Wireless Control 3D Printer with a Liquid Sprinkler Product Replacing Mechanism

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ABSTRACT

This paper introduces a wireless 3d printer with a liquid sprinkler mechanism for large scale production of certain types of products in industrial applications. The 3D printer can capable of producing 3 dimensional object from a designed model. Object model design by using CAD software. The slicing software generates G-code, which gives instruction to 3d printer about its movements along three axis. Send This G-code to controller via wireless mode. 3d printer can produce a 3D object on the bed of deposition. The final product may stick on bed of deposition. Replacement of product may cause damage in product and consuming much time for it. This problem is solved by spraying 1:1 water alcohol mixture on the end product. Here a automatic liquid sprinkler sense the final product and automatically spraying the mixture on it.

Keywords: *Liquid sprinkler, CAD software, G-code, Slicing software*

1. INTRODUCTION

Now 3d printing became indispensable tool in medical, engineering, businesses fields. Some industries want to manufacture same types of products in large scale. Recently Indian government plans to implement thousands of 3d printed toilets in rural areas. This way government can reduce 40 percentage of total cost and save 80 percentage of total time needed. Wireless control 3d printer with a liquid sprinkler product replacer mechanism can manufacture products in large scale. This 3D printer converting a digital file in to a real 3d object by using fused filament technology. Different types of 3d printing techniques such as stereolithography (SLA), fused filament fabrication (FFF), and laminated object manufacturing (LOM).

Fused filament fabrication (FFF) technique used for printing due to its simple working. A layer by layer deposition procedure is employed in FFF technology. for that , first need to design the model of product by using CAD software. Slicing software generate corresponding G-code. G-code is the commands to 3d printer about three axis movement of 3d printer. Each layer of product printed as extruder moves along x,y,z axis. Extruder nozzle moves based on the instructions given by controller. This layering process continues until the final product formed. Wireless communication between host and 3d printer made possible by use of xbee modules. Mainly the hardware components of wireless 3d printer with a liquid sprinkler divided in to four. It includes computer system, controller, printer and liquid sprinkler. Printer part consists of x, y, z axis supports , extruder and bed of deposition. Material required for production fed from a coil as a solid filament. The material passes through extruder, where melting of solid filament takes place when it pass heater, which attached to extruder with required melting temperature. Transformation from molten material to its original solid state occurs immediately after the material touches with bed of deposition. Final object formed on the platform of 3d printer. It may stick on bed of deposition due to changing state of material from liquid to solid. 1:1 water alcohol mixture can able to release this sticky nature. Here an automatic liquid

sprinkler sense the product and automatically sprinkling spraying the mixture on it. It makes the product replacement easy.
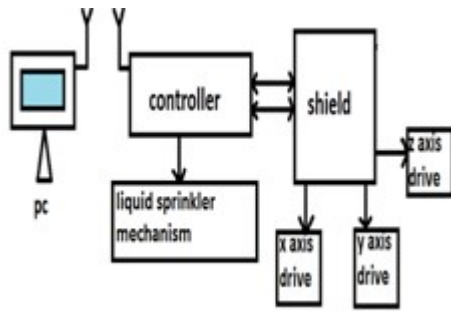

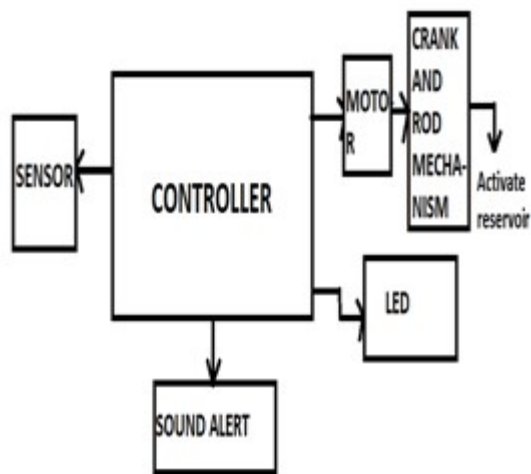**Fig 1: Block diagram representation of wireless 3d printer with liquid sprinkler**

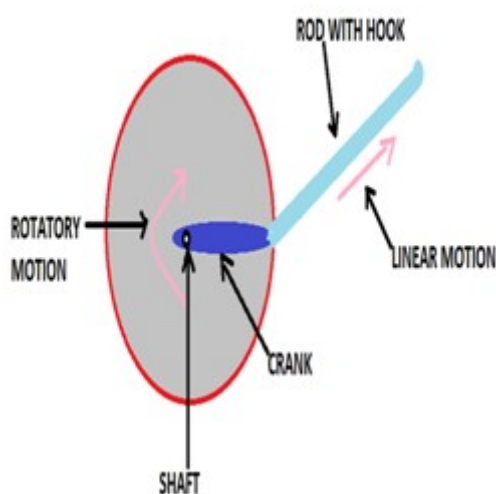**Fig 2: block diagram of liquid sprinkler**

Fig 3: Crank and rod mechanism

2. PROPOSED SYSTEM

Proposed system includes a 3d printer along with a liquid sprinkler. Designed model of actual product divides using slicing software. The slicing software transforms the 3d model into G-code commands. These commands are sending to the controller via wirelessly using x bee modules. The extruder nozzle moves along x, y, z axis. Path of extruder nozzle determined by transmitted G-code from computer system to controller. Liquid sprinkler separate the product from platform by spraying 1:1 water alcohol mixture directly on the product. It makes easier to product replacement.

3. CONSTRUCTIONAL DETAILS

First load the G-code on to controller using GRBL controller software. cnc shield directly mount on the controller. Driver for each axis motor connected to this shield. Liquid sprinkler attached to this system for automatic detection of the product form and spraying the 1:1 water alcohol mixture for removal of sticking nature of material on the platform. Constructional details of proposed system shown in the figure 1. Block diagram explanation of liquid sprinkler shown in figure 2. IR sensor placed on 3d printer can detect the end product and amplified output of sensor gives to the controller. The rotary motion of the motor converted in to linear motion by a crank rod mechanism as shown in the figure 3. This mechanism activates the liquid reservoir, which responsible for spraying the liquid mixture. There is a sound alert is a sound alert for the completion of printing process. This mechanism activates the liquid reservoir, which responsible for spraying the liquid mixture. There is a sound alert when printing process is completed.

4. RESULTS

3d model designed using CAD software. Slicing software generated G-code, which is the command for 3d printer. Slicing software also estimate total printing time. G-code sent to controller via wireless manner. IR sensor detect end product and motor rotates. LED and a sound indication for the sign of end product formed completely.

5. CONCLUSION AND FUTURE WORK

Wireless 3d printer with liquid sprinkler successfully implemented. First design a 3d model in CAD and generate G-code give instruction to 3d printer about the path of extruder move. G-code send to controller

wirelessly using xbee module. The product may stick on the platform due to sudden temperature change in the material is a disadvantages of the model available in the market. This problem is solved by introducing a liquid spraying mechanism on end product. Wireless 3d printer with liquid sprinkler can print 3d object and remove the sticky nature of the material on the platform. Sometimes manual replacement of object consumes much time. In future work, introduce an additional product replacing platform with the sprinkler. That can eliminate manual effort for replacing the product and save much time.

6. ACKNOWLEDGMENT

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