DCBA 3D Scanner

Low-Cost, High-Precision, User-Friendly

Vision

Our Vision:

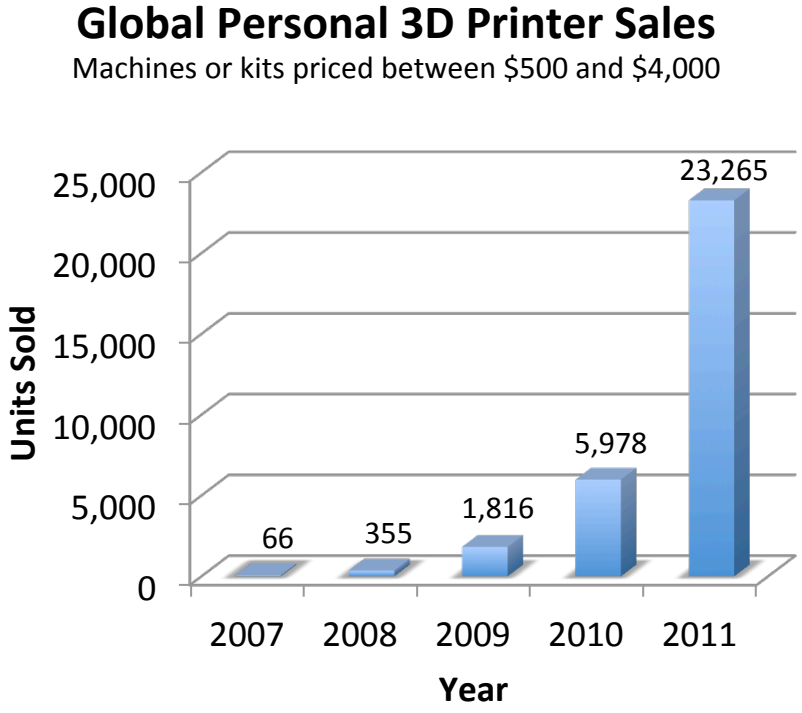
All work in measurement, design, art, and manufacturing will soon take advantage of the accuracy and speed of 3D scanning.

Our Goal:

We will develop high-quality 3D scanners accessible to individuals and businesses on small budgets.

Market

- Existing $350 million 3D scanning market targets large businesses – similar accuracy and lower price exposes a much larger market
- Potential users
  - Research labs
  - Hobbyist builders
  - Artists
  - Product Designers
  - Small manufactures
- Interest in and use in 3D of printing is growing wildly. 3D scanning is the other part of this revolution



Data from Wohlers Report 2012: Additive Manufacturing and 3D Printing State of the Industry

Relevant Technology Advances

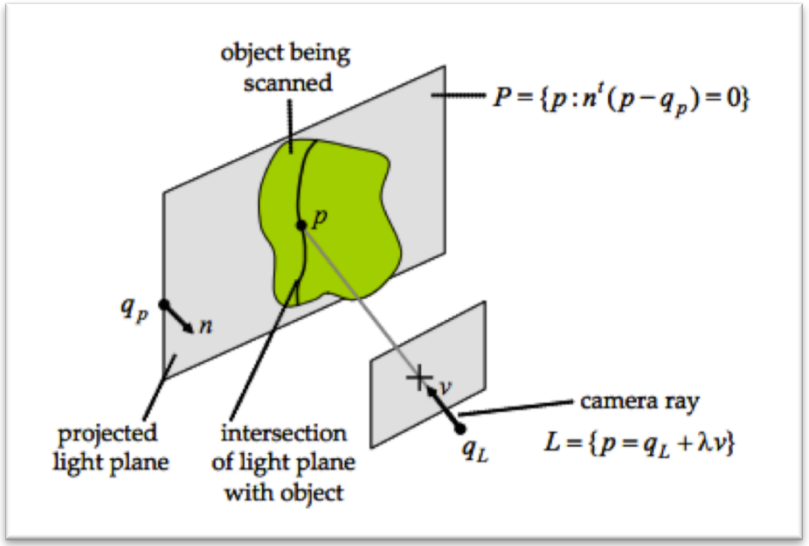
- **Optics and Digital Imaging**
  - Notably emergence of high-quality, compact, and cheap cell phone cameras
- **Computing**
  - High-power computers are practically ubiquitous
- **Digital Fabrication**
  - High-precision laser cutting and CNC machining is now easily attainable

Scanning Techniques

- Existing methods include
  - Structured Light
  - Image Reconstruction
  - Laser Time of Flight
  - Laser Triangulation
  - Computed Tomography
  - Serial Sectioning
  - Contact Scanning
- Recent interest in 3D scanning has spurred academic research advances, particularly in structured light and image reconstruction

Structured Light Scanning

1. Known light pattern is projected onto scene
2. Scene is imaged using one or more cameras
3. Point cloud calculated by triangulation



Images from Douglas Lanman and Gabriel Taubin's SIGGRAPH 2009 Course Notes accessed on 3/4/2013 at http://mesh.brown.edu/byo3d/notes.html

Product Goals

- **Accurate**
  - 0.025 mm accuracy
  - This level of precision comparable to or better than most manufacturing processes
- **Low-cost –** less than $500
- **Usable**
  - Intuitive website and software UI
  - Computer-controlled calibration
- **Modular**
  - Easily alter the workspace
  - Enables scanning a single face of large objects, all faces of a small object, or even an entire room with one system
  - Allows easy upgrading, maintenance, and expansion
- **Compact –** fits on top of a desk

Our Team

Troy Astorino
Year: 2013
Major: Physics/AeroAstro
Job: Team Lead/Programming

Gus Downs
Year: 2013
Major: Physics, Math
Job: Mechanical & Electrical Engineering

Craig Cheney
Year: 2014
Major: Mech. Eng.
Job: Mechanical Engineering

Turner Bohlen
Year: 2014
Major: Physics
Job: Programming

Our Current State

- Ideas we want to explore:
  - Fixed and moving gratings over LEDs instead of projectors
  - Redundant arrays of cheap CMOS cameras
  - Merging multiple scanning techniques

[CAD model here]

Next Steps

- Prototype Prototype Prototype!
- Explore algorithmic methods for combining multiple scanning methods and reducing error
- Forward-facing software development to allow for various input devices (allows rapid modification during prototyping and future additions)