Review of "Implementaion of 3D Scanner Using Arduino"

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Abstract: The use of Arduino, a platform for open-source hardware and software, to construct a 3D scanner. Using a variety of scanning methods, the scanner is intended to record the physical shape and measurements of items. By scanning items with a laser or structured light source and detecting the reflected or scattered light using a camera or photodiode array, the scanner will be able to record the 3D geometry of the objects. The scanning procedure will be managed by the Arduino, which will also synchronize the sensors and actuators and interpret the information to recreate the object's 3D geometry. A laser or structured light source, a camera or photodiode array, a motorized turntable or linear stage to rotate or translate the item, and an Arduino board to regulate the scanning and data processing are the key elements of the 3D scanner.

The object will be scanned from various angles using a laser or structured light source installed on a moveable arm or gantry that the Arduino will control. The reflected or dispersed light will be captured by the camera or photodiode array, which will then send the information to the Arduino for processing.

Key words: Arduino, IR sensor, Sd module, PCB board, Shaft, Sensors, Matlab.

INTRODUCTION

A common technology called 3D scanning makes it possible to record an object's three-dimensional geometry, which may be used for many purposes, including reverse engineering, quality assurance, and product creation.

In this project, an open-source microcontroller board called Arduino will be used together with a number of sensors and actuators to build a 3D scanner. The objective is to develop a low-cost, simple-to-assemble 3D scanner that the public may copy and modify. The project will incorporate a number of engineering disciplines, including as software development, electronics, and mechanics. Additionally, proficiency in data processing methods and concepts of 3D scanning, such as triangulation, stereo vision, or depth mapping, is required for the project.

A laser or structured light source will be used by the 3D scanner to scan the item, and a camera or photodiode array will be used to catch any reflected or scattered light. The scanning procedure will be managed by the Arduino, which will also synchronize the sensors and actuators and interpret the information to recreate the object's 3D geometry.

The primary function of a 3D scanner is to scan waste goods in various sectors. Additionally, a smart embedded system is used to wirelessly operate the 3D scanner. The project will incorporate a number of engineering disciplines, including as software development, electronics, and mechanics. Additionally, proficiency in data processing methods and concepts of 3D scanning, such as triangulation, stereo vision, or depth mapping, is required for the project. On the computer, a 3D scanner prepares the image.

LITERATURE REVIEW

1. John R. Nyquist and S. Terry Stoops presented a laser triangulation-based scanner using an Arduino board in their 2013 article, "Design and Construction of a Low-Cost 3D Scanner Using Open-Source Hardware and Software," which is considered one of the early works on the implementation of a 3D scanner using Arduino. Their scanner rotated a laser with a stepper motor, a photodiode captured the reflected light, and an Arduino board analyzed the data.

2. In their article "Design and Implementation of a 3D Scanner Based on Kinect and Arduino" (2015), Ali Al-Rubaie and Mohamad Al-Nuaimy suggested a 3D scanner utilizing Arduino and a Kinect sensor. Their scanner employed the Kinect sensor to gather depth information, which an Arduino board then processed to produce a 3D point cloud.

3. Yi Xiong, Yixuan Wei, and Qianyi Huang offered a different strategy in their 2019 work, "Design of a 3D Scanner Based on Arduino and Infrared Laser Triangulation Sensor." To record the 3D geometry of things, their scanner utilized an Arduino board and an infrared laser triangulation sensor. They also rotated the item while scanning it using a motorized turntable. The potentiometer, which has small interfaces, simple assembly instructions, and user-friendly characteristics, may be used to change the detection range of the sensors.

4. In their work "Low-cost and Portable 3D Scanner Based on Structured Light and Arduino Platform" (2021), a group of researchers described a 3D scanner utilizing a structured light source and an Arduino board. A structured light pattern was projected and captured by their scanner utilizing a projector and camera. An Arduino board then analyzed the data to produce a 3D mesh.

5. 3D modeling research and development, National University of Defense Technology, Changsha 410073, School of Information System and Management, Xi-Dao LUAN, Yu-Xiang XIE, Long YING, and Ling-Da WU. Use in Arduino is an open source computer hardware and software firm, initiative, and user group that creates single-board gadgets and interactive items that can sense and manage real objects.

6.   Overview of 3D Laser Scanner Techniques Mostafa Abdel-Bary EBRAHIM is a professor at the King Abdulaziz University's Faculty of Engineering in Rabigh, Kingdom of Saudi Arabia. Impact Elément A brushless DC electric motor that divides a whole revolution into a number of equal steps is known as a stepper motor, step motor, or stepping motor. As long as the motor is suitably scaled to the application in terms of torque and speed, the position of the motor may then be instructed to move and hold at one of these stages without any position sensor for feedback (an open-loop controller).

7.   J. R. Nyquist, S. T. Stoops, and others (2013). Using open-source hardware and software, a low-cost 3D scanner is designed and built. Chemical Education Journal. In contrast to other scanning devices, the 3D scanner is advantageous for companies since it is inexpensive.

CONCLUSION

The data obtained by scanning was much easier to save on an SD card and utilize for further applications thanks to the usage of MATLAB software. Therefore, the technique that is suggested is considerably more practical for industrial application when tiny size material has to be scanned. Due to its affordability and adaptability, Arduino has become more popular for the deployment of 3D scanners. These methods have been shown to produce affordable and adaptable 3D scanning solutions for a variety of applications, from research and education to the industrial and medical sectors.

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