3D Model Design using Arduino

Mr. M.S.Shinde[1], Prof. R. R. Karhe[2], Prof. A. J. Patil[3]
[1]Student, Shri Gulabrao Deokar College of Engg. Jalgoan, Maharashtra, India
[2]Professor, Dept. E& TC, Shri Gulabrao Deokar College of Engg. Jalgoan, Maharashtra, India
[3]Principal, Shri Gulabrao Deokar College of Engg. Jalgoan, Maharashtra, India

Abstract—*Arduino is an open-source platform used for constructing and programming of electronics. It can receive and send information to most devices, and even through the internet to command the specific electronic device. It uses a hardware called arduino uno circuit board and software Arduino hardware and its components shall be looked at. Software and the Environment that Arduino runs on are both looked at too. Some applications will be taken as examples that can help to use Arduino in more interesting fields i.e. 3D Printing Technology.*
3D printing is a process of making a three-dimensional solid object of virtually any shape from a digital model. 3D printing is achieved using an additive process, where successive layers of material are laid down in different shapes. 3D printing is also considered distinct from traditional machining techniques, which mostly rely on the removal of material by methods such as cutting or drilling. A materials printer usually performs 3D printing using digital technology. The 3D printing technology is used for both prototyping and distributed manufacturing with applications in architecture, construction, industrial design, automotive, aerospace, military, engineering, civil engineering, dental and medical industries, biotech, fashion, footwear, jewellery, eyewear, education, geographic information systems, food, and many other fields. Open source 3D printing could become a mass market item because domestic 3D printers can offset their capital costs by enabling consumers to avoid costs associated with purchasing common household objects. The proposed system aims to be an affordable alternative to the household user, where currently 3D printing technology is still out of reach for the majority of the population.

Keywords— Open Source Platform, Hardware, Software, Microcontroller.

I. INTRODUCTION

Today the world we live in is becoming hugely dependent on technology. This means there is a need for a more technically skilled workforce to build and maintain required technology. Many new technologies are interactive, therefore it makes it easier to create environments in which learning can be done by doing, receiving feedback and refining understanding and building new knowledge.

Arduino is an open-source platform used for constructing and programming of electronics. It can receive and send information to most devices, and even through the internet to command the specific electronic device. It uses a hardware called arduino uno circuit board and software Programme to programme the board. In these modern day, Arduino are used a lot in microcontroller programming among other things due to its user friendly or easy to use setting, like any microcontroller an arduino is a circuit board with chip that can be programmed to do numerous number of tasks, it sends information from the computer programme to the Arduino microcontroller and finally to the specific circuit or machine with multiple circuits in order to execute the specific command. An arduino can help you read information from input devices such as e.g. Sensors, Antenna, Trimmer (potentiometer) etc... and can also send information to output devices such as LED, Speakers, LCD Screen, DC motor etc.

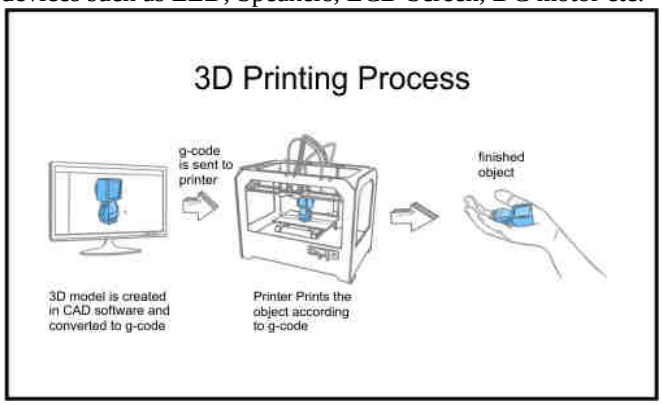

Fig. 1: Conceptual view of Proposed System

As shown in the fig. the proposed system can be divided into three modules. They are

1. Actual Hardware System.
2. Interface System.
3. Computer Based Application.

The actual Hardware System with IC (Integrated Circuit) converts the g-code to hardware control signals. The Connection between hardware & Software is made with serial (USB/COM) port. The serial connection is used to send g-code line-by-line to the microcontroller IC.

II. SURVEY REVIEW

1. Adamu Galadima describes a brief look at the Arduino microcontroller and some of its applications and how it can be used in learning. Arduino is an open-source microcontroller used in electronic prototyping. Arduino hardware and its components shall be looked at. Software and the Environment that Arduino runs on are both looked at too. Some applications will be taken as examples that can help make learning Arduino more interesting. This can be used as a major way to

encourage students and others to learn more about electronics and programming.

2. Kwae-Hi LEE presents a method for automatic 3-D reconstruction of man-made objects using high resolution aerial imagery. The proposed method consists of three parts. First, by using mean curvature diffusion, noise is eliminated and edges are preserved. Next, images are segmented by n'atershed algorithm. Finally, manmade objects are modelled as a set of planar polygonal patches.
3. Ajmal S. Mian addresses the problem and presents a novel algorithm for automatic 3D model-based free-form object recognition. He uses a robust tensor-based representation for matching surface patches from the scene with a model library.
4. Nazim Mir-Nasiri describes design and development of a camera-based tracking robot that can constantly track moving object without necessity of calibrating camera in real world units then control the two wheeled moving platform to follow the object. The camera serves as a feedback sensor to guide robot constantly towards the object. The complexity of the system and processing time is less due to the unnecessary camera unit conversions and calibrations.
5. Pingkun Yan proposed a novel object class detection method based on 3D object modelling is presented. Instead of using a complicated mechanism for relating multiple 2D training views, the proposed method establishes spatial connections between these views by mapping them directly to the surface of 3D model. The 3D shape of an object is reconstructed by using a homographic framework from a set of model views around the object and is represented by a volume consisting of binary slices.

III. ARDUINO AS A LEARNING TOOL

Arduino was actually formed when Massimo Banzi's students couldn't find affordable and efficient microcontrollers for a project they were working on. Banzi together with David Cuartielles created their very own board with one of Banzi's students, David Mellis, writing the programming language for it. Because of how easy it was to use, it became a hit amongst students even if they didn't know much about computer programming and electronics. Soon enough interesting designs using the Arduino microcontroller started springing up. Whether it was making things move or controlling things, Arduino grew in popularity. It is very interesting to see results of a project worked on. Be it a blinking light, a moving part and so on. This interest is what motivates people to design something of their own. The numbers of projects that can be worked on are endless and are limited only by one's imagination. In the following section we shall look at a few project designs using arduino.

IV. 3D PRINTING WORKING

A 3D printer cannot make any object on demand like the "Star Trek" replicators of science fiction. But a growing array of 3D printing machines has already begun to revolutionize the business of making things in the real world. 3D printers work by following a computer's digital instructions to "print" an object using materials such as plastic, ceramics and metal. The printing process involves building up an object one layer at a time until it's complete. For instance, some 3D printers squirt out a stream of heated, semi-liquid plastic that solidifies as the printer's head moves around to create the outline of each layer within the object. The instructions used by 3D printers often take the form of computer-aided design (CAD) files — digital blueprints for making different objects. That means a person can design an object on their computer using 3D modeling software, hook the computer up to a 3D printer, and the watch the 3D printer build the object right before his or her eyes.

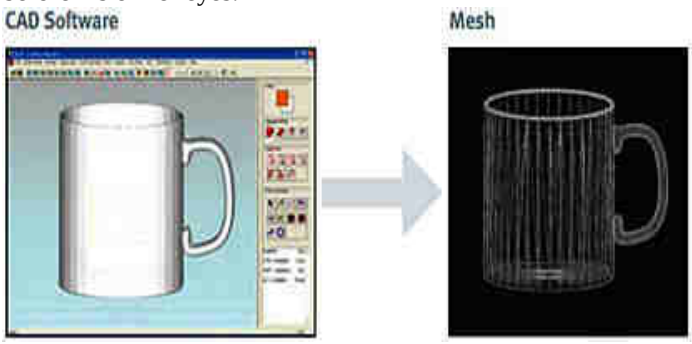

Fig. 3: Example of 3D Printing

The medical industry has also taken advantage of 3D printing's ability to make unique objects that might otherwise be tough to build using traditional methods. U.S. surgeons implanted a 3D-printed skull piece to replace 75 percent of a patient's skull during an operation in March 2013. Researchers also built a 3D-printed ear mold that served as the framework for a bioengineered ear with living cells.

The spread of 3D printing technology around the world could also shrink geographical distances for both homeowners and businesses. Online marketplaces already allow individuals to upload 3D-printable designs for objects and sell them anywhere in the world. Rather than pay hefty shipping fees and import taxes, sellers can simply arrange for a sold product to be printed at whatever 3D printing facility is closest to the buyer.

V. FEARTURES

3D printing probably won't replace many of the usual assembly-line methods for building standard products. Instead, the technology offers the advantage of making individual, specifically tailored parts on demand something more suited to creating specialized parts for U.S. military aircraft rather than making thousands of trash cans for sale at Wal-Mart. Boeing has already used 3D printing to make more than 22,000 parts used on civilian and military aircraft flying today.

Such 3D printing services may not be limited to specialty shops or companies in the near future. Staples stores plan to offer 3D printing services in the Netherlands and Belgium starting in 2013.

Businesses won't be alone in benefiting from 3D printing's print-on-demand any where capability. The U.S. military has

deployed 3D printing labs to Afghanistan as a way to speed up the pace of battlefield innovation and rapidly build whatever soldiers might need onsite. NASA has looked into 3D printing for making replacement parts aboard the International Space Station and building spacecraft in orbit.
Most 3D printers don't go beyond the size of household appliances such as refrigerators, but 3D printing could even scale up in size to build objects as big as a house. A separate NASA project has investigated the possibility of building lunar bases for future astronauts by using moon "dirt" known as neolith.

VI. CONCLUSION

In this paper our 3D printer using Arduino Technology solves the correspondence problem between unordered views of an object for automatic 3D modelling. we builds a 3D feature model for establishing spatial connections between different image views by mapping appearance features to the surfaces of a 3D shape.

REFERENCES

[1] P. D. Minns, C Programming For the PC the MAC and the Arduino Microcontroller System. Author House, 2013.

[2] M. Banzi, Getting Started with arduino. "O'Reilly Media, Inc.", 2009.

[3] Arduino, "Arduino uno." Last visited on 06/09/2014.

[4] A. M. Gibb, New media art, design, and the Arduino microcontroller: A malleable tool. PhD thesis, Pratt Institute, 2010.

[5] M. Margolis, Arduino cookbook. " O'Reilly Media, Inc.", 2011.

[6] D. Mellis, M. Banzi, D. Cuartielles, and T. Igoe, "Arduino: An open electronic prototyping platform," in Proc. CHI, vol. 2007, 2007.

[7] A. U. ARDUINO UNO, "Front. arduino uno board," 2012.

[8] B. Stroustrup et aI., The C++ programming language. Pearson Education India, 1995.

[9] J. Boxall, Arduino Workshop: A Hands-on Introduction with 65 Projects. No Starch Press, 2013.

[10] "Intro to arduino," January 2014.

[11] "Using motion detectors with an arduino," June 2012.

[12] "Capacitance measurement with the arduino uno," January 2014.

[13] H. Kwon and H.-J. Choi, “A time-sequential multi-view autostereoscopic display without resolution loss using a multi-directional backlight unit and an LCD panel,” Proc. SPIE, vol. 8288, 82881Y, 2012.

[14] T.Sasagawa, A. Yuuki, S. Tahata, O. Murakami, and K. Oda, “Dual Directional Backlight for Stereoscopic LCD,” SID Symposium Digest of Technical Papers, vol. 34, pp. 399-401, 2003.

[15] K.-W. Chien and H. Shieh, “Time-multiplexed three-dimensional displays based on directional backlights with fast-switching liquid-crystal displays,” Appl. Opt., vol. 45, pp. 3106–3110, 2006.

[16] Y. Hwang, F.-K. Bruder, T. Fäcke, S.-C. Kim, G. Walze, R. Hagen, and E.-S. Kim, “Time-sequential autostereoscopic 3-D display with a novel directional backlight system based on volume-holographic optical elements,” Opt. Express, vol. 22, pp. 9820-9838, 2014.

[17] J. Schultz, R. Brott, M. Sykora, W. Bryan, T. Fukamib, K. Nakao, and A. Takimoto, “Full Resolution Auto stereoscopic 3D Display for Mobile Applications,” SID Symposium Digest of Technical Papers, vol. 40, pp. 127-130, 2009.

[18] M. Park, J. Kim, and H.-J. Choi, “Effect of interlacing methods of stereoscopic displays on perceived image quality,” Applied optics, vol. 53, pp. 520-527, 2014.

[19] F. W. Campbell and J. G. Robson, “Application of Fourier analysis to the visibility of gratings,” J. Physiol., vol. 197, pp. 551–566, 1968.