Frameless Stereotactic Navigation

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Client
Dr. Nathaniel Brooks

Overview

- Client Description
- Problem Definition
- Current Methods
- Project Design Specifications
- Design Possibilities
- Design Matrix
- Future Work

Client

Dr. Nathaniel Brooks

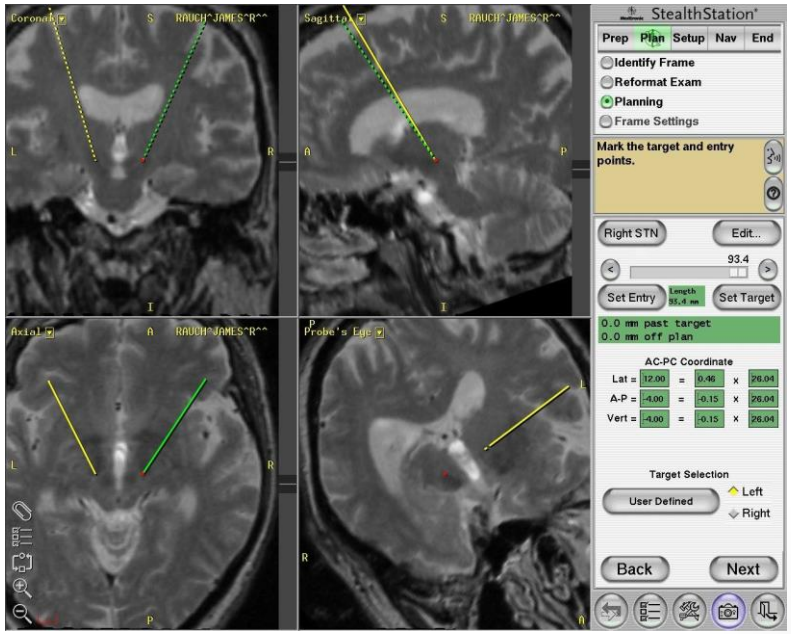
- Neurosurgeon
- UW Hospital

Problem Definition

Proposal:

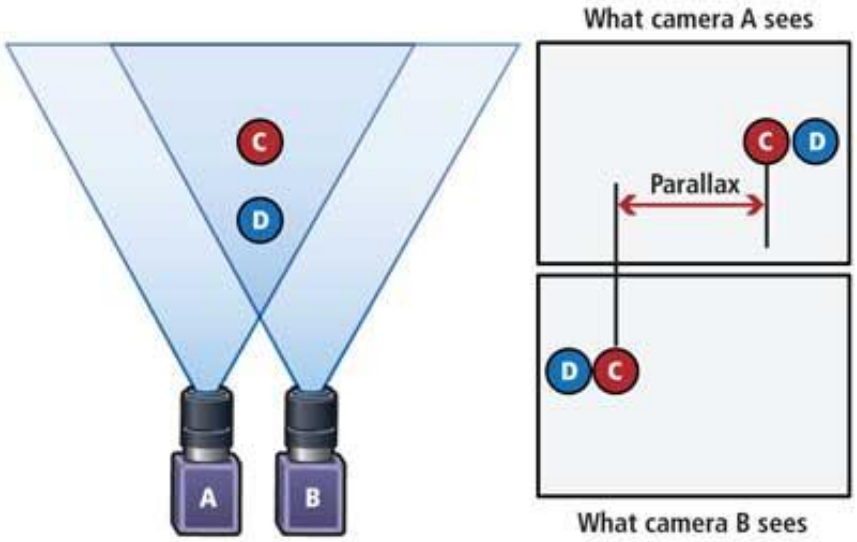
Create a stereotactic navigation system to be used in smaller-scale radiology and pain procedures which is easily portable and inexpensive

- Tumor excision
- Disease Treatment



http://www.neuroandspine.com/SiteCollectionImages/IMG_0188.JPG

Triangulation



Work by Daniel Lau

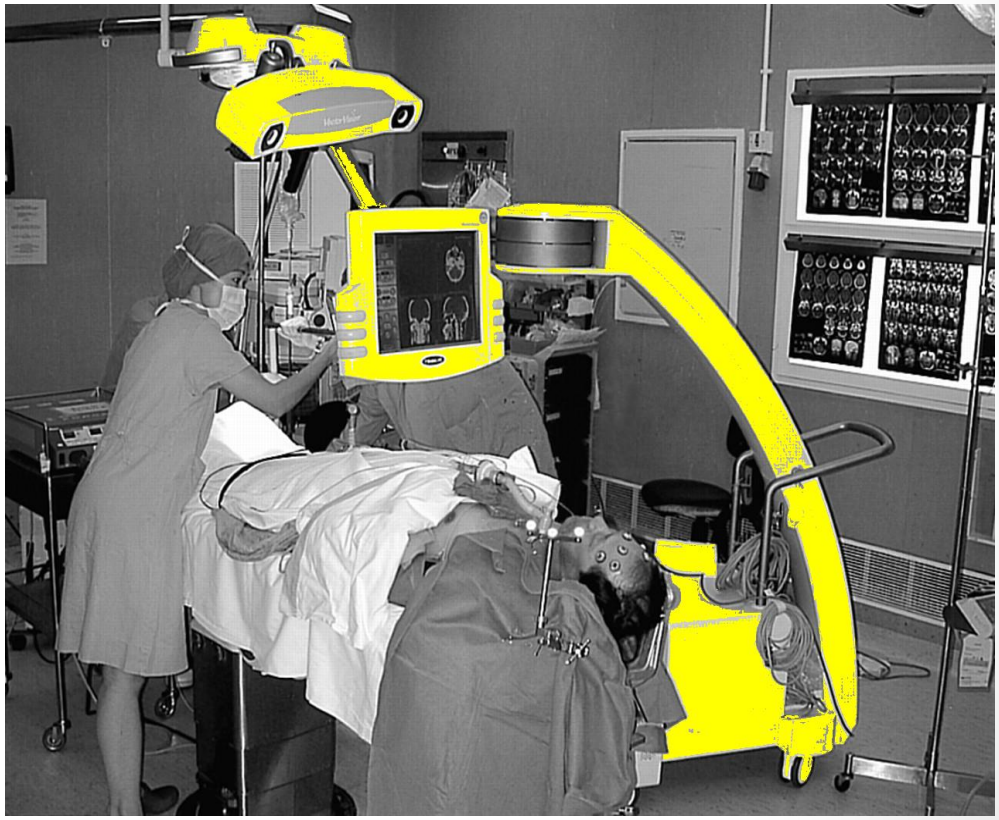
- Concept: use of two or more visual inputs to obtain a 3D image of an object
- Overlap of visual fields
- Resolution dependent on space and orientation of cameras

Current Methods

Conventional Machines:

- Only able to be used on certain surgeries
- Large and not easily portable
- Very expensive

http://www.terumotmp.com/productdetails.aspx?categoryId=1&productId=407



Br J Radiol

PDS

- Accuracy must be within 1 mm
- Able to navigate a space of 0.028m^3 (1ft^3)
- Must be easily portable between rooms
- Compatible with patient x-ray prints
- Must be able to be cleaned and sterilized
- Must be built within a budget of $1000

Proposed Designs

Design 1: Wii Remote

Resolution: 1024x768

FPS: 30

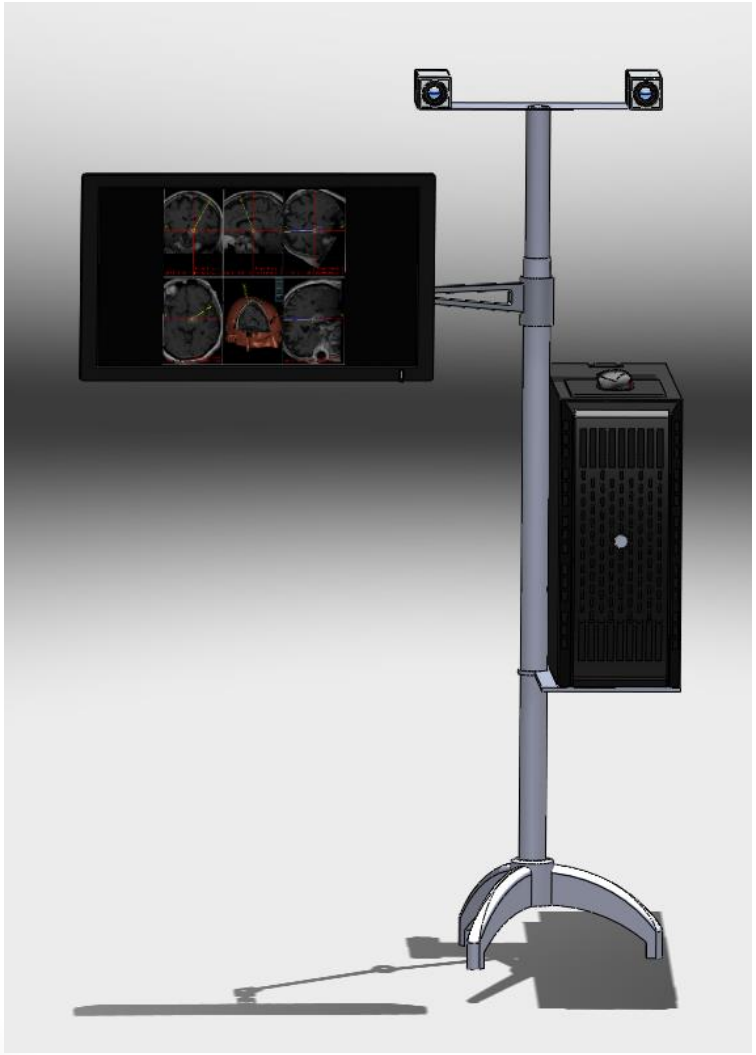
Upload Speed: 24Mbps

Cost: ~$30

Accuracy: 1mm

http://www.nintendo.com/wii/what-is-wii/#/controls

Design 2: HD camera



Resolution: 1080p

FPS: 30

Upload Speed: 480Mbps

Cost: $300

Accuracy: <0.1mm

http://replayxd.com/cameras/replay-xd1080-tech-specs/

Design 3: Bumblebee 2

Resolution: 1024x768

FPS: 20

Upload Speed: 400Mbps

Cost: ~$1800

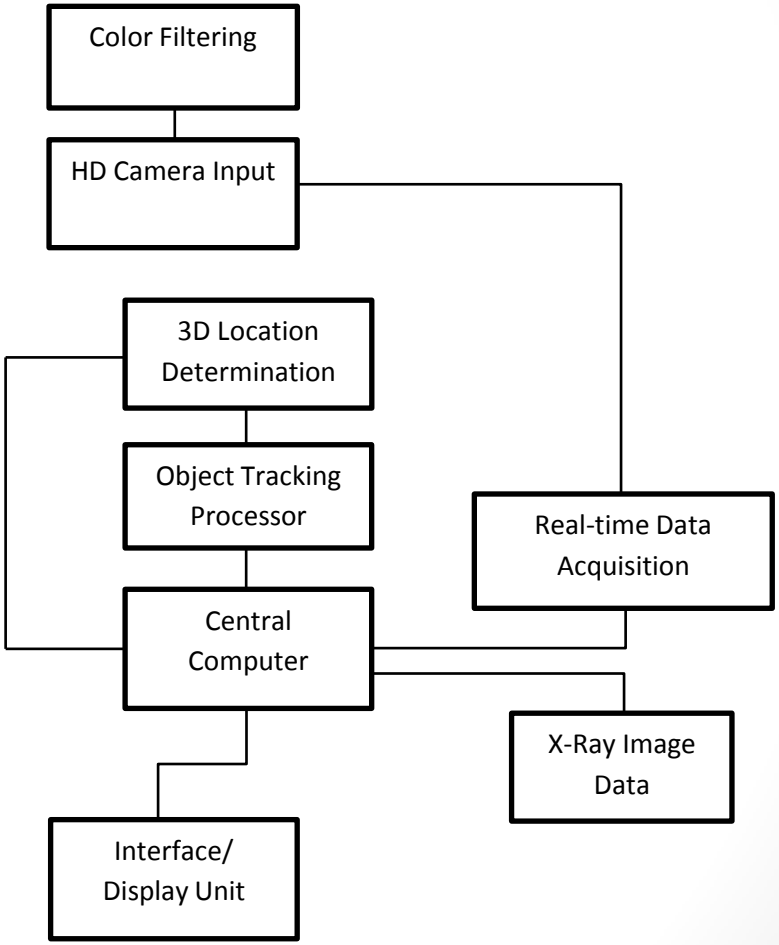
Accuracy: <0.1mm

http://ww2.ptgrey.com/stereo-vision/bumblebee-2

Design Matrix

Criteria (Weight)	Design 1: Wii Remote 		Design 2: HD Camera 		Design 3: Bumblebee 2 	
Accuracy and Reliability (30)	4	24	4	24	5	30
Cost (20)	5	20	4	16	1	4
Program Elegance (15)	3	9	3	9	4	12
Size and Portability (15)	4	12	5	15	4	12
Ease of Use (10)	3	6	4	8	4	8
Safety (10)	3	6	4	8	4	8
Total (100)		77		80		74

Final Design



Future Work

- Order components
- Software development
- Establish physical setup
- Testing
- Incorporate x-ray images
- Tablet version

Acknowledgements

Dr. John Puccinelli

Dr. Nathaniel Brooks

UW Hospital

QUESTIONS?

References

1. E W H To, E H Y Yuen, W M Tsang, E C H Lai, G K C Wong, D T F Sun, D T M Chan, J M K Lam, A Ahuja, and W S Poon The use of stereotactic navigation guidance in minimally invasive transnasal nasopharyngectomy: a comparison with the conventional open transfacial approach *Br J Radiol April 2002 75:345-350*
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3. http://ww2.ptgrey.com/stereo-vision/bumblebee-2
4. http://www.nintendo.com/wii/what-is-wii/#/controls
5. http://replayxd.com/cameras/replay-xd1080-tech-specs/