Title: 3D Printed Respiratory Motion Phantom PgR 9

Date: 11/4/2026

Client: Dr. Andrew Shepard, Dr. Jordan Slagowski
Advisor: Prof. Mehmet Orman
Team:

- Student 1: Matthew Niemuth - Team Leader
- Student 2: Royal Swick - Communicator
- Student 3: Drew Kruse - BSAC
- Student 4: Natalie Waibel - BWIG
- Student 5: Avi Ganti - Co-BPAG
- Student 6: Jahan Ingraham - Co-BPAG

Problem statement: Design and Fabricate a 3D-printed respiratory motion phantom insert that simulates two lung lesions with realistic density and anatomy for evaluation of real-time tumor tracking during radiotherapy.

Brief status update: This week we received feedback from other design teams during show and tell. The main improvement other teams thought we could make was threading the cap to just twist onto the end of the phantom instead of having our current cap which just slips on and is prone to slipping off. We also made some dimension adjustments to our phantom and the tumor inserts, as the phantom was printed too large to integrate with the QUASAR system and the tumor inserts did not fit within their designated places within the phantom. We are meeting with our client today, Thursday 11/5, to get feedback from them on our updated prototype.

Difficulties / advice requests: N/A

Current design: Automated Standardized Insert System

Materials and expenses:

Item	Description	Manufac-turer	Mft Pt#	Vendo r	Vendo r Cat#	Date	#	Cost Each	Total	Link
Category 1										
									$0.00	
									$0.00	
Category 2										
									$0.00	
									$0.00	
								TOTAL:	**$0.00**	

Goals

Major team goals for the next week

1. Make more progress on the code to automate the tumor insert creation process.
2. Incorporate feedback we receive from our clients today on our prototype to work towards a final stage motion phantom prototype.
3. Make sure our Lab Archives is up to date.

Next week's individual goals

- Royal Swick
    - Next week I have 2 midterms and labs so I won't be able to do as much work as usual. But I plan on trying to improve the code so that it accommodates for 2 tumors.
- Matthew Niemuth
    - Make more progress on the code to standardize the tumor insert printing process. Also, take the feedback we receive from the client meeting this week into our prototype to move towards a final product. Last would be to make sure the team gets back on track with Lab Archives entries.
- Drew Kruse
    - I will keep reiterating our prototype until we get it how we want it. I will work on the solidworks with the team to make sure we are all on the same page. I also need to keep my lab notebook up to date and add some more relevant research.
- Natalie Waibel
    - Meet to reiterate the design after client feedback. Continue to transfer independent work to Lab Archives. Add lots more relevant research.
- Jahan Ingraham
    - Talk with the client to get feedback and change phantom design. Make a back edge for the phantom and see how a magnet would work to fit with the QUASAR system. I also need to update lab archives with my progress and previous research that is missing.
- Avi Ganti
    - Use client feedback to rework the phantom in solidworks after our meeting. Additionally, update Lab Archives to be up to date with my progress. Meet with team to discuss next steps

Timeline:

Task	Sep			Oct					Nov				Dec	
	12	19	26	3	8	17	24	31	7	14	21	28	5	10
Project R&D														
Research	X	X	X	X	X	X	X	X						
Design			X	X	X	X	X	X						
Prototyping				X	X	X	X	X						
Testings								X						
Deliverables														
Progress Reports	X	X	X	X	X	X	X	X						
PDS		X												
Design Matrix			X											
Prelim Presentation				X										
Prelim Report					X									
Final Poster														
Final Report														
Meetings														
Client		X		X										
Advisor	X	X	X	X	X	X	X	X						
Website														
Update														

Filled boxes = projected timeline
X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments

- Royal Swick:
    - Previous Goals: Meet with the clients to go over our progress so far. Take feedback and improve upon our design.
    - Accomplishments: Made some corrections to the dimensions of our cylinder tumor inserts, met with the clients and talked over our progress.
- Matthew Niemuth
    - Meet with clients to receive design feedback on prototype and code. Once we meet with them and see what they think, we can move forward with improving and applying their feedback to our design to work towards a final prototype for the end of the semester.
    - Accomplishments: This week I mainly spent time just brainstorming about how to incorporate feedback from show and tell and how to improve from our first prototype as far as changing dimensions to make it actually fit with the QUASAR system. I also participated in the client meeting, discussing our current progress to them and getting feedback on where they want us to go from here. I did not get as much done this week as usual because I had two midterms that took up a lot of my time on top of other classwork and research involvement.

- Drew Kruse
    - Previous Goals: I will play a part in getting our prototype cadded up and printed by Friday for show and tell. We will split up to work on the different parts of the phantom and work together to make sure that all fit together seamlessly.
    - Accomplishments: I helped CAD our first and second prototypes as well as print them out for show and to show our client to get feedback on hers they think. Will help adjust the prototype once we hear from client.
- Jahan Ingraham
    - Previous Goals: Make another design of the phantom in solidworks and printing on BambuLab.
    - Accomplishments: Finished training and printed cap and body of first phantom for show and tell. Presented at show and tell explaining to groups and getting feedback specifically on how the automation would be easiest to complete with code.
- Natalie Waibel
    - Previous Goals: Meet with clients to get feedback on our progress (prototype and code). Then, we can designate next steps to improve our prototype and code.
    - Accomplishments: Worked on updating lab archives. Presented at show and tell and discussed improvements from peer feedback. Met with client to go over design and receive feedback.
- Avi Ganti
    - Previous Goals: Create a model of the phantom in SolidWorks to be printed using BambuLab. Finish training
    - Accomplishments: Finished training and printed our first prototype for the phantom. Presented at show and tell and took note of peer feedback. Presented prototype to client and received feedback on things to change.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Matthew Niemuth	11/5/2026	○ This week I mainly spent time just brainstorming about how to incorporate feedback from show and tell and how to improve from our first prototype as far as changing dimensions to make it actually fit with the QUASAR system. I also participated in the client meeting,	4	4	41

		discussing our current progress to them and getting feedback on where they want us to go from here. I did not get as much done this week as usual because I had two midterms that took up a lot of my time on top of other classwork and research involvement.			
Royal Swick	11/4/2026	○ Made some corrections to the dimensions of our cylinder tumor inserts, met with the clients and talked over our progress.	3	3	43
Drew Kruse	11/5/26	This week I did some research on how we can use solidworks to make the prototype that we will bring to show and tell next week. We have reviewed the data that our client gave us from the test CT scan for the densities of the materials. I attended the client meeting to talk about the design we chose and what our steps are moving forward.	3	3	35
Natalie Waibel	11/5/26	Worked on updating lab archives. Presented at show and tell and discussed improvements from peer	4	4	37

		feedback. Met with client to go over design and receive feedback.			
Avi Ganti	10/28/26	Presented at show and tell, received peer feedback on our project and provided feedback to all other groups. Reviewed and revised CAD model to fit system better. Met with client to discuss testing and further steps.	4	4	40
Jahan Ingraham	10/28/16	- CAD designed the cap and helped Drew and Avi with the body of the phantom. - Gave elevator pitches for show and tell and received feedback.	2	2	39