IR 3D SCANNER

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ABSTRACT

The aim of this project is a to design and construct a low cost and high efficient 3D Scanner with some handy features.3D Scanner is a device which has the ability to get a 3D structure of the particular object.Generallya3D scanner consists of a source of electric current, a camera and a PC user interface for controlling the scanner and acquiring data via an Ethernet connection. But my 3D scanner consists of IR sensor, PIC 16F877A microcontroller, and Stepper motors and a Motor controller IC. This 3D scanner facilitates 360-degree scans through the implementation of a rotating sample platform. Each position of rotation is scanned using a linear actuator to increase resolution. And our scanner is capable of producing all data necessary to compute and construct 3D representations.

Other kind of 3D scanners used so far in the world, operated using a laser beam. But since our 3D scanner uses IR sensor, it is cheaper than the others. This module is also controlled using a PC interface (Serial port communication).

This project is called the Designing a 3D scanner. This is a perfect solution for the commercial industries such as Aerospace, Automotive, Consumer Products, Manufacturing, Heavy Industries, Medical, Oil and Gas, Power Generation. This sensor can be used to detect the 3D structure of a particular object. The featuresofthis3D IR scanner are low cost, Efficient and easy operation.

Keywords: Microcontroller, 3D scanner, personal computer

1. INTRODUCTION

This project is to design a low cost, highly efficient, user friendly and accurate IR 3D scanner. This IR 3D scanner can be used to fulfill the requirements of some industries such as, Aerospace, Automotive, Consumer Products, Manufacturing, Heavy Industries, Medical,

Oil, Power Generation. Since the system is fully automatic, users will be able to enjoy the closest solutions for their requirements.

Generally, the main goal of the project is to design and construct the IR 3D scanner with advanced controlling system .Therefore, to achieve this goal there are many scopes for this project, which contains many aspects. The scopes contains in thisprojectis3D object scanning, hardware and electronic circuit.

The first scope is about network installation and technique. In this project, focus will be given to the given object for scanning. Moreover, this project is design for people who involve seriously in various fields. This project also involves on hardware and electronic circuit basic and the technique. The electronic basic involves on design the related circuit such as stepper motor controller circuit and power control circuit. The processes are continuing with simulation, modification and construct the circuit to the board. This project are involved on PCB and casing design.

In this project, thePIC16F887areused in order to program the scanning process and to make sure that the circuit that had been designs function as needed. The software involved in this process is Proteus and micro PRO for PIC.

2. EXPERIMENTAL

When an object is placed on the platform of the scanner, IR sensor emits the IR ray towards the object and the reflected rays received by the sensor are recorded and analyzed. The platform is rotated horizontally up to 360 degrees, then the scanner reads both x and y coordinates. After completing 360 degrees the IR sensor moves vertically taking z coordinates, and continues horizontal readings continuously and then again takes vertical readings for every point of the particular object. After taking all the x, y, and z coordinates they are analyzed by the software and plot all the observed points. After joining the points on the plot the scanned 3D image is created. The details of the components are as follows.

2.1 Microcontroller

The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worrying too much if there are enough pins to do the job including 33 I/O lines, eight 10-bit ADCs, two PWM Channels and runs at 16MHz. This is mostly used in many applications[2].

2.2 IR Sensor

An Infrared (IR) sensor is used to detect obstacles in front of the robot or to differentiate between colors depending on the configuration of the sensor.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, its resistance and correspondingly, its output voltage, change in proportion to the magnitude of the IR light received. This is the underlying principle of working of the IR sensor[3].

2.3 USB –TTL

The TTL-232R-3V3 is a USB to TTL serial converter cable incorporating FTDI's FT232RQ USB - Serial UART interface IC device, the latest device to be added to FTDI's range of USB UART interface Integrated Circuit Devices. It is designed to allow for a fast, simple way to connect devices with a TTL level serial interface to USB[4].
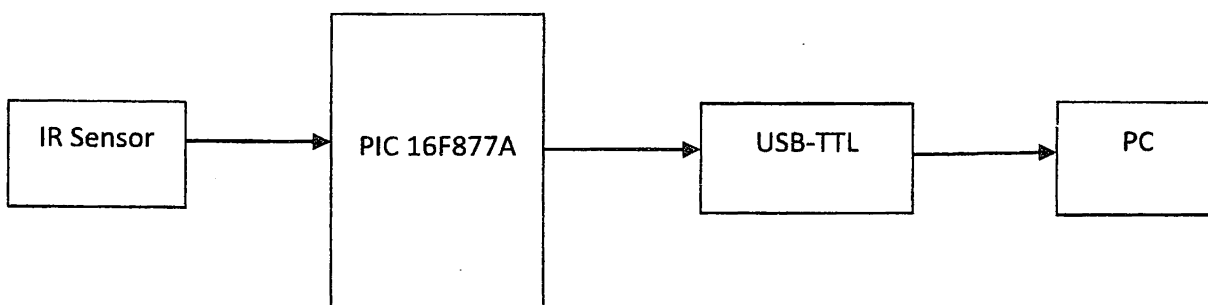

Figure 1: Block Diagram of the System

3. RESULTS AND DISCUSSION

- A 3D scanner is a device that scans three – dimensional objects.
- 3 Dimensional coordinates can be taken as the final output of the project.
- The 3 dimensional data will be saved as a text document in the computer.

Advantages of the project

- System independent (civil engineer, same business, using in the same films,)
- Manual quality assurance can be automated using the system.
- Cost effective
- Accuracy
- Process speed controllable
- Easiness of making virtual object using real word objects coordinates

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4. CONCLUSION

The project is done according to the 3D measurements which required for the scanning. The outcome is clearly mentioned and the way to scan a document is clearly described in the paper. Designing level is clearly mentioned and components also gathered according to the requirements.

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