# 3-D Laser Scanner

by **argon** on August 4, 2005

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## Intro: 3-D Laser Scanner

Create your own super hi-tech 3-D laser scanner. Using just a laser pointer, wine glass, rotating platform, and a digital video camera, you can make accurate 3-D models of an object or person.

Now on Know How! Click on the steps above for more details.


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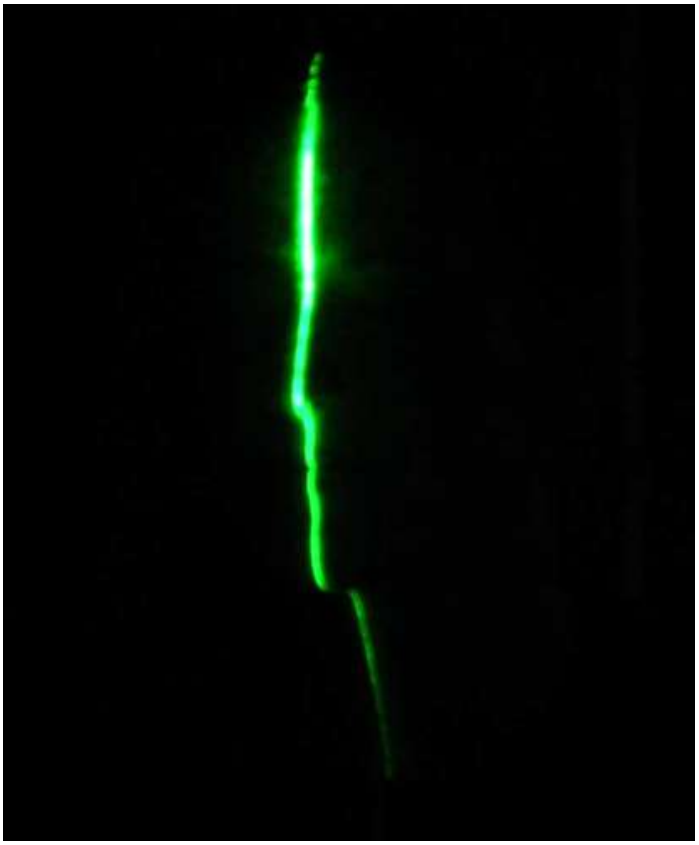
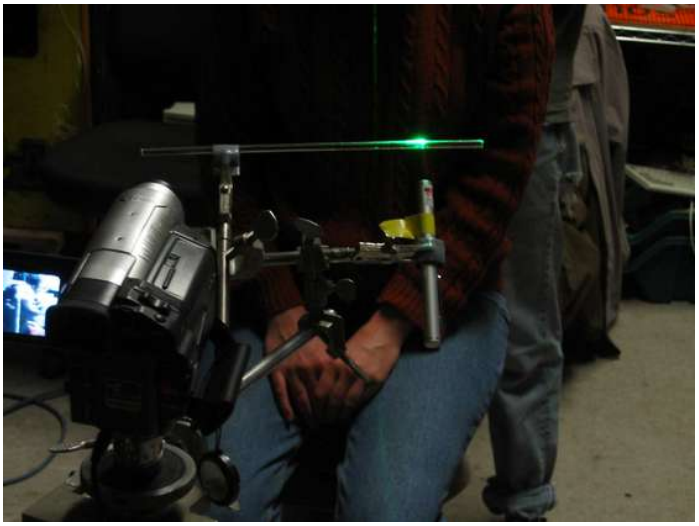




### File Downloads

**timsmom4.stl** (11 MB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'timsmom4.stl']

## Step 1: Position camera, laser, and cylindrical lens

Align the laser so that its beam passes through the cylindrical lens, creating a vertical line rather than a point, and projects onto your target. Initially, the lens was the stem of a wine glass, but in this picture I use a cylindrical piece of acrylic. Position the video camera at a small angle (~15 degrees) from the laser.

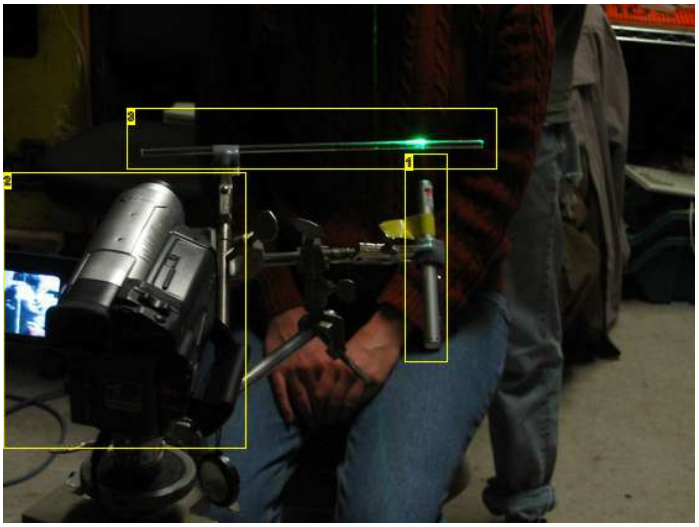
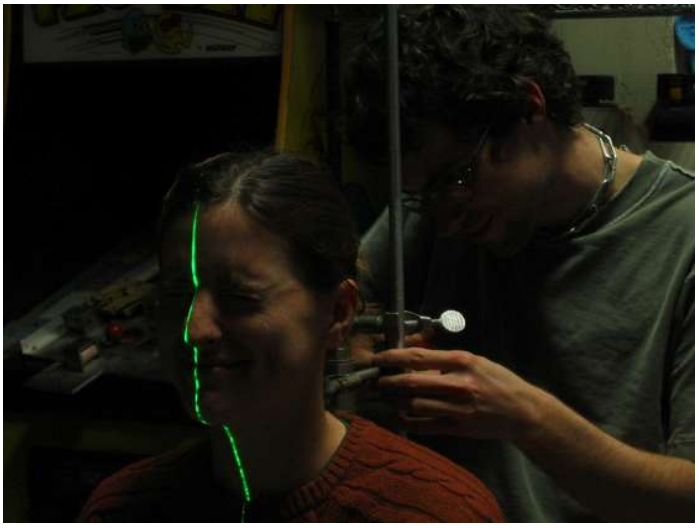


**Image Notes**

1. Laser pointer. Use a green laser if you want it to look cool, although any color will suffice.
2. Video camera. Position the video camera at approximately a 15 degree angle to the laser.
3. This is the cylindrical lens. Originally, I used the stem of a wine glass, but eventually, I upgraded to an acrylic rod.

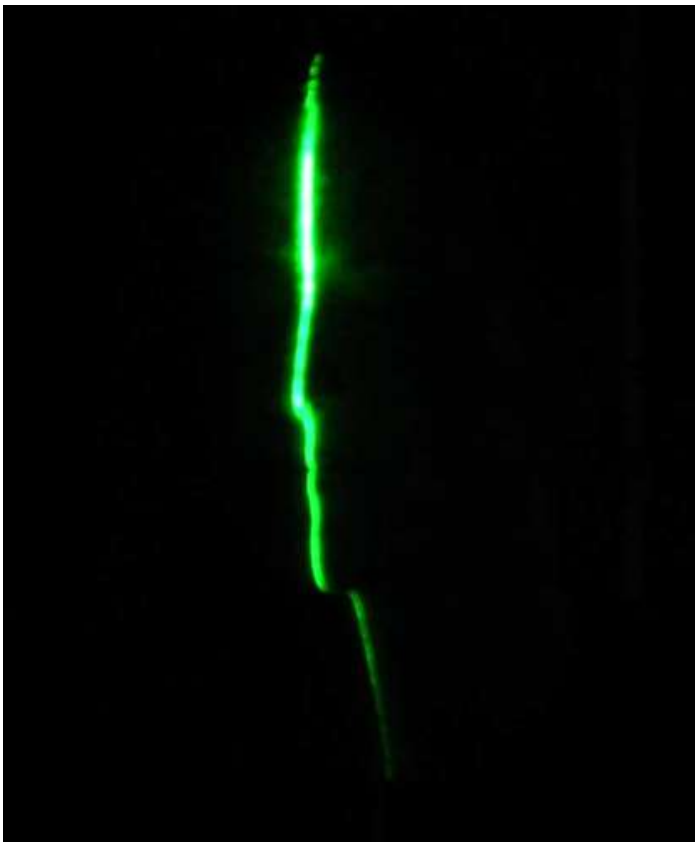
## Step 2: Position target on rotating platform

Create a platform which rotates at a constant angular velocity. Record players, for example, are perfect for small objects. Position your target at the center of rotation. And make sure your target closes her eyes!



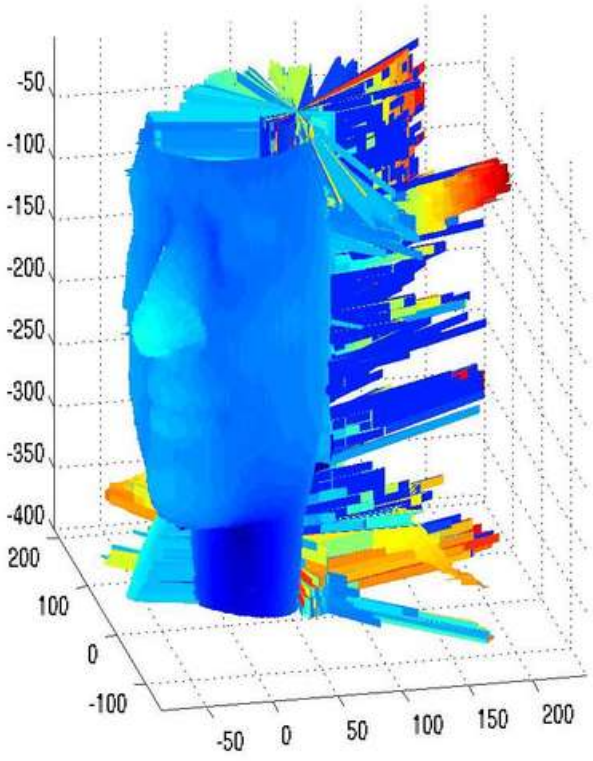
## Step 3: Lights, camera, action!

Turn off the lights. To make the image processing easier, it's very helpful to get the room as dark as possible so that only the reflected laser light is visible. Rotate your target at a constant angular velocity. Record the video. Notice how protruding features displace the laser line.



## Step 4: Process the video

Convert the video to an avi. Use an edge detection algorithm to find the location of the laser line. Reconstruct your 3-D model. I've included an early, uncommented MATLAB script, which was used to generate this image.




**File Downloads**

**KnowHowScanner.m** (4 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'KnowHowScanner.m']

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## Comments

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**v.navaneethakannan** says: Mar 12, 2011. 3:42 PM **REPLY**
I couldn able to download the script...Kindly help me out pls

**Moo_cow** says: Mar 5, 2011. 12:51 AM **REPLY**
Could you just use a laser level since it already makes the beam a vertical line, or does it have to be green?

**ronibar02** says: Jan 6, 2011. 1:14 AM **REPLY**
Hi Argon,
I am looking for a scanner for scanning the bottom of the foot, and use the digital data to carve insoles with a cnc system.
Can you help with that?

**greenjedi** says: Feb 8, 2011. 5:33 PM **REPLY**
Maybe you could make a mold of the foot and then scan the mold?

**grcan** says: Jan 19, 2011. 12:00 PM **REPLY**
When I use this script in Matlab, to give message "Undefined function or variable 'laserColor"
How can I use tihs script ? Thanks

**v.navaneethakannan** says: Nov 15, 2010. 11:49 AM **REPLY**
Fabulous work! I am involved in creating a low cost 3D scanner for physically challenged ( bio medical application ) can some guys help me out in carrying out..please..

**tanmaysane** says: Oct 31, 2010. 8:24 AM **REPLY**
Itz indeed an awesome concept.I am trying to make such a scanner myself.cud u plz help me wid the basic matlab source code. As in from where can I download the matlab code?

**rvillamil** says: Sep 30, 2010. 2:58 PM **REPLY**
Hi I know very little of MATLAB but I want to know if you could explain me how to use it. How do I call the function that throws me the 3D image of my scan.

thank you

**rvillamil** says: Sep 27, 2010. 9:04 AM **REPLY**
Hi everyone, this is really cool, I have used David-laserscan and it pretty sweet.
Does anyone know how to scan big Objects, does it need Calibration patterns?
Does anyone know how to scan by moving camera and laser, for example scanning big objects.

Thanks!

write back!

**tinkerman92** says: Aug 30, 2010. 7:31 PM **REPLY**

if u wanna save the trouble of building a rig to make a line of the laser u can simple buy a lined laser diode like this 1 here http://www.dinodirect.com/red-laser-module-focused-line-5mw/AFFID-15.html

**garninja** says: Sep 14, 2009. 1:20 PM **REPLY**

what file do you download on http://www.david-laserscanner.com/

**badideasrus** says: Aug 29, 2010. 1:43 PM **REPLY**

DAVID_Setup_2_5_5.exe on the downloads page.

**boyankir** says: Sep 11, 2009. 1:14 AM **REPLY**

http://laserpointerpen.net/58-50mw-green-laser-pointers-ir-fliter Thanks for sharing this great tutorial,I just bought a 50mw green laser pointer from and decide to do it myself.

**smtgr14** says: Oct 3, 2009. 9:56 PM **REPLY**

So i have all the hardware, but what software do i get??? MATLAB is wayyyy too much and i'm just a teen so some sort of freeware would be nice.

**badideasrus** says: Aug 29, 2010. 1:43 PM **REPLY**

david 3d. its free, the assembler program (what puts the peices of the mesh togeter) isn't. for that, use meshlab.

**Ma3oud** says: Dec 2, 2009. 1:01 PM **REPLY**

hi guys!
i read all comments and all steps.
1-what's your meaning from "edge detection algorithm"? is it kind of video filter or effect? how and with which software i can do so?
2-how can i import this video file (avi) into matlab? and how use the .m file you have attached?

TNXS ALOT

**badideasrus** says: Aug 29, 2010. 1:42 PM **REPLY**

if i'm readin this right, matlab IS the detection algorithm..... david 3d works just as well, and it's free.

**eyebot117** says: Feb 9, 2010. 4:09 PM **REPLY**

Very clever! One specific way to improve however, would be to use a mirror on a small DC motor. It would spin the mirror creating a straight line with the beam. The only thing of concern with this method would be vibrations from the motor distorting the line. Can red be used for the color of the laser?

**badideasrus** says: Aug 29, 2010. 1:40 PM **REPLY**

if this thing works like david 3d, then technically you could use a regular lightbulb and a shade that lets through a line. would work the same as a lazer line, just be harder to focus....

**zephyrr** says: Feb 14, 2010. 8:07 PM **REPLY**

Is there a way to use this for full body models? I want to be a game designer and I think this would be great for character models.

**badideasrus** says: Aug 29, 2010. 1:38 PM **REPLY**

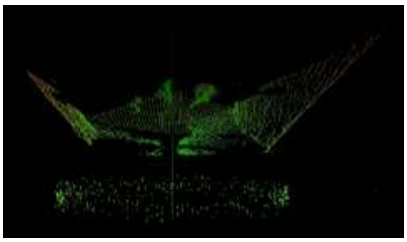
i thought the same thing. there are some problems though. useing a 3d scanner on living things requires both a very wide beam, and a person very good at standing still. also, it's not as easy to set up a 3d scanner as it sounds. i never got mine to work (i was using david 3d, though, free, supposedly easy to use, no programming needed (i also didn't try that hard....)) it would be easyer to make things out of clay and then scan them, if u have a sculpting talent. or toys (like models for home train tracks. u can get anything from plants to animals to everyday objects for a train set....) been told to use meshlab to combine the mesh peices....

**MdP1632** says: Mar 12, 2010. 9:12 PM **REPLY**

I don't see why it couldn't be used as it is to create full-body models. If you need the beam to be longer when it is shined through the glass tube or dowel or wine glass or whatever you use, try using something of a different width.

**le Cauchemar** says: Aug 3, 2010. 4:21 PM **REPLY**

Nice idea, just had to make my own :) The focus for me was on writing the software by myself, which took some hours ^^ Here you can see my first try with a paper ship :D



**ghostrider2** says: Jun 16, 2010. 6:18 AM **REPLY**
how can i convert the file into a format that can be used with 3ds max?

**danielemur** says: Apr 15, 2010. 5:04 PM **REPLY**
Would www.osalt.com/matlab , http://www.scilab.org/ or http://scipy.org/ work in place of matlab?

**Bear Enthusiast** says: Dec 22, 2009. 6:58 PM **REPLY**
Does anyone know how to get MATLAB to export a file that can be converted to an .stl, and if so: how?

**snaut** says: Mar 20, 2010. 7:58 AM **REPLY**
hi, i wrote a script to export files to openscad, which itself can export to .stl, i'll upload it sometime soon.

**zhanat** says: Nov 19, 2009. 8:54 AM **REPLY**
Hi! I have a problem with Matlab. Anybody, can you help me?
....
m = aviread('polygon.avi', calFrame);
....
??? Error using ==> aviread at 53
polygon.avi does not support the 'Index' parameter.
Error in ==> KnowHowScanner at 61
m = aviread('polygon.avi', calFrame);

**bardon08** says: Sep 26, 2007. 7:37 PM **REPLY**
Why not use a laser level with a line lens? It would make for a higher quality model because there would be a thinner line, which would make for more precise measurements.

**stevie1** says: Jul 29, 2008. 8:07 AM **REPLY**
thats what i was thinking, and i'm pretty sure that laser levels have a threaded thing in the bottom to hook up a tripod to them.

**bardon08** says: Sep 15, 2009. 10:11 AM **REPLY**
yeah, the one i have does

**tdl711** says: Aug 29, 2009. 9:38 AM **REPLY**
With the commetns about matlab and its cost, I wonder about using R (www.r-project.org) instead, because it is available for FREE. It is a software package not unlike matlab. The problem is I wouldn't know how to go about translating the code between the two...but it might be useful to know about if someone wanted to get around the expense of matlab.

**dcoulombe** says: Sep 16, 2008. 12:51 PM **REPLY**
the handyscan 3d scanner is better than that: http://www.creaform3d.com/en/handyscan3d/default.aspx

**Esmagamus** says: Aug 17, 2009. 2:29 PM **REPLY**
Reeeaaly? I bet you'll give one to this gentleman if he hasn't got the dough to buy one. And the purpose of this site is to find new ways to do things, not to know how and where to get them off the shelf.

**elvedin** says: Aug 6, 2009. 2:53 AM **REPLY**
hehe do you know how to make it, if you know than make it and show us. this is not good example to compare this and that handyscan 3D scanner

**evanwehrer** says: Dec 6, 2008. 6:31 AM **REPLY**

Dude, this is for people who dont want to buy one, but make one. What your comparing is like comparing a pencil and a space station.

**iTraceur** says: Jul 2, 2009. 11:00 PM **REPLY**

A homemade pencil, actually...

**Gamer917** says: Aug 10, 2009. 1:25 AM **REPLY**

actually its like comparing a fisher space pen and a homemade pencil

**AriOululainen** says: Jun 24, 2006. 3:27 PM **REPLY**

Could you please send a more detailed description? Step 4 is not clear to me, have not done an "avi" before. Ari

**bloodymess** says: Nov 25, 2006. 3:21 PM **REPLY**

"avi" means Audio Video Interleave;it's a movie format, just like .mpg or .wmv. you can convert your video to an .avi with most video converters; just look online, you should find one for free.

**LVGene** says: Jul 21, 2009. 12:46 AM **REPLY**

AVI is a container.

**68K** says: Jun 16, 2009. 9:53 AM **REPLY**

AVI isn't a format, it's a container and as such the data inside the file can be in various formats. When converting anything to avi you'll need to specify codecs to use for the audio and video.

**franklinonline** says: Jun 19, 2009. 11:32 AM **REPLY**

hes close enough explaining it to someone

**TOCO** says: Jul 2, 2009. 6:25 AM **REPLY**

is this the actual software that they used in the video. If not where is the actual software?

**kethxxx** says: Jun 29, 2009. 6:39 PM **REPLY**

I have this problem in mat lab "Error getting frame data" but I use 15 fames/s I dont know ¿? Some one give me the manual in pdf please or explain me how I give the parameter to MATLAB

**frank the destroyer** says: Jun 24, 2009. 4:38 PM **REPLY**

this is friggin sweet, dirt cheep, and overall a breakthrough for the poor 3d modeler

**MicroKID** says: Jun 24, 2009. 4:46 AM **REPLY**

- Where is this executable what processes the laser and converts it to a 3D model?
- How is the camera attached? Is it via some capture card?

**julienrl** says: Jun 19, 2009. 9:07 AM **REPLY**

does this mean I have to buy matlab or can matlab scripts run in windows (I know it probably means I have to buy it... Im just hoping I dont have to since it costs waaaaaaaaaaaaaaaaaaaaaaaaaaaaay too much)

**liqudice** says: May 16, 2009. 9:15 AM **REPLY**

this is awesome its KISS Keep It Stupid Simple. not implying stupid but the ability to make this at your house is amazingly simple. awesome write up!!!

**bigjeff5** says: Jun 17, 2009. 11:07 PM **REPLY**

I prefer Keep It Simple Stupid, which does imply stupid. ;)

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