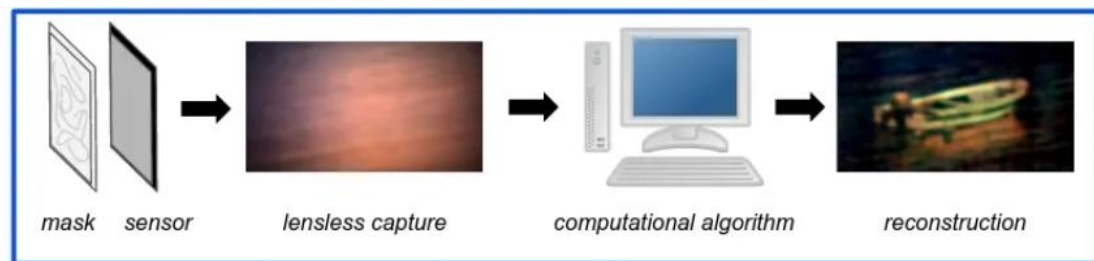# INTRAORAL 3D SCANNER

TASKS ASSIGNED
- ➢ Lensless image dataset and search algorithm for reconstruction
- ➢ Micro lens Array
- ➢ LIDAR sensor
- ➢ Laser guided 3D scanner

1) Lensless imaging - hardware, software and algorithms

For capturing the image, They use diffuser-cam which is the image sensor. This is being controlled by Raspberry Pi. The images are captured and fed into reconstruction Algorithm for better quality. There are blogs for every steps in which they have explained how to do lens less imaging, about point source and computational algorithm.

mask   sensor   lensless capture   computational algorithm   reconstruction

Reference
https://medium.com/@bezzam/a-complete-lensless-imaging-tutorial-hardware-software-and-algorithms-8873fa81a660

2) MULTI LENS ARRAY

Multi-lens arrays (MLAs) are optical components that consist of multiple lenses arranged in a pattern on a substrate. For medical application, Microlens array are being used.

I have gone through the site EDMUNDOPTICS for our requirement of 12inch*1 inch Multilens array but they have 58.0 x 60.0 mm and 46.06 x 46.06 mm.

I will enquire them if they could provide us as per our requirement
https://www.edmundoptics.in/f/multi-lens-arrays/13719/

OTHER HANDY RESOURCES

NALUX CO.,LTD

 "Micro Lens Array" can be used as controllable optical diffuser. MLA have been widely used for illuminator lens for sensors, for example face recognition, autonomous driving, factory automation, AR/VR, security, etc.


Reference
 https://www.youtube.com/watch?v=yGh4yTvkccc
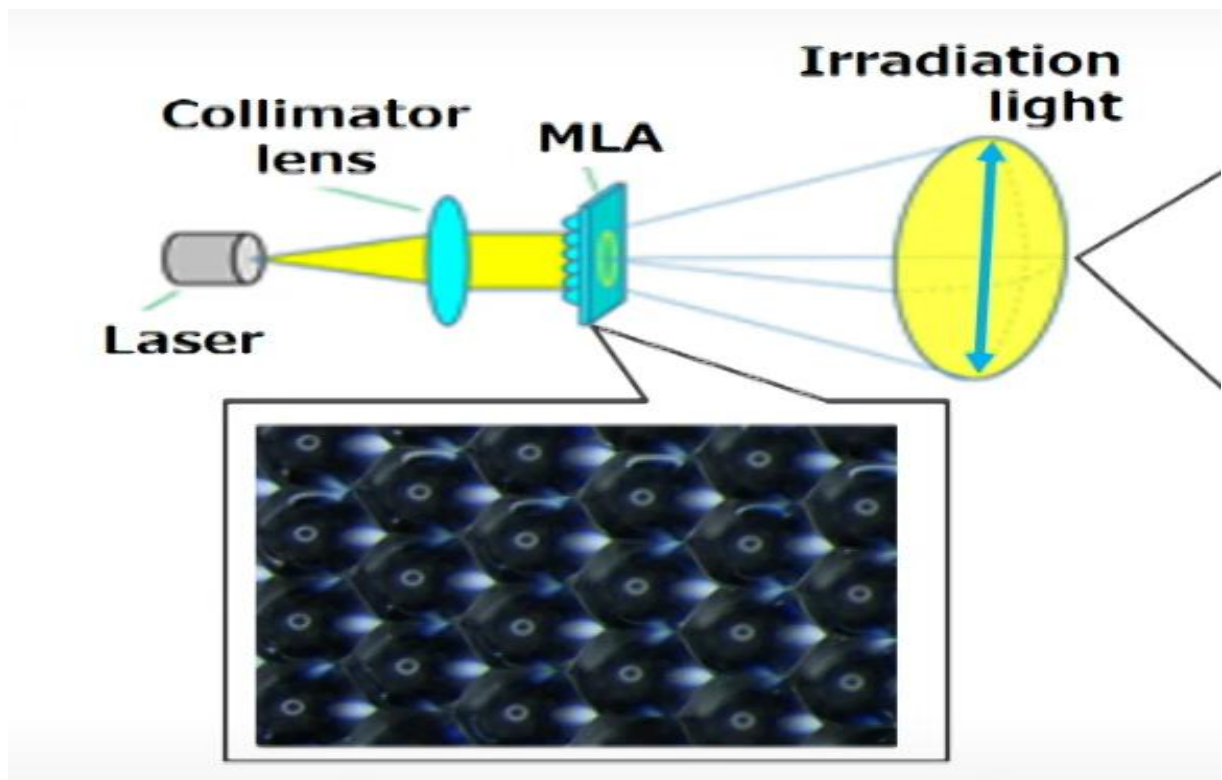
3) IMAGING ASPECT

There are methods like parallel confocal imaging or fluroscence imaging and triangulation using laser light which are being used in current scanners.

1) **Parallel confocal imaging** - focuses a smaller beam of white (visible) light at one narrow depth level at a time. Point capture (part of a sample) are imaged at a time and stitched

2) **fluorescence imaging or Structured light imaging-** uses white light for focuses entire sample to be captured at a time
Reference - https://en.wikipedia.org/wiki/Confocal_microscopy

3) **triangulation using laser light** - Uses LiDAR for estimating depth of the capture. It measures the distance to a target. The distance is measured by sending a short laser pulse and recording the time lapse between outgoing light pulse and the detection of the reflected (back-scattered) light pulse

Measuring Distance Using LiDAR
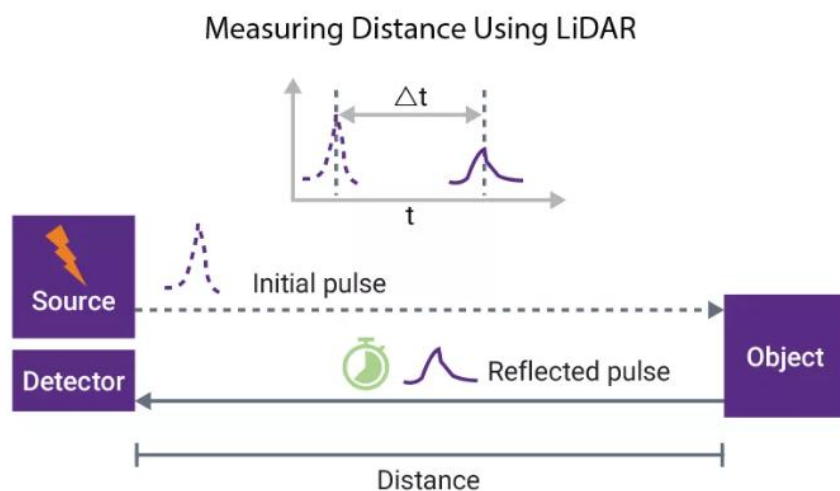
4) Laser guided 3D scanner

   LiDAR could be used to scan larger areas of the mouth, such as the entire arch, with greater accuracy than other methods

- LIDAR scanners use laser light to measure distances. The LIDAR sensor emits laser beams into the oral cavity.
- The laser beams emitted by the LIDAR sensor bounce off the surfaces.
- The LIDAR sensor measures the time it takes for the laser beams to travel to the surfaces and back. By knowing the speed of light, the system can calculate the distance to each point where the laser hits.
- The collected distance measurements create a point cloud, which is a dense set of 3D coordinates representing the surfaces in the scanned area. This point cloud forms the basis for the detailed 3D model
- The LIDAR data with other imaging technologies, such as optical scanning or structured light scanning. This integration helps improve the overall accuracy and detail of the captured 3D model

OTHER REFERENCES

Intra-Oral 3D Scanning for the Digital Evaluation of Dental Arch Parameters
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REAL3D VOLViCON - Evolution of their scanner after several iteration
https://real3dtech.com/real3d-intraoral-3d-scanner.html
LiDAR
https://deliverypdf.ssrn.com/delivery.php?ID=750066083101071100064066091119104076007056010023061049023086004108095109006125013111041119107107108043037093088113123102117084060086008008061124027082127089021082004064001071084068013087083030002081121115070012 0