistance of interface. The Block graph is as appeared in fig:1 mentioned underneath. Stepper engines moves in irregular headings that encourages the rotatable cutter to manufacture the material. With the force breakdown or power loss, MEMS beat the breakage of twist yarns accordingly give safe and durable manufacture. Power Supply- this provides a suitable voltage to run the microcontroller with the help of step down transformer. 8051 Microcontroller- Used for obtaining ADC output for functioning of interface. Interface- Used as input for stepper motors working at desirable speed. Stepper Motors- Provides movement for fabrication of cloth in axial directions. Rotatable Cutter- Movement of cloth for proper alignment and desired shape of cloth. Positional Transducer converts mechanical energy into electrical energy to drive the rotatable cutter. MEMS Connected to Microcontroller.

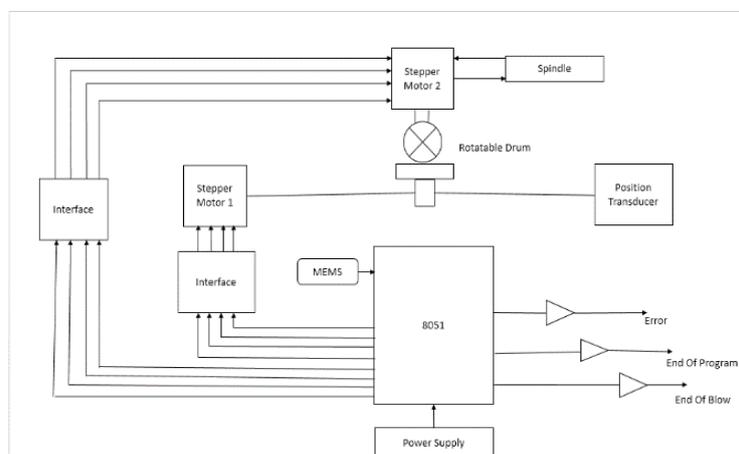


Figure 1: Block Diagram for Fabrication of cloth using MEMS

DESCRIPTION

Major steps involved in plate cutting mechanism using MEMS are explained as follows. The system Composes of

Power Supply

Power Supply is the circuit from which we get a desired dc voltage to run the other circuits. The power supply used in homes, electrical appliances are at a desired voltage of 230v AC. But the component used require 12V. The normal microcontroller works at a voltage of 12V AC. So a step-down transformer is used to convert the 230V AC to 12V AC which is later converted to 12V DC using a rectifier. The output contains some ripples even though it is a DC signal due to which it is called pulsating DC. To remove the ripples and obtain smoothed DC power, filter circuits are used which makes the microcontroller to work with desired performance. The block diagram is as shown in Fig-2 below.

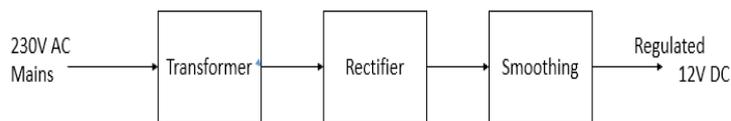


Figure 2: Block Diagram of Power Supply

8051 Microcontroller

The microcontroller utilized is AT89S52 which was created by ATMEL Company. It is utilized primarily as a part of embedded control frameworks that has a high class of performance and low power utilization with CMOS 8-bit microcontroller with 8K bytes of in-framework programmable blaze memory as shown in fig-3. This gadget is produced utilizing Atmel's high-thickness non-unpredictable memory innovation. This is a capable microcontroller which gives high-adaptability and savvy answer for some control applications. It comprises of scaffold rectifier which changes over 12V AC to 12V DC in this way by diminishing the consonant decreases (i.e) changing over uneven signs to break even with craved sign. A directed IC 7805 converts the 12V to 5V. A reset catch, which will store up to two machine cycles. A precious stone oscillator is utilized to produce beat. Simple to-computerized converter ADC0809 with 8-bit simple to advanced converter used to change over simple data to advanced yield. Subsequently the yield is given to interface.

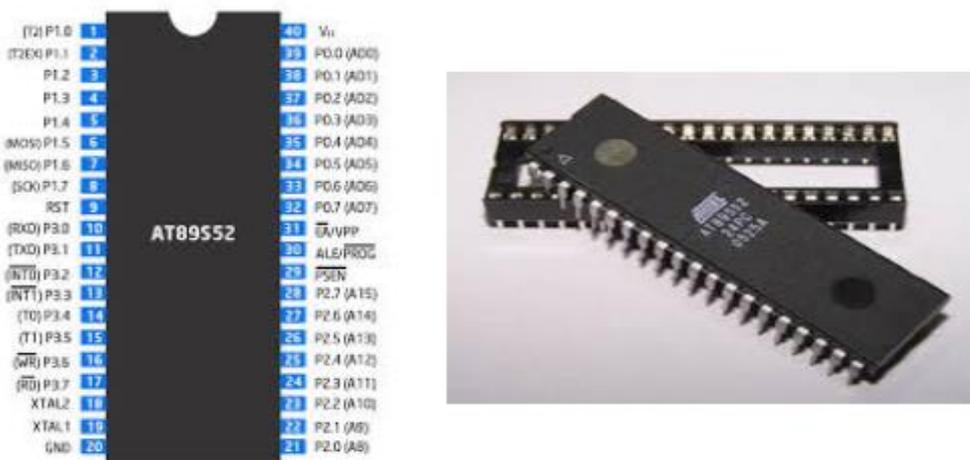


Figure 3: Pin diagram and General structure of AT89S52.

Interface

The interface connects the output of the controller to the input of the stepper motors 1, 2. The output will be digital.

Stepper Motors

The stepper motor is an electromagnetic gadget[5] that changes over computerized beats into mechanical shaft pivot. It is a brushless DC engine that partitions a full pivot into various equivalent steps. This stepper engine shown in fig-4, comprises of toothed electromagnets which tends to move the apparatus teeth and adjusts to next one. These engines utilized tends to move along X and Y bearings in like manner. An axle is additionally appended to the stepper engine for the development of material in context headings.



Figure 4: Stepper Motor

Rotatable Cutter

The rotatable cutter consists of a fixed plate on which cloth is placed. It is used for the movement of the cloth in horizontal and vertical direction which allows cloth to move in positional way. A spindle[6] is also provided with the rotatable cutter for the cloth to be threaded, lined and stitched in a right way along with the movement of cutter. They are worked automatically one after the other.

Positional Transducer

Transducer is a gadget that changes over one type of vitality to another structure. Here, the mechanical vitality from the stepper engine change over it into electrical vitality. The AWT190 has been intended to change over the immediate force estimation in a solitary stage or 3 stage (3 or 4 wire) adjusted burden framework into a standard DC yield flag that is corresponding to the deliberate worth. The DC sign is suitable for driving estimation and/or control gear either at the estimation point or at a remote area. The yield sign can be unidirectional, bi-directional or balance. The yield signal level is demonstrated by a green LED on the front that gives an unmistakable sign of module capacity. The configuration is completely strong state - for long haul solidness.

RESULT AND DISCUSSION

The above Circuit diagram shown in fig-5, explains the experimental setup and the Graph no:1 explains the meters of cloth spun with the power supply. Normally, the spun of cloth takes place in regular steps. Whenever the power supply gets disrupted also there will be no deformation in the cloth happens. Thus the fabrication of the cloth is completed for 5meters in 1 hour using Bio-mems.



Figure 5: Training Kit Output



Graph-1: Meters of cloth spun VS time

CONCLUSION

MEMS innovation is by all accounts a decent decision for the manufacture of material with no distortions in material industry. Along these lines MEMS goes about as a force supply reagent, in the middle of when the manufacture of material because of power decimation. This causes the manufacture of material to be further prepared at the point where it stops and most likely causes twist yarns. To dodge such conditions MEMS is utilized to overcome such conditions in the fields of Medical[7], plain cutting instrument in commercial enterprises, paper and mash businesses, Glass cutting and so forth

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