PORTABLE 3D SCANNER

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Introduction:

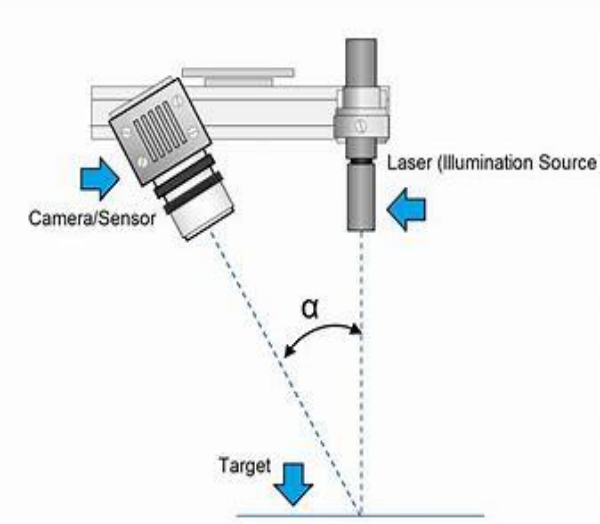
3D scanning is the process of analyzing and scan a real-world object or environment to collect data on its shape and possibly its appearance. The collected data can then be used to get XYZ coordinates to plot a point cloud which is then used to construct a digital 3D model. Various methods exist for this process, this project uses Triangulation and Structured light approach to get the required coordinates for plotting the point cloud.

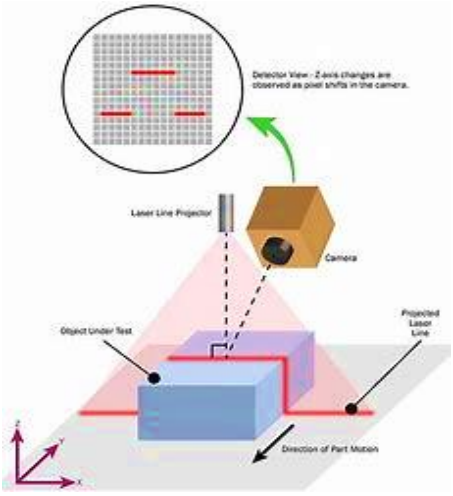
Objectives:

- To create a high resolution 3-Dimensional model which can be used for creating duplicate objects using 3D printing.
- 3D scanning made easy to model and replicate 3D models in an efficient way.
- To overcome the limitations of the current 3D scanners

Methodology

Triangulation is a method that uses trigonometry to find the distance of the surface of the object.





The triangulation laser shines a laser on the subject and exploits a camera to look for the location of the laser dot Depending on how far away the laser strikes a surface, the laser

dot appears at different places in the camera's field of view. The laser dot, the camera and the laser emitter form a triangle. The distance between the camera and the laser emitter are known. The angle of the laser emitter corner is also known. The angle of the camera comer can be determined by looking at the location of the laser dot in the camera's field of view. These three pieces of information fully determine the shape and size of the triangle and gives the location of the laser dot corner of the triangle. Hence determining the distance at which the surface of the object is located. A laser strip instead of a single laser dot, is swept across the object to speed up the acquisition process

A line laser is used to speed up the process of scanning by projects a continuous line of light on a surface. Therefore, we obtain a greater number of points in given time compared to a point laser. The basic principle of triangulation remains the same, but due to the larger surface area under scan a high-resolution camera with a high pixel density is used as a detector. The camera is calibrated to detect the reflected wavelength of light.

The camera is placed at an angle to the surface and the laser line, when projected it reflects a distorted line when the distance with respect to surface of the object changes or a imperfection on the surface is being scanned, by analysing the distorted reflection we can reproduce the 2D surface, by moving sensor or the object perpendicular to the line we produce a 3D image.

Results and Conclusions

- The advent of 3D scanning, representation of 3D objects modelling was used to be done by complex 2D representation.
- 3D scanning made easy to model and replicate 3D models in an efficient way.
- But in today‘s 3D scanners we lack the specifications that meet designers needs like accuracy, speed and resolution. Which in turn make these scanners unpopular in industries.
- Hence this model/prototype is built to improve some of the limitations.\

Scope for future work

As mentioned above 3D scanners are still relatively new technology which leaves Engineers and Developers opportunity to improve the technology at a large scale. Even though the proposed 3D scanner is better than existing technology, it still leaves room for more improvements. In the future iterations of this scanner range of scanning will be improved, which makes scanning very large objects with high accuracy and resolution possible. Further the scanner can be implemented on mobile vehicles like an automated Drone or a UAV to produce highly accurate 3D topographical maps by scanning vast terrains which are difficult to be accessed by humans, saving time and energy in the process.