

BME Design - Sample Complete Notebook

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John Puccinelli

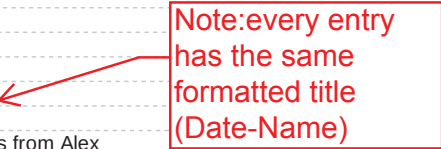
on

Sep 16, 2014 @09:13 AM CDT

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Note: every entry
has the same
formatted title
(Date-Name)





Team contact Information

• John Puccinelli • Aug 27, 2014 @09:44 AM CDT

Last Name	First Name	Role	E-mail	Phone	Office Room/Building
Puccinelli	John	Advisor	puccinelli@bme.wisc.edu	608-890-3573	2132 ECB
Brooks	Nathaniel	Client	n.brooks@neurosurgery.wisc.edu	608-263-1409	J6/505 Clinical Science Center
Monette	Stephen	Leader	sjmonette@wisc.edu	715-781-5888	
Yueh	Alex	Communicator	ayueh@wisc.edu	520-301-4469	
Levin	Jake	BSAC	jimlevin3@wisc.edu	608-575-2686	
Boyer	Matthew	BWIG	mwboyer@wisc.edu	952-240-4493	
Nguyen	Alex	BPAG	amnguyen@wisc.edu	608-295-1013	



Project description

• John Puccinelli • Aug 27, 2014 @09:41 AM CDT

Course Number:

BME 300

Project Name:

Frameless Stereotactic Navigation

Short Name:

Stereotactic_Navigation

Project description/problem statement:

Note: This is an evolving statement as the project progresses and note copy/paste from the client's project submission

Computerized frameless stereotactic navigation is a system that allows for precise determination of location of tools and instruments relative to a patient during medical procedures. The system is commonly used in surgeries, such as brain or spine surgeries, which require a high level of accuracy in tool placement. Such systems are highly costly and are therefore less available for smaller, less invasive procedures, including interventional radiology and pain procedures. The goal of this project is to develop a stereotactic navigation device using inexpensive and readily-available components, such as HD cameras, which maintains a level of accuracy necessary for use in radiology and pain procedures.

About the client:

Dr. Nathaniel Brooks, Neurosurgeon at UW Hospital

<http://www.uwhealth.org/findadoctor/profile/nathaniel-p-brooks-md/8690>

Note: Provide as much detail as possible



09/12/2013-Client Meeting-First

• John Puccinelli • Aug 27, 2014 @09:19 AM CDT

Title: Client Meeting

Date: 9/12/2013

Content by: Stephen Monette

Present: All team members and Dr. Nathaniel Brooks

Goals: To discuss the project with the client. Possible questions:

- How do current frameless stereotaxy techniques/systems work?
- What are the benefits of a computerized frameless stereotaxy system?
- Are there other systems that currently use the Wii/Kinect approach?
- What are the accuracy/precision requirements for the device?
- Is there room to attach equipment to the patient?
- Does device need to track the location of the tools inside the body or just at the surface?
- Is there a specific location of the body that we should focus on using this for?
- How much space around the patient is required?
- What is the budget of the project?

Meeting Notes:

- Existing techniques use infrared camera to track tool location
- Design would cut down on radiation exposure
- More accessible for interventional radiology and pain procedures because of lower cost
- Current products to look into
 - Fluoronav-Medtronic
 - Stealth-Medtronic
 - Striker-BrainLab
- Focus initially for use on spine
- Cameras typically 5-6ft away from patient
- May require reference arc on the patient (directly on spine)
- Device needs to know location of tool inside and outside of body
- Mostly used for varying types of needles
- Will use input images of DICOM type taken from front and side by fluoroscopy x-rays
- Team will meet with client about twice a month

Conclusions:

The client provided detailed design specifications which we will try to meet for this semester. The team is more comfortable with what we need to accomplish, but this meeting has sparked a definite need for more research, specifically in the methods of 3D object tracking. The project will require some significant knowledge of programming and video-capturing devices.

Note: Every entry follows the format

Note: Generate questions to bring to client meetings

Note: Clear conclusions and action items for all entries



09/26/2013-Client Meeting-Notes from Alex

• John Puccinelli • Aug 27, 2014 @09:38 AM CDT

Title: Generating questions for client meeting

Date: 9/24/2013

Present and contend by: All team members

Goals: Questions for the client meeting

- Is there a side of the patient that is used more often by the clinician?
- Does the individual applying treatment need to move around the patient?
- What is the required size of the working environment?

Conclusions:

There are still many unknowns we hope to have answered

Notes from Alex Yueh

Note: Make it clear who created the content of an entry

Title: Client Meeting

Date: 9/26/2013

Present: All team members except me and Dr. Nathaniel Brooks

Goals: To discuss the project with the client and have our questions answered

Meeting Notes:

- Focus tool tracking on spinal needles (disposable)
- Treatment applicator will not need to move around the patient once the procedure begins
- Reference arc should be placed on patient
- Procedure duration: 30 seconds to 10 minutes
- Detectable working area of 1 cubic foot
- System should be light and small enough so that it can be picked up and moved
- Doesn't need to be sterilized - (needles and placement markers do)
- Cameras can be as close as 3ft/1m to the patient
- System will be placed at foot or head of patient table
- Client meetings run every other Monday at 4:30pm

Generate your own conclusions

Conclusions:

The team is more prepared to make an accurate assessment of design alternatives based on the latest client feedback. A few updates to the PDS will be necessary. The team will prepare to share their design alternatives later this evening.



09/05/2014-First day of class

Title: First advisor meeting

Date: 9/5/2014

Content by: Me

Present: Whole team and advisor

Goals: Establish clear expectations for the course

Content:

Met with the advisor, established team roles (see project information). Set up our weekly meeting at ...

Conclusions/action items:

Have a lot of work to do this semester



09/18/2013-Patent Search

• John Puccinelli • Sep 04, 2014 @09:48 PM CDT

Title: Patent search

Date: 09/18/2013

Present and content by: Me

Goals: Perform a patent search for "stereotactic navigation"

Note: Research should show search items/criteria

Content: Most relevant results

Stereotactic

<https://www.google.com/patents/DE10032203A1>

Otto Pasty, 2000

DE 10032203 A1

Notes: Details a multi-membered arm that can be placed locally anywhere near the patient to be used to position and locate an attached device without interfering with other medical procedures.

Note: Include complete citation

Surgical positioning system

<https://www.google.com/patents/US6662036>

Eric R. Cosman, 2002

US 6662036 B2

Notes: Very relevant to our project. Describes a system that positions the subject's body in relation to a treatment or imaging machine. Uses cameras and index markers on the patient to determine 3D location. Also mentions use in conjunction with x-ray imaging of the patient.

Note: Summary from each reference

Apparatus for performing stereotactic surgery

<https://www.google.com/patents/EP1510182B1>

Steven J. Urquhart et al., 2004

EP 1510182 B1

"Typically, stereotaxy procedures require the use of a stereotactic head frame, which is generally referred to as a frame-based stereotaxy procedure. A typical stereotactic head frame is a halo-like device that is rigidly affixed to the patient's skull under local anesthesia, generally using four pins or screws. Once the stereotactic frame is secured, the stereotactic frame is used to define a target and a trajectory to the target, identified with the CT or MRI images."

Notes: Describes a stereotactic head frame which attaches to the patients head for maintaining accurate position tracking during surgery. It is coupled with image guidance.

Conclusion:

Many of these patents are close to what we want to create, but none were found that were frameless/wireless. These are also very large and complicated systems. I will continue to search for more patents at a later time.



10/03/2013-Design Flowchart

• John Puccinelli • Aug 27, 2014 @09:48 AM CDT

Title: Design Flowchart

Date: 10/3/2013

Present and content by: Me

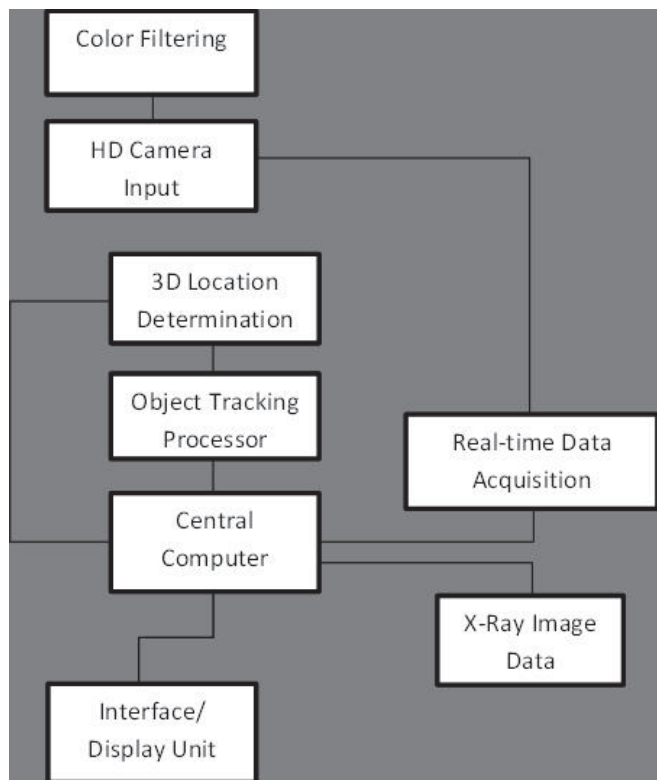
Goals:

Generate a diagram that demonstrates the information flow for the current version of our design.

Notes:

- Image sent through physical color-filtered
- Image acquired by HD Cameras
- Data sent in real-time to central computer
- Each image processed for 2D object tracking
- Tracking data from each camera combined to create 3D location
- Data gathered by central computer and combined with x-ray image data
- Graphical output on the display monitor

Flowchart

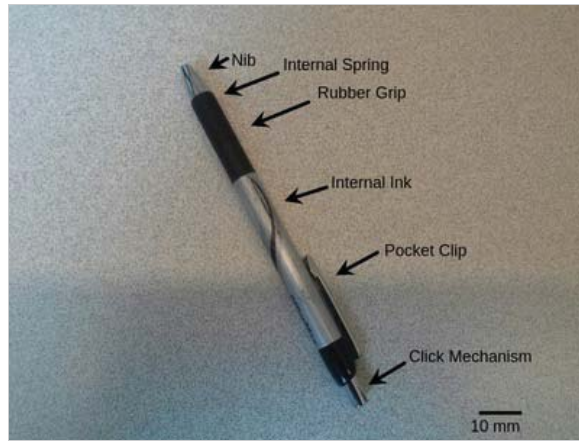


Conclusions

We will modify this flow chart as needed throughout the semester



09/05/2014 - Prototype 1 - pen



Note: Always provide clear labels and scale

temp.jpg(136.4 KB) - download The prototype of our pen labeled with the key features. Note that two internal structures (spring and ink) cannot be seen in this image. The pen is made out of ABS plastic with a chrome nib, pocket clip, and click mechanism.

Note: include detailed caption



08/27/2014-Entry format

• John Puccinelli • Sep 04, 2014 @09:50 PM CDT

(Every text entry of your notebook should have the **bold titles (or similar)** below and every page/entry should be named starting with the date of the entry)

Title: Descriptive title (i.e. Client Meeting)

Date: 8/27/2014

Content by: The one person who wrote the content

Present: Names of those present at meetings (not necessary for individual work)

Goals: Establish clear goals for all text entries (meetings, individual work, etc.)

Content:

Contains clear and organized notes (also includes any references used)

Conclusions/action items:

Recap only the most significant findings and/or action items resulting from the entry.