FABRICATION OF RECORD AND PLAY ROBOTIC ARM USING 3D PRINTER

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Abstract:

As we aware of the thing that jobs which are repetitive are in the favor of killing the human creativity. In the long run world is getting better day to day. But some jobs are still stuck in the same accent. Due the many factors such as higher machinery cost, high availability of labor at low capital, lack of availability of modern equipment.

Robots have the potential to replace the humans at the manufacturing line. They complete the assigned work in the less time. Functionality of these robots is purely based on the instructions given to it in the form of program. Robots are highly reliable and works efficient they keep their high point in maintain the accuracy and precision. They can function round the clock and they are not relay on the seasons. In the broad view they help us to think differently by reducing the physical work, hence they are perfect for line and repetitive jobs. On the other hand they are high on cost, and their production craves for the highly skilled people. These robots are difficult to manufacture since it require greater amount of precision. To overcome such problems and to save the material to decrease the cost a new manufacturing process need to be adopted.

Additive manufacturing the term itself refers the process i.e manufacturing process in which material is melted to its melting point and joined to get the desired shape. In this kind of manufacturing process only one machine is enough to get the life for a design. Hence they is need not have heavy machinery and number of machines for different functions.

Robotic arm made out of additive manufacturing would reduce the cost and makes the manufacturing process a piece of cake to illustrate this and to study about the 3d printing and to draw out the challenges faced in such a manufacturing process we opted the design.

INTRODUCTION

Additive Manufacturing: This is the official reference concept for all technology implementations in the industry (ASTM F2792). In contrast to subtractive manufacturing methodologies, it is characterized as the process of joining materials to create objects from 3D model data, typically layer upon layer. 3D printing is a rapidly expanding sector, with daily growth in popularity and uses for 3D printers. I will try to provide an introduction to the broad range of 3D printer technology in this guide, a comparison of the most popular 3D printers on the market, an overview of printing materials, online sites and communities providing 3D models or 3D printing services, and an introduction to the design and printing of your first model. Additive manufacturing methods are continually changing and new techniques are regularly explored and unveiled. However, the ASTM group 'ASTM F42-Additive Manufacturing' categorized the spectrum of Additive Manufacturing technology into 7 forms in 2010 to standardize the industry.

Material Extrusion:

One of the most popular and widely used additive production technologies is fused deposition modeling (FDM). FDM has been trademarked by Stratasys Inc. and is thus used

to avoid copyright problems with the separate term Fused Filament Fabrication (FFF).

Fig 1. Material Extrusion type FDM 3D Printer (LulzBot TAZ 6)/Image Credit: LulzBot

In this procedure, material in a filament shape is drawn through a nozzle, heated and then extruded and deposited in a layer-by-layer phase on the construction platform. Most commonly, FFF 3D printers are Cartesian, where the nozzle moves in the X & Y direction, while the building platform moves in the Z direction. Extrusion 3D printers are affordable and deliver easy parts to be prototyped easily. It is typically used to print objects, characters, toys, games, and other similar products for households. Since the overall resolution is about 100 microns, the components have a rough surface finish.

A laser or an electron beam is used in the Powder-bed fusion process to sinter, melt and fuse the powder particles together while tracing the cross-section of the object to be formed. The powder dispensing device spreads a fresh sheet of powder onto the building platform upon completion of the first layer, and the printing continues for the next layer. This method proceeds until the full object is constructed.

Material Jetting: A standard two-dimensional inkjet printer works in a similar way as the material jetting process. Stuff is dispensed from several print heads in the form of liquid droplets similar to the ones in an inkjet printer. The material is a photosensitive polymer that hardens to create the layer-by-layer portion of the material when exposed to UV light.

Fig.2. Half Glossy, Half Matte finish with Material Jetting/Image Credit: 3DHubs

For construction parts with high dimensional precision and smooth surface finish, this additive manufacturing technique is used. In reality, parts can be printed with equal precision in both glossy and matte finishes. It is a technology for multi-materials that allows full-color printing. The technology is also referred to as Drop-on-Demand (DOD) because it utilizes printheads to produce wax-like parts that dispense liquid content. It is often used to generate patterns for investment casting

Driven Deposition of Energy: Directed Deposition of Energy (DED) is an additive manufacturing technology used for 3D metal and alloy printing. It can be used for polymers, glass and ceramics, but for those materials it is not popularly used.

A nozzle holds a wire-form material known as a feed that passes around multiple axes in DED, and an electron beam projector that melts the feed as it moves through while tracing the object's geometry. As it utilizes a laser, DED is also referred to as laser engineered net formation, 3D laser cladding, directed light processing or direct metal deposition. The nozzle supplying the material is not limited to any particular axis in the DED

phase, but due to 4 to 5 axis machines, it can be pushed from different angles. This approach is not only used for the creation of new items, but is often used to incorporate materials to existing repair models.

Materials including Titanium, Cobalt Chrome and Tantalum are used in this additive processing technology (a rare metal). In the aerospace and automotive industries, the most common application of the DED method is

Robot arms: A robotic arm (not a robotic hand) is a type of mechanical arm, typically programmable, with a purpose similar to that of a human arm; the arm may be the total amount of the mechanism, or may be part of a more complex robot.

Types of ROBOTS:

Cartesian robot / Gantry robot: Used for pick and place work, sealant application, assembly, machine tool handling and arc welding operations. This is a robot with three prismatic joints in its arm, the axes of which coincide with a Cartesian coordinator.

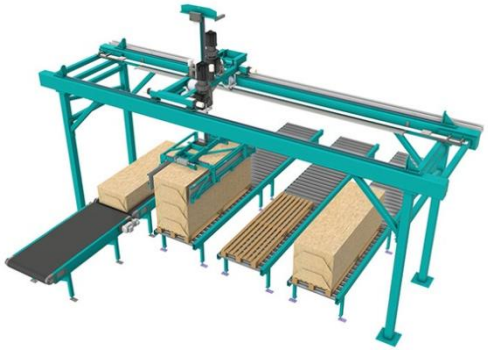

Fig.3.Gantry Robot

Cylindrical robot: Used for assembly procedures, machine tool handling, spot welding and die casting machine handling. This is a robot whose axes form a system of cylindrical co-ordinates.

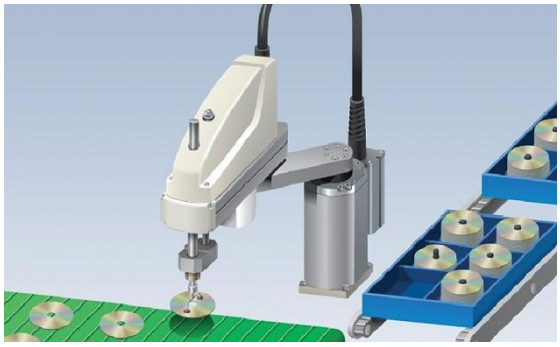

Fig.4 Cylindrical Robot

Used for managing machine tools, spot welding, die casting, fettling devices, gas welding and arc welding. Spherical robot/polar robot: It is a robot whose axes form a set of polar coordinates.

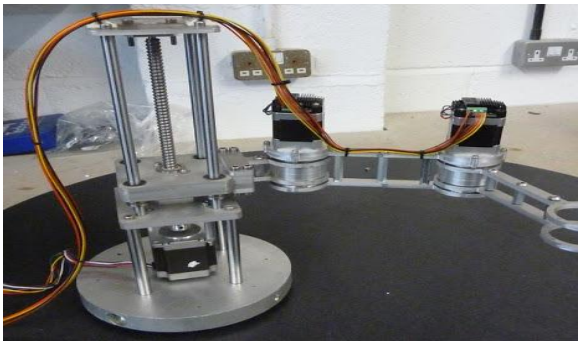

Fig 5.Spherical Robot

SCARA robot: Used for pick and place job, sealant application, assembly operations and machine tool handling. To provide enforcement in a plane, this robot features two parallel rotary joints.

Fig.6 SCARA Robot

Articulated robot: Used for assembly, die casting, fettling equipment, gas welding, arc welding and spray painting operations.

It's a robot with at least three rotational joints in its legs.

Fig.7 Articulated robot

PROPOSED WORK:

I did not use an external power source for this circuit. The Arduino is operated by the USB port, and the potentiometer and the Servo motors are powered by the +5v pin on the board. At any given time, only one servo motor will be in motion in our robotic arm, so the current consumed will be less than 150mA, which can be obtained by the Arduino Board's on-board voltage regulator. In order to power them, we have 5 Servo motors and 5 potentiometers. These 5 potentiometers are wired to the Arduino board's 5 Analog pins A0 to A4. PWM signals are powered by the Servo motors, so we have to attach them to the Arduino PWM pins. The pins D3, D5, D6, D9 and D11 only support PWM on the Arduino Nano, so we use the first 5 pins for our servo motors. I used a perf board to weld the links, and when done, my board looked something like this below. If possible, I also added a barrel jack to power the system via the battery. It is absolutely optional, though.

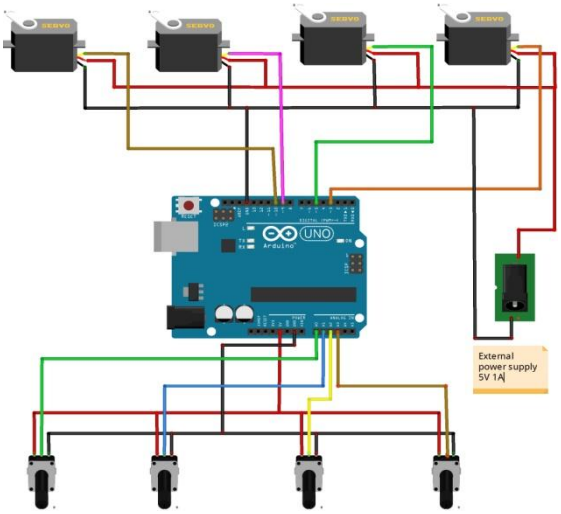

Fig.8 Schematic diagram

IMPLEMENTATION RESULTS:

Fig.9 Implemented Robot

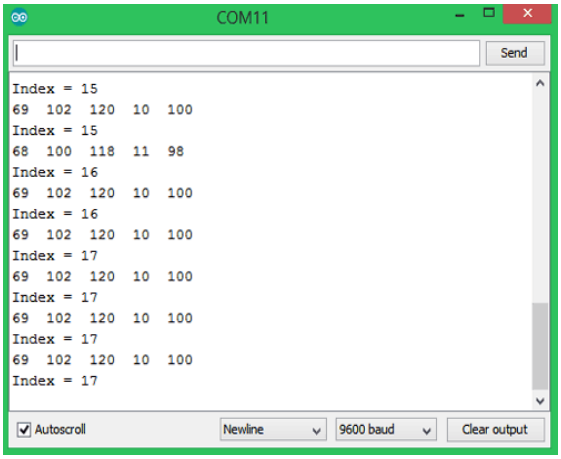

Fig.10. Arduino debug window(a)

For debugging, the details shown here can be used. The present location of servo motor 0 to motor 5 is the numbers starting from type 69. Index values are for the scale of the array. Notice that the array we use has a limit of 700, so we have to document the movements fully before we reach that limit. We should enter P on the serial monitor after the recording is done and press enter and we will be taken to the Play mode and the following will be shown on the serial monitor.

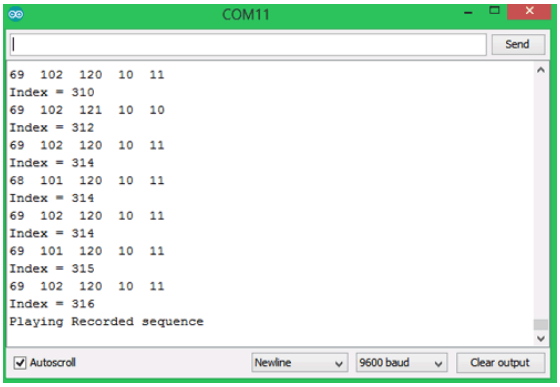

Fig.10. Arduino debug window(b)

CONCLUSION:

Find a suitable robot model on the internet in this job, assemble it for 30 prints, make some structural changes, transfer it and integrate it with lots of capabilities. The process of 3D printing proved to be time-consuming and often difficult, but it was absolutely possible to resolve it through instruction, reading on the subject and the method of attempt and error. Enabling the prototype with loT capabilities was a fascinating concept and a real challenge. It has strengthened the robotic arm.

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