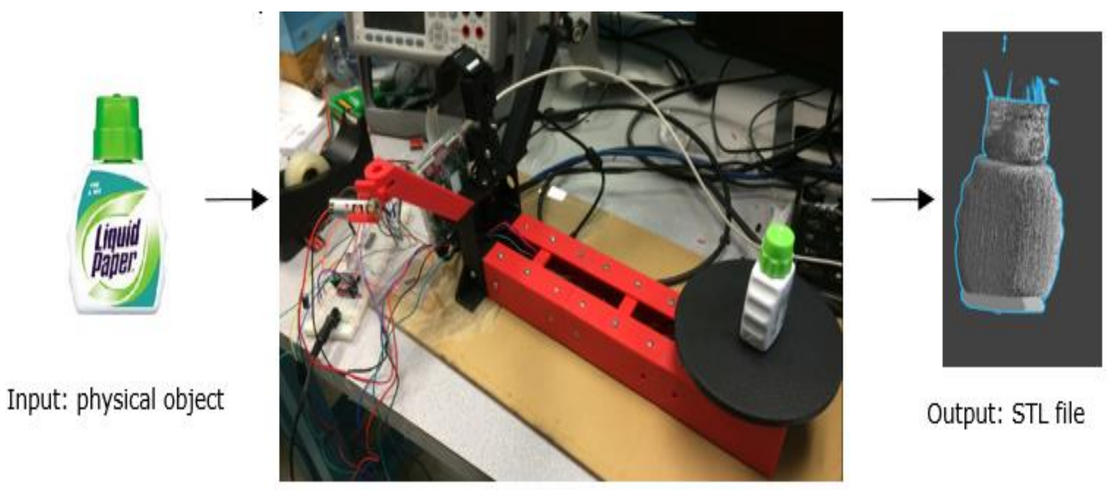
# 3D Scanner

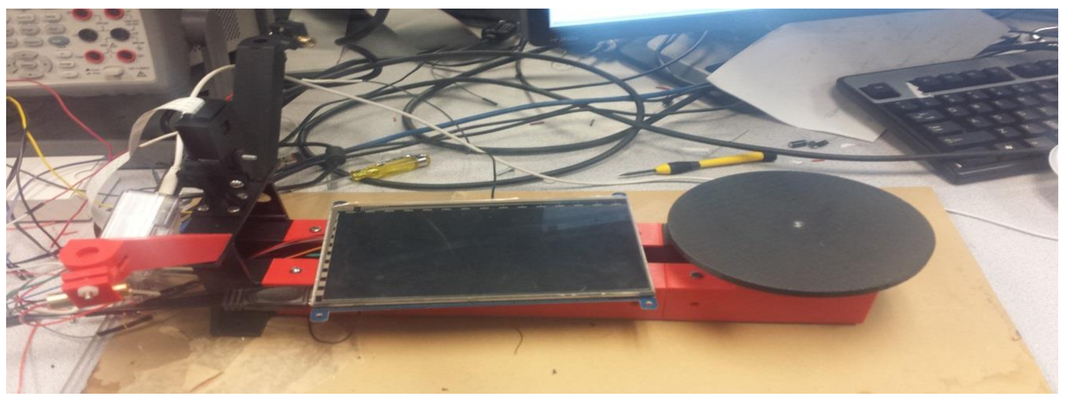
Vangjel Frasheri, Siyan Lin, Chenkai Zhou
Faculty Advisor: Prof. Tessier

## Abstract

**3D scanners are relatively new technologies that have many useful applications, but yet very few people own them, mostly due to the expense of the product. Our implementation is a way to create a cheap standalone 3D scanning system, which through the use of processing information taken by a camera and line lasers, can create digitized 3D models**

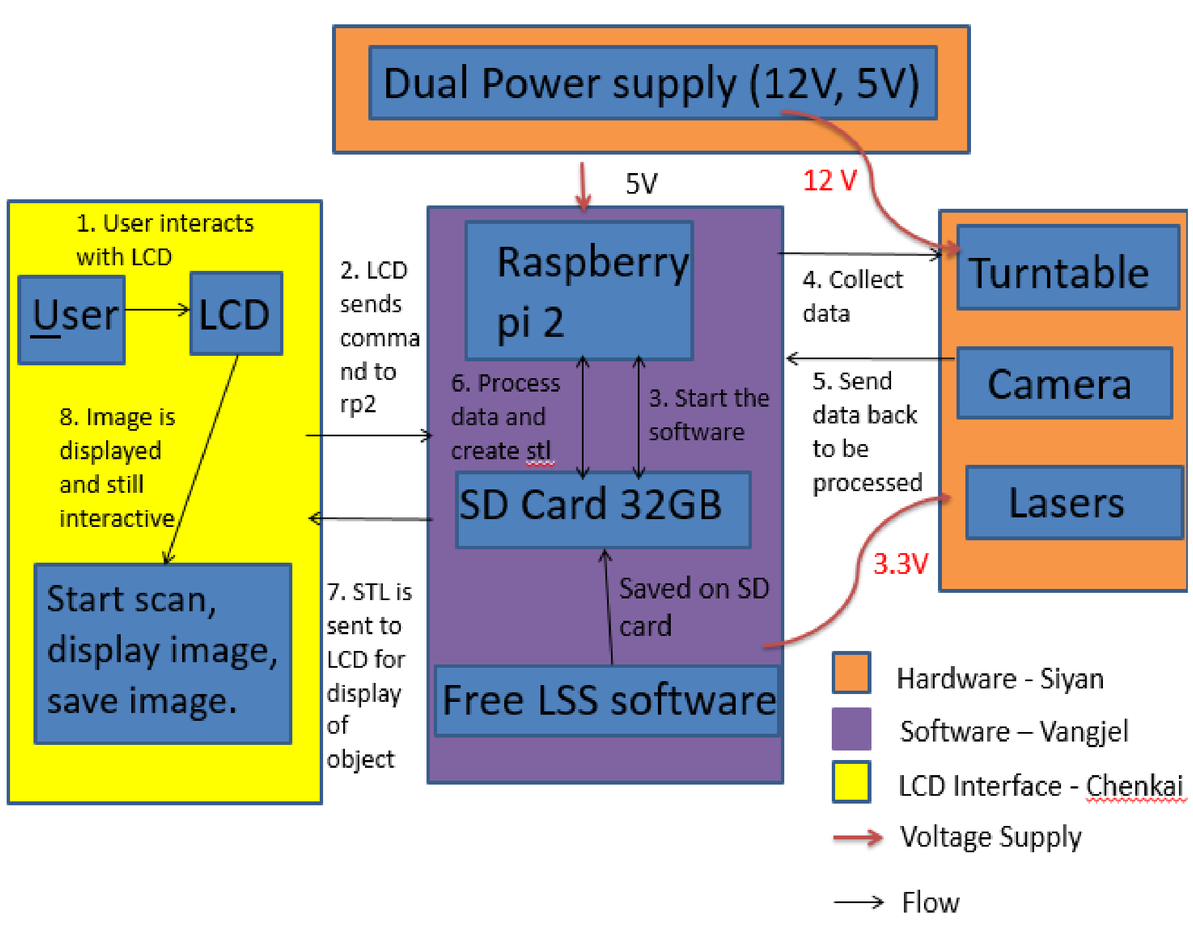
## System Overview



- **Objects are placed on the turntable**
- **The LCD screen includes a user interface to interact with the system**
- **With the click of a button, scan starts**
- **Once complete, you can send it to your email for printing!**

## Block Diagram




## Results

STL file

Original on the left, printed scan on the right

- **Size accuracy is within 1mm**
- **Lighting can reduce scan quality**
- **Object material can reduce scan quality**

## Specifications

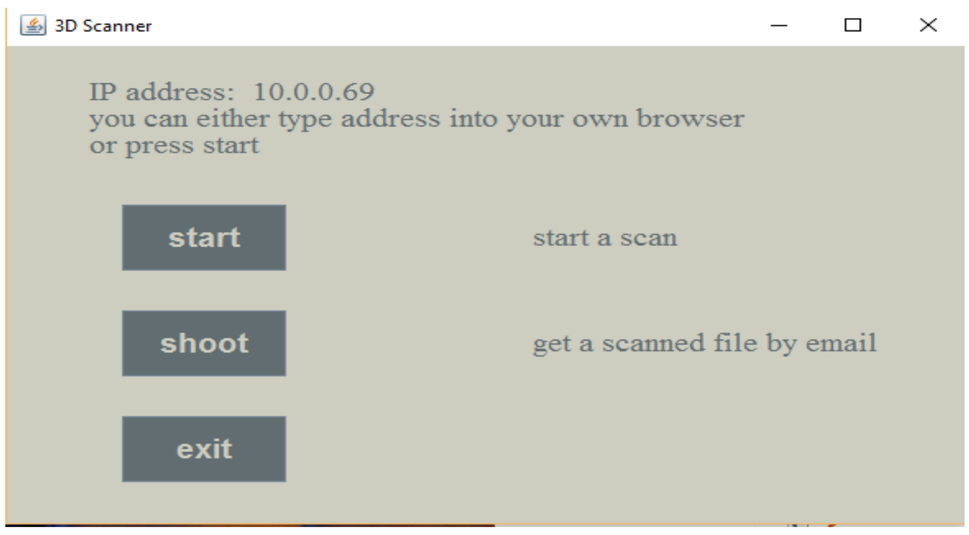
| Specification | Goal | Actual |
|---|---|---|
| Weight | 1kg | 2kg |
| Power consumption | 34W | 22.25W |
| Cost | Under $300 | $255 |
| Accuracy | +/- 5cm | +/- 1mm |

## Acknowledgement

**We own our great success to Prof. Tessier; it would been very different without his advice and guidance. We would also like to thank our reviewers. Prof. Gong and Prof. Leonard for spending their time to evaluate our project and gave us some very great feedback**

# The User Interface

- With the start button, you get instant access to the freelss website
- From there you can start scanning your object
- The shoot button prompts for an email to send your last scan to

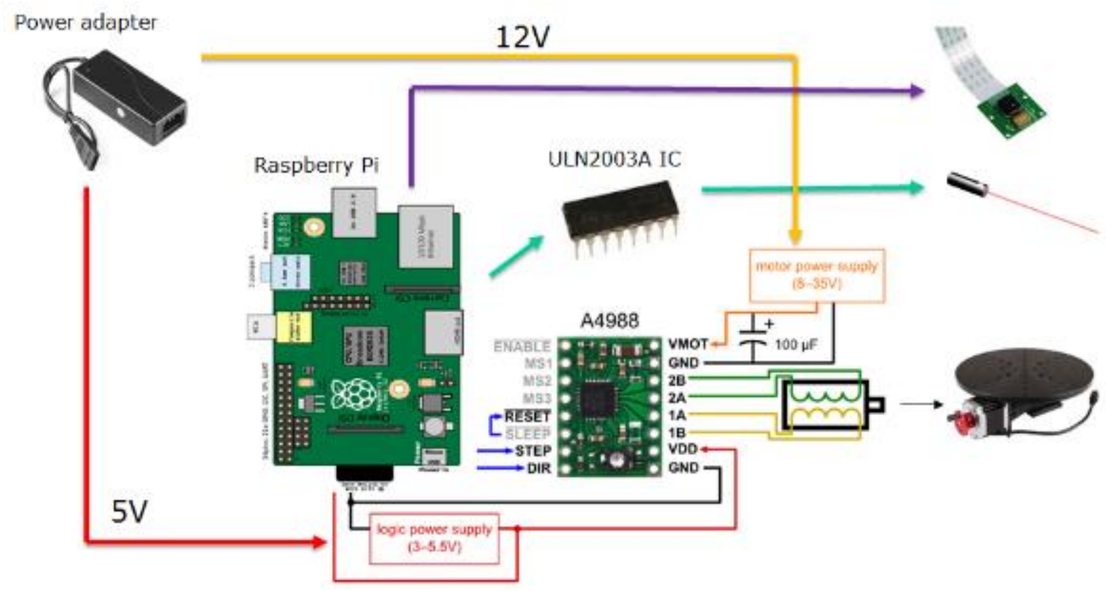



# Data Collection

- Turntable table
  200 steps/rev

- laser
  Line laser
  Red (wavelength 520-635 nm)

- Camera
  Camera data processing(time-lapse ect.)
  5MP (2592x1944 pixels)
  Video resolution 1080p30




# Cost

**Development**

| Part | Price |
|---|---|
| Raspberry Pi 2 | 45 |
| Step Motor | 60 |
| Laser Sensors | 50 |
| Camera | 30 |
| PCB | M5 |
| LCD | 70 |
| Total | 255 |

**Production(1000)**

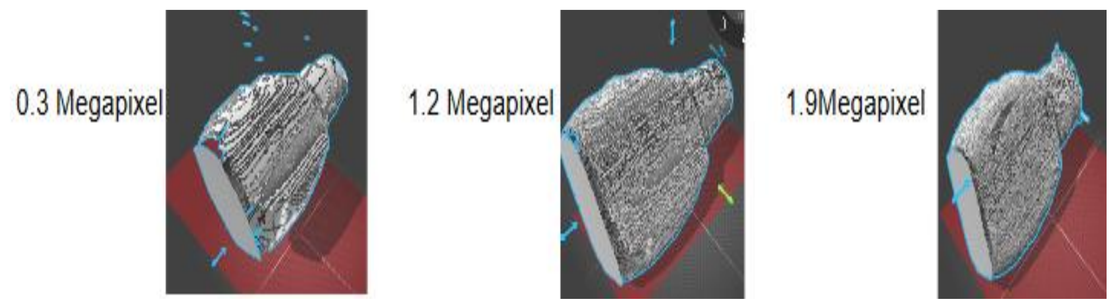
| Part | Price |
|---|---|
| Raspberry Pi 2 | 29.95 |
| Step Motor | 33.54 |
| Laser Sensors | 27.56 |
| Camera | 23.7 |
| PCB | 5.5 |
| LCD | 55.3 |
| Total | 175.5 |

# Resolutions

- Resolution:

5 Megapixel( 2592 X 1944) takes about 55 mins.
1.9Megapixel( 1600 X 1200) takes about 10 mins.
1.2Megapixel ( 1280 X 960 ) takes about 8 mins.
0.3 Megapixel (640x480) takes about 3 mins.

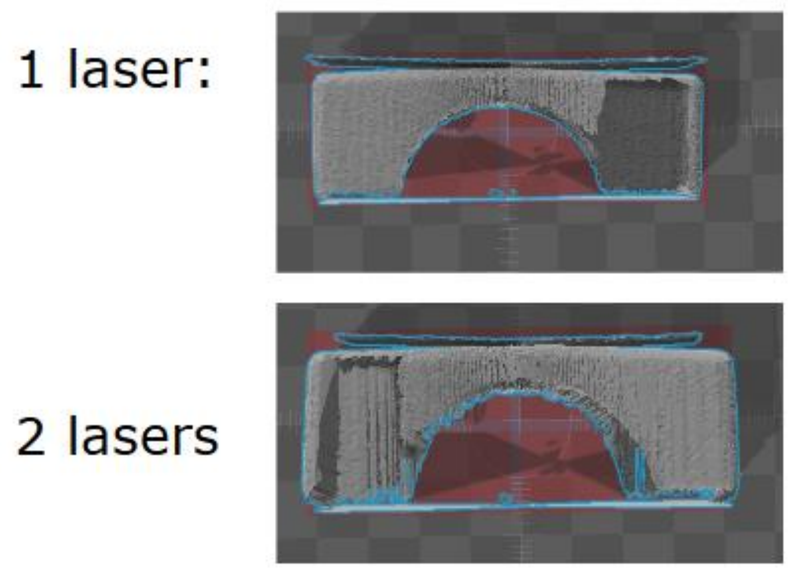
- Size : 2MB- 100MB




# Optics Sensor

One vs. Two lasers

- Able choose one or two lasers for a scan
- not increases the quality
- but reduce the number of “gaps”
- Calibrate before use




# Experiment

Laser triangulation

- A laser line point to scan across a target sample
- A camera sensor picks up reflected light
- System calculates the distance from the object to the scanner