International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Fabrication of Manually Operated Electro Magnetic Abrasive Finishing

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Abstract – The aim of our project is to obtain precision finishing of rough surfaces which are required to the work by addition of joystick to adjust the magnetic field on to the required surface. The magnetic field can relocated at any point by the use of joystick by the use of arduino uno board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs.

The results demonstrate the viability of the manually operated (EMAF) setup in achieving desired surface finishes across a range of materials, including metals and composites. It is designed to offer flexibility and ease of use, allowing operators to adjust parameters such as magnetic field intensity, abrasive particle size, and feed rate. Through a series of experiments and analysis, the efficiency of the fabricated system is evaluated in terms of surface roughness, material removal rate, and surface integrity.

Key Words: Precision finishing, Magnetic force, Surface quality, Polishing, Manual operation.

1. INTRODUCTION

Embedded is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function. Most of the controlling systems, today, are embedded systems. The complexity of the systems may differ from to the other.

EMBEDDED SYSTEMS

HARI	ΓWARE
Peripherals	1. ALP
Processors	2. C
Memory	3. VB, etc...

Using a specialised machining technique called electro magnetic abrasive finishing (EMAF), metallic workpieces can have high-quality surface finishes. EMAF removes material from the workpiece surface using abrasive particles and an electromagnetic field, producing a smoother and more uniform finish.

For items in a variety of applications, including aerospace equipment, medical devices, semiconductors, vehicles, tools, and dies, among others, a highquality surface with a low value of surface roughness and high dimensional accuracy is needed. The production of components with complicated shapes for various applications requires the use of sophisticated materials, such as alloys of hard materials, glass, ceramics, and composite materials. These materials are challenging to finish because of their extreme hardness and toughness, as well as the goods' intricate shapes. The finishing process is the last step in the manufacture of components, and it accounts for around 15% of the overall production expense. Abrasive finishing is a method for precision surface finishing that shows promise. In order to complete the intricate shapes shows promise.

2. SYSTEM DESIGN:

A workpiece holder, an abrasive suspension tank, and an electromagnetic field generator make up the EMAF machine. The holder, which is then immersed in the abrasive suspension, is filled with the workpiece. The workpiece's surface is traversed by the abrasive particles in a controlled manner as a result of the generator's powerful magnetic field, which removes material and provides the appropriate surface finish. Depending on the particular application, the abrasive particles employed in EMAF can either be free or bound to a carrier material. The intensity of the abrasion can be changed by varying the magnetic field, giving the surface finish gained precise control.

Operating mode for Robot is through Bluetooth commands by using android software. We store few feedback commands in the controller which can be used for controlling the robot whenever input is provided from the android software. In this joystick mode, buttons will be present for the movement of the robot in all four directions. It helps in easy operation for those who can operate the same using hand.

When producing high-quality surface finishes for products in the aerospace, automotive, and medical device industries,

EMAF is used.are essential to the functionality and lifetime of a product. When finishing complicated or irregularly shaped objects, such turbine blades or medical implants, where conventional machining processes may be constrained, it is especially effective. The experimental configuration of the system is shown in the figure below

3. HARDWARE DESIGN:

Stepper motors, a switched motor power supply, and a 3D printer are included. Power supply A switching regulator is included into a switched-mode power supply (SMPS), also known as a switched power supply, switch-mode power supply, switched power supply, or switcher, which is an electronic power supply. An SMPS, like other power supplies, converts voltage and current characteristics while transferring power from a DC or AC source (often mains power; see AC adapter) to DC loads, like a personal computer. In contrast to a linear power supply, a switching-mode supply's pass transistor alternates between full-on and full-off states with low dissipation and spends comparatively less time in transitions with high dissipation, minimising lost energy. In an ideal switched-mode power supply, there is no power loss. Varying the ratio of on-to-off time, sometimes referred to as duty cycles, regulates voltage. InIn contrast, a linear power supply continuously dissipates power in the pass transistor to control the output voltage. An key benefit is the greater electrical efficiency of the switched-mode power supply.

3.1 STEPPER MOTOR:

stepper motor A brushless DC electric motor that divides a whole rotation into a number of equal steps is called a stepper motor. As long as the motor is appropriately scaled for the application in terms of torque and speed, the position of the motor can be instructed to move and hold at one of these steps without any position sensor for feedback (an open-loop controller). Large stepping motors with fewer poles, known as switched reluctance motors, are often closedloop commutated. When DC voltage is provided to the terminals of brushed DC motors, the motors continue to spin. The stepper motor is well known for its ability to transform an input pulse train (usually composed of square waves) into an accurately measured increment in the rotational position of the shaft. The shaft revolves with each pulse.via a predetermined angle. Stepper motors really consist of several "toothed" electromagnets arranged as a stator revolving around a central iron rotor.

3.2 3D PRINTER:

3D Printer Using computer-aided design (CAD) software, a 3D printer is a sort of additive manufacturing technology that builds three-dimensional items by layering material. After reading a digital 3D model, the printer produces the object by extruding or depositing material in layers until the desired shape is achieved. Fused Deposition Modelling (FDM), Stereolithography (SLA), and Selective Laser Sintering (SLS) are just a few of the numerous varieties of 3D printers. Each kind of printer produces objects with various degrees of intricacy, detail, and sturdiness using various materials and techniques. There are many uses for 3D printing in a variety of fields, including product creation, architecture, engineering, medicine, and education. It permits quicker prototyping, personalization, and the development of intricategeometries and structures that are either impossible or extremely difficult to manufacture using conventional manufacturing techniques. Even while 3D printing technology has advanced significantly in recent years, there are still several drawbacks, like the length of time it takes to print huge objects, the calibre of the final result, and the price of materials. However, it is anticipated that future advancements in the industry.

4. SOFTWARE DESIGN:

The Arduino Uno can be programmed with the Arduino software. The ATmega328 on the Arduino Uno comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500

protocol (reference, C header files).We can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.

4.1 JOY STICK:

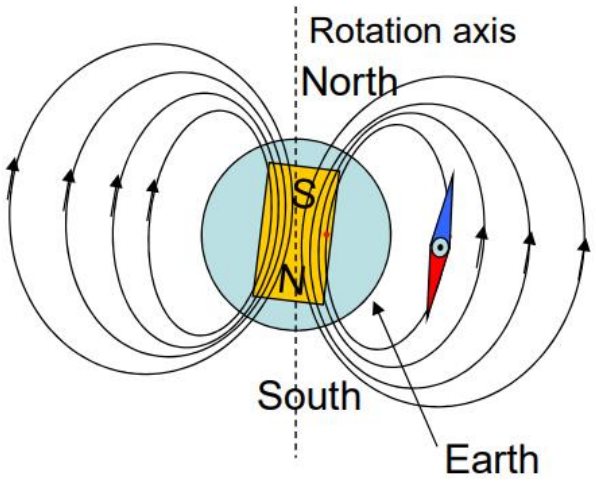
By pressing the "joystick" button the user can remote control a vehicle with specific gestures. For the interpretation of gestures to commands, the application uses the built-in accelerometer sensor of the smart device. There are 8 different gestures available (FRONT, BACK, LEFT, RIGHT, FRONT_LEFT, FRONT_RIGHT, BACK_LEFT, and BACK_RIGHT).

You can set these gestures with your own custom commands through the the menu button "Set Commands". Additionally, there is a STOP and an ANDROID button that can be assigned with custom commands as well.

The mode provides via the menu options the option to change the orientation of accelerometer axis‘s (X->Y, Y->X) in order to operate properly in Android phones with different default orientation.

5.MAGNETISM:

The phenomenon of magnetism is associated with iron that is attracted by permanent magnets that can also be made of iron compounds. Historically, magnetism was observed even before the mankind started producing metals. Naturally occuring magnetite, one of iron oxides, showed magnetic properties and it was used to build a navigational device compass. Compass is a small magnet that points to the North with this north pole and to the South with its south pole



5. CONCLUSION: In conclusion, the manually operated abrasive finishing machine represents a significant step towards achieving a good surface finish in metallic and non-metallic materials. The design and construction of an electromagnetic abrasive finishing machine necessitates careful consideration of a number of issues, including the choice of suitable materials, the electromagnetic coil system's design, the choice of abrasive particles, and the optimisation of operational parameters. Through thorough calibration and fine-tuning of the operating parameters, the machine's performance can be improved. According to the EMAF machine's experimental findings, the workpiece's surface finish dramatically improved as processing time rose. The EMAF machine can produce a high-quality surface finish in a short amount of time, according to the study of the surface roughness and material removal rate. In summary, the EMAF machine is a very efficient technique for precisely finishing the surfaces of metallic and non-metallic materials.The machine offers a fast processing time, high material removal rate, and outstanding surface polish. The EMAF machine has the potential to develop into a vital tool for many sectors that demand high-quality surface finishing with additional study and development.

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