



Team e10

3D SCANNER

COE ADVISORS

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TEAM MEMBERS

AUBREY THARPE - CpE

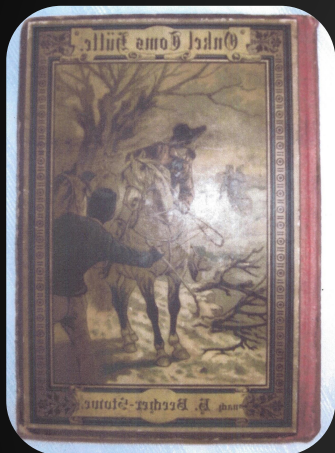
TAYLOR WAGNER - CpE

RACHELLE DAUPHIN - CpE

NICOLAS CARDENAS - CpE



Introduction



- Intentions
 - Black Archives
- Goals
 - Accurate Scan
- Results
 - Promising



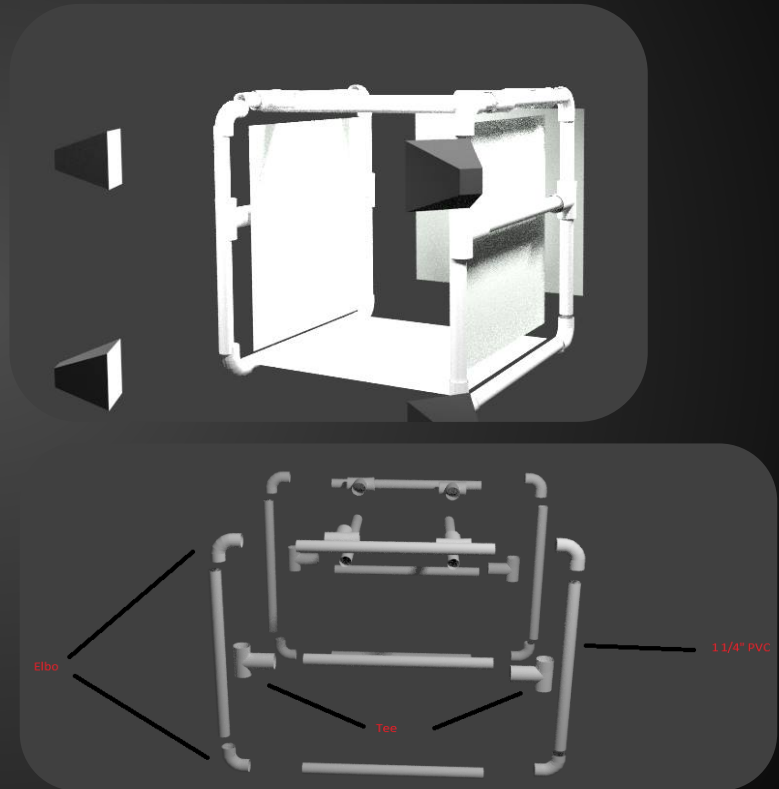
Aubrey Tharpe



Frame



- Frame is a 26 piece kit (~5ft x ~5ft x ~4ft)
- Four pipes that are approximately 5' in length in the middle and on the bottom
- 8 pipes that are approximately 2.5' in length that make up the height
- Walls are connected together through 2 pipes that are also approximately 5' in length.
- Middle is connected with T pipe fittings and the bottom two are connected with elbow fittings
- Height is connected into the T fittings and the elbows that are connected to the 5' pipes as well as the top pieces.
- The walls are connected through the T fittings on the top pieces.
- acrylic bed is then laid on top of the middle pipes





Bed

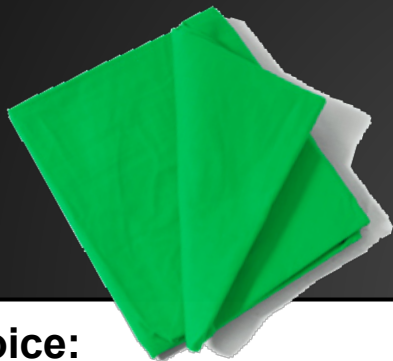


4.5' x 2' x 0.5''



Cover

Previous Choice: *ChromaKey Green Muslin*



Reasons of choice:

- Chromakeying to help eliminate the background from the object

Reasons for change:

- Color of the cover reflected onto the object, and the amount was very noticeable “Color Spill”.
- Must be fixed manually.
- This type of color correction requires expert knowledge in photo editing software.



Color Spill

Taylor's shoe with color spillage from the cover

Rachelle Dauphin



Cover

Final Choice: *White Cloth Background*



Reasons of choice:

- Color spillage isn't a concern when using a neutral color background
- Lighting isn't restricted by the color of the background reflecting if brightness intensity is increased.
- Helps distribute light when reflected.



Tiger stuffed animal with a white cloth background.
Color accurate but poorly reconstructed.

Rachelle Dauphin



Lights

Previous Choice: *SMD 3528 Flexible LED Strips*



Reasons of choice:

- Cheap and flexible
- Can be close to artifacts without infrared heat damaging the objects

Reasons for change:

- Inconsistent exposure to the bottom of the frame.
- Color temperature causes discoloration
- Contribution to color spillage due to a light source being placed on the background.



Taylor's shoe with discoloration and some color spillage from the cover



Lights

Final Choice: Fluorescent Lights with Umbrella Diffusers Kit



Reasons of choice:

- Diffusing umbrellas to disperses and softens light
- Easy to disassemble and adjust.

Doll texture's color is vibrant and white balanced.

Rachelle Dauphin



Camera

Smartphone Rear View Camera



Rear Camera from the Samsung
Galaxy S4

Reason of Choice:

- 8 - 13 Megapixel
- 720p videos
- Convenient to the user and easy to use.
- “Burst” feature, which makes the user take multiple pictures continuously while slowly moving around the object.



Software

VisualSfM



VisualSfM - [Sparse Reconstruction] - [0] - []

File SfM View Tools Help

#1 : IMG_20141004_113855

```
Log Window
PBA: 6250 3D pts, 20 cams and 36713 projs...
PBA: 3.428 -> 2.569 (5 LMs in 0.13sec)
#points w/ large errors: 34
Focal Length : [2831.986]->[2685.328]
Radial Distortion : [-0.054 -> -33]
~~~~~
#30/30: 958 projs and 190 pts added.
PBA: 7361 3D pts, 30 cams and 40690 projs...
PBA: 2.817 -> 2.654 (17 LMs in 0.37sec)
#points w/ large errors: 50
PBA: 7311 3D pts, 30 cams and 40142 projs...
PBA: 2.424 -> 2.423 (15 LMs in 0.32sec)
#points w/ large errors: 3
END: No more images to add [0 projs]

#####
Failed to find two images for initialization
Resuming SfM finished, 18 sec used

-----
30 cams, 7406 pts (3+: 5940)
40142 projections (3+: 37378)

-----
1 model(s) reconstructed from 30 images;
30 modeled; 0 reused; 0 EXIF;
4MB(4) used to store feature location.

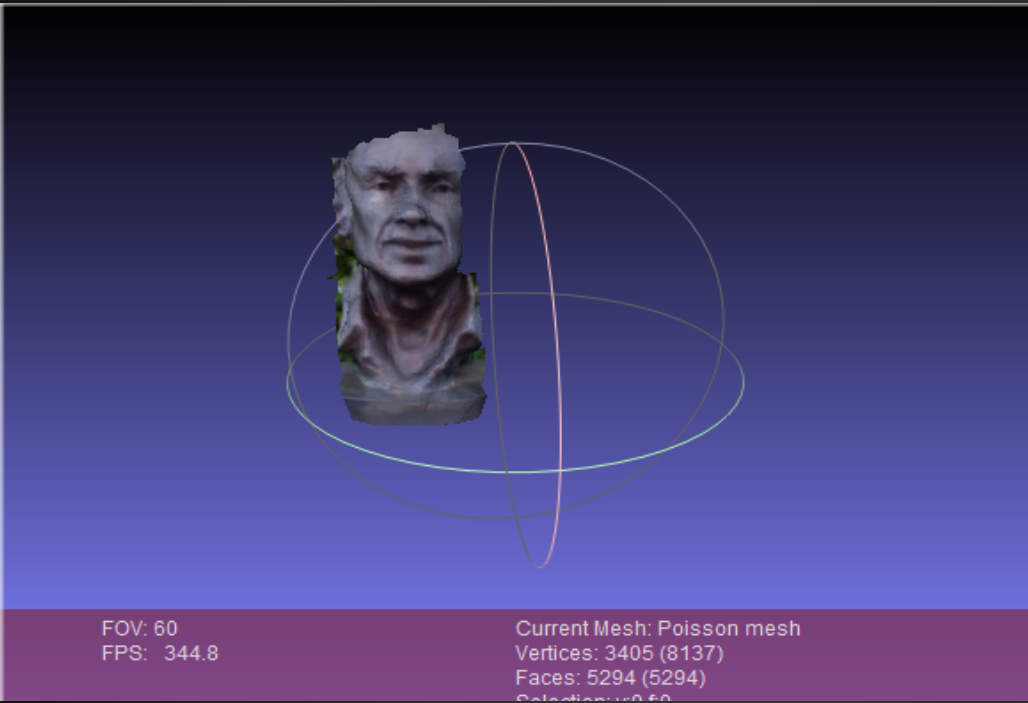
-----
#####-----timing-----#####
Structure-From-Motion finished, 20 sec used
17.1(15.8) seconds on Bundle Adjustment (+)
16.6(15.4) seconds on Bundle Adjustment (*)
#####

Run full 3D reconstruction, finished
Totally 20.000 seconds used
```



Software

Meshlab



FOV: 60
FPS: 344.8

Current Mesh: Poisson mesh
Vertices: 3405 (8137)
Faces: 5294 (5294)
Selection: us0 f0

C:/Users/Taylor/Desktop/dirac3/dirac.nvm.cmvs/00/bun...

- 1 option-0000.ply *
- 2 Poisson mesh *

✓	0	00000000.jpg
✓	1	00000001.jpg
✓	2	00000002.jpg
✓	3	00000003.jpg
✓	4	00000004.jpg
✓	5	00000005.jpg

Loading textures
Texture[0] = 'texture.png' (1024 x 1024) -> (1024 x 1024)



Suspension Techniques



Taylor Wagner



Photography Techniques



- Start from the top, go down, then start at the top again for spherical method method
- Resolution of at least 1280 x 720 or a video of equivalent resolution
 - VLC media player's video option can play it with the scene filter on and the pictures will collect into a folder
- Photos should have at least around 60 percent overlap between the pictures
- User circles around the object at that fixed distance and taking pictures at least two more pictures at different distance
- For complicated surfaces take more photos





Budget

Past



<u>Item</u>	<u>Distributer</u>	<u>Costs (\$)</u>	<u>Quantity</u>	<u>Total (\$)</u>
USB 8MP Webcam	TVC-Mall	2.50	13	32.50
Acrylic Sheet	Amazon	15.00	1	15.00
PVC Pipe	Home Depot	3.00	8	24.00
PVC Joints	Home Depot	0.50	8	4.00
Green Screen	Amazon	15.00	4	60.00
USB Hub	Amazon	4.00	2	8.00
Computer	Walmart	500.00	1	500.00
Other	-	-	-	150.00
<u>Total Cost:</u>	-	-	-	793.50

Nicolas Cardenas



Budget

Current



Used Material

<u>Item</u>	<u>Cost (\$)</u>	<u>Quantity</u>	<u>Total (\$)</u>
Polished Acrylic	221.25	1	221.25
PVC Pipe	2.25	12	27.00
PVC Elbow	1.19	8	9.52
PVC Tee	1.74	8	13.92
Fluorescent Lights with Umbrella Diffusers Kit	47.51	1	47.51
White Translucent Cover	2.00	2	4.00

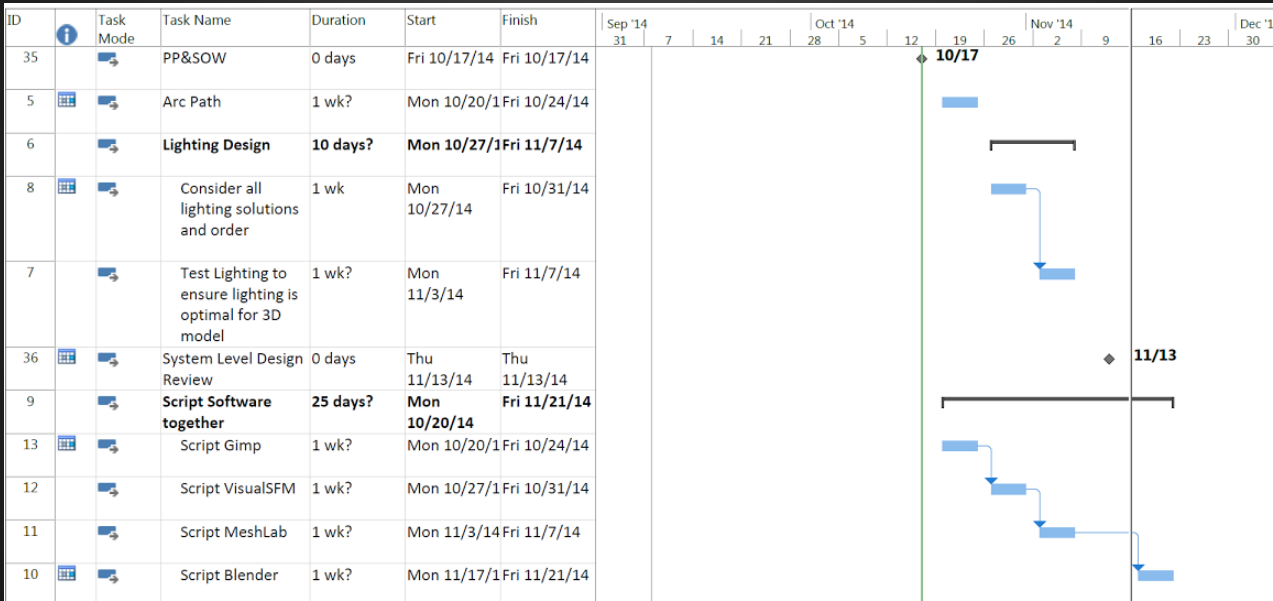
Unused Material

Green Screen Muslin	15.00	2	30.00
LED Lights	53.93	2	107.86
LED Power Adaptor	23.70	1	23.70
Total			484.76

Nicolas Cardenas

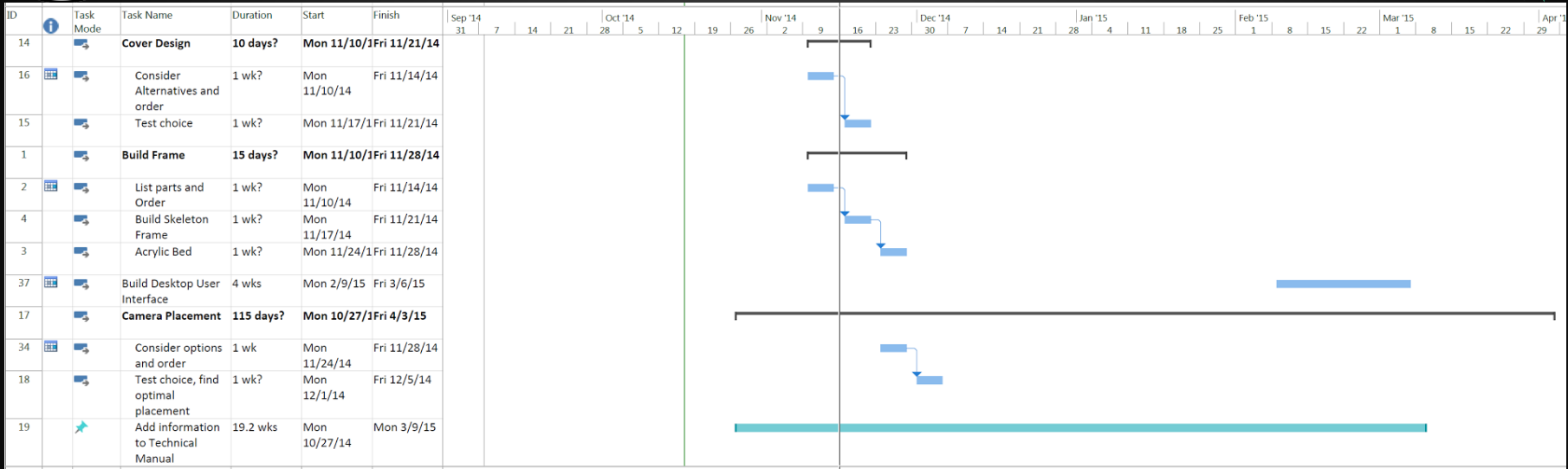


Schedule





Schedule





Schedule



ID	Task Mode	Task Name	Duration	Start	Finish	Jan '15	Feb '15	Mar '15	Apr '15																
						4	11	18	25	1	8	15	22	1	8	15	22	29	5	12					
20	➔	Scan Sample Collection	60 days	Mon 1/12/15	Fri 4/3/15	[Gantt bar from Jan 12 to Apr 3]																			
33	📅➔	Prioritize Artifacts	1 wk	Mon 1/12/15	Fri 1/16/15	[Gantt bar from Jan 12 to Jan 16]																			
21	🔄➔	Scan	55 days	Mon 1/19/15	Fri 4/3/15	[Gantt bars: Jan 19-25, Feb 1-7, 14-20, 27-3, Mar 6-12, 19-25]																			
32	📅➔	Revise Arch	55 days	Mon 1/19/15	Fri 4/3/15	[Gantt bar from Jan 19 to Apr 3]																			
38	📅➔	User manual	3 wks?	Mon 3/16/15	Fri 4/3/15	[Gantt bar from Mar 16 to Apr 3]																			
39	🌟	Project Management	160 days	Mon 9/8/14	Fri 4/17/15	[Gantt bar from Sep 8, 2014 to Apr 17, 2015]																			
40	🌟	Website	151 days	Sun 9/21/14	Fri 4/17/15	[Gantt bar from Sep 21, 2014 to Apr 17, 2015]																			



Schedule



8	Brainstorm on Final Design	10/20/14	11/19/14	31	100%				
8.1	Bed	11/4/14	11/19/14	16	100%				
8.2	Cameras	10/20/14	11/19/14	31	100%				
8.3	Cover	10/28/14	11/19/14	23	100%				
8.4	Lighting	10/20/14	11/19/14	31	100%				
8.5	Frame	10/20/14	11/19/14	31	100%				
9	Order Test Sample	11/13/14	1/1/15	50	100%				
9.1	Cameras	11/13/14	1/1/15	50	100%				
10	Revise Final Design	1/1/15	1/31/15	31	100%				
10.1	Bed	1/1/15	1/31/15	31	100%				
10.2	Cameras	1/1/15	1/31/15	31	100%				
10.3	Cover	1/1/15	1/31/15	31	100%				
10.4	Lighting	1/1/15	1/31/15	31	100%				
10.5	Frame	1/1/15	1/31/15	31	100%				
11	Create Test Plans	12/12/14	2/4/15	55	100%				
11.1	Camera	12/12/14	2/4/15	55	100%				
11.2	Frame	12/12/14	2/4/15	55	100%				
11.3	Acrylic Bed	12/12/14	2/4/15	55	100%				
11.4	Lighting	12/12/14	2/4/15	55	100%				
11.5	Background Cover	12/12/14	2/4/15	55	100%				
11.6	Software	12/12/14	2/4/15	55	100%				
12	Hardware Built	1/19/15	4/16/15	88	100%				
13	Testing	2/11/15	3/14/15	32	100%				
13.1	Cameras	2/11/15	3/14/15	32	100%				
13.2	Frame	2/11/15	3/14/15	32	100%				
13.3	Acrylic Bed	2/11/15	3/14/15	32	100%				
13.4	Lighting	2/11/15	3/14/15	32	100%				
13.5	Background Cover	2/11/15	3/14/15	32	100%				
13.6	Software	2/11/15	3/14/15	32	100%				
14	Website	9/1/14	4/24/15	236	100%				
15	Management	9/1/14	4/24/15	236	100%				



Significant Test Result Progression



- Taylor's Shoe with green background
- Could not do wrap around
- 70 images



Aubrey Tharpe



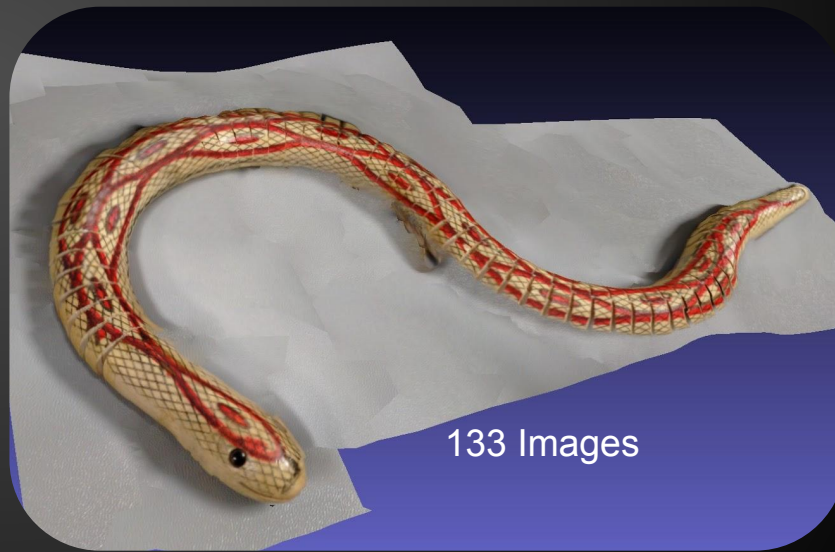
Significant Test Results



- More photos
- No green screen
- Still no wrap around



76 Images



133 Images



Significant Test Results



- Video at 1280 x 720
- Wrap Around
- White Cloth Background
- 273 images
- Printable Mesh