

Project Checkpoint

Surgical Instruments for Robotic Microsurgery

Members

Zaid Ashai

Pranav Lakshminarayanan

Mentors

Kevin Olds

Allen Feng

Dr. R. Taylor

Dr. J. Richmon

Overview

- Project Summary
- Progress
 - Dependencies
 - Goals met
- Updated Deliverables and Timeline
- Upcoming Milestones
- Summary

Project Summary

Develop and evaluate novel surgical instruments for robot assisted vein suturing



Dependencies

Dependency	✓ / ✗	Status
Machine shop training	✓	Completed training for basic shop, lathe, and U-Print
Access to steady-hand robot	✓	Trained in use
Materials to design prototypes	✓	Ordered through project funding
Scheduling of mock operations and study	✓	Starting Friday, March 27

Original Deliverables

Minimum

Computer-aided design of:

- suture needle holder
- tool attachment unit

Pilot study with simple tool

Expected

Build designed suture needle holder and tool attachment unit

Implementation of tools with REMS robot

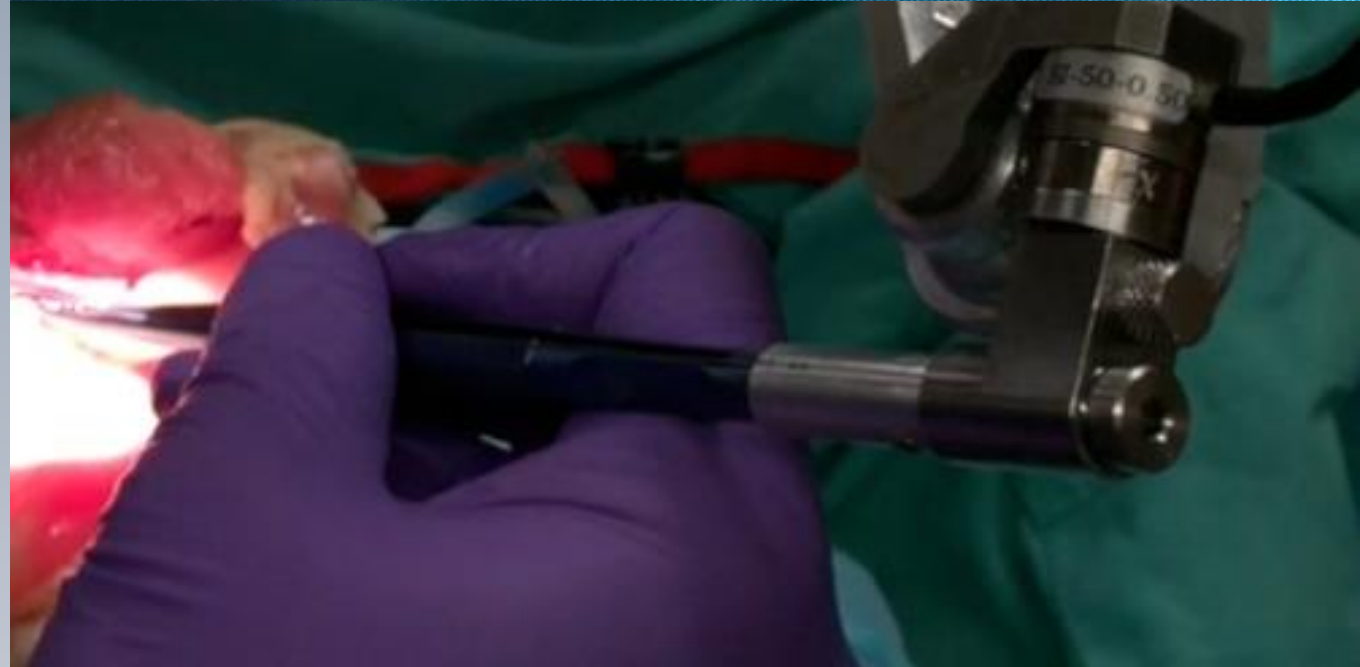
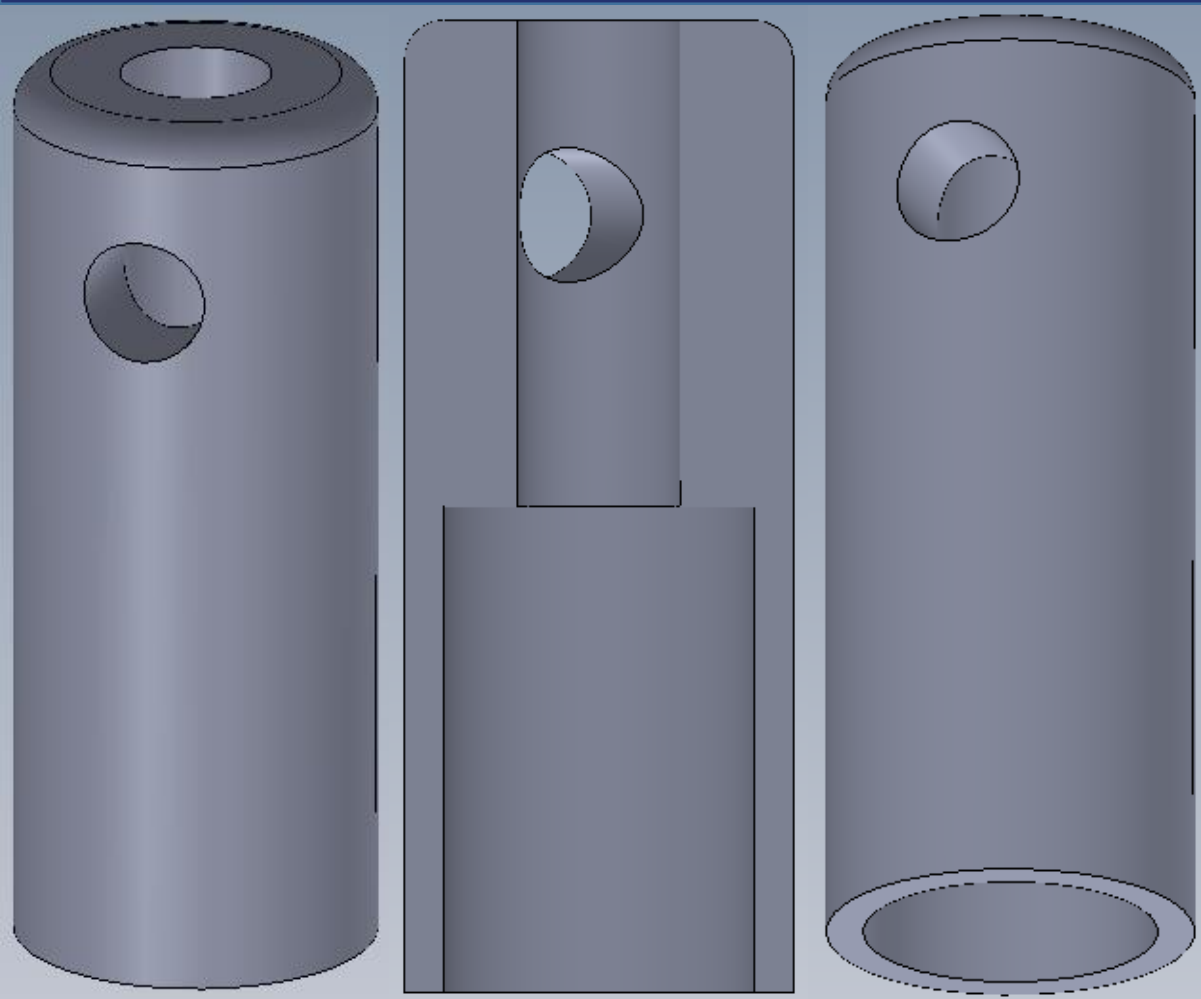
Perform surgical tests in mock OR by Dr. Richmon

Maximum

Conduct user study on viability of new tools with medical students, under the supervision of Allen Feng and Dr. Richmon

Re-design and optimize the REMS movement algorithm and/or mechanisms

Designs



Deliverables

Minimum

- ✓ Design of forceps adapter
- Computer-aided design of:
 - suture needle holder
 - tool attachment unit
- Pilot study with simple tool

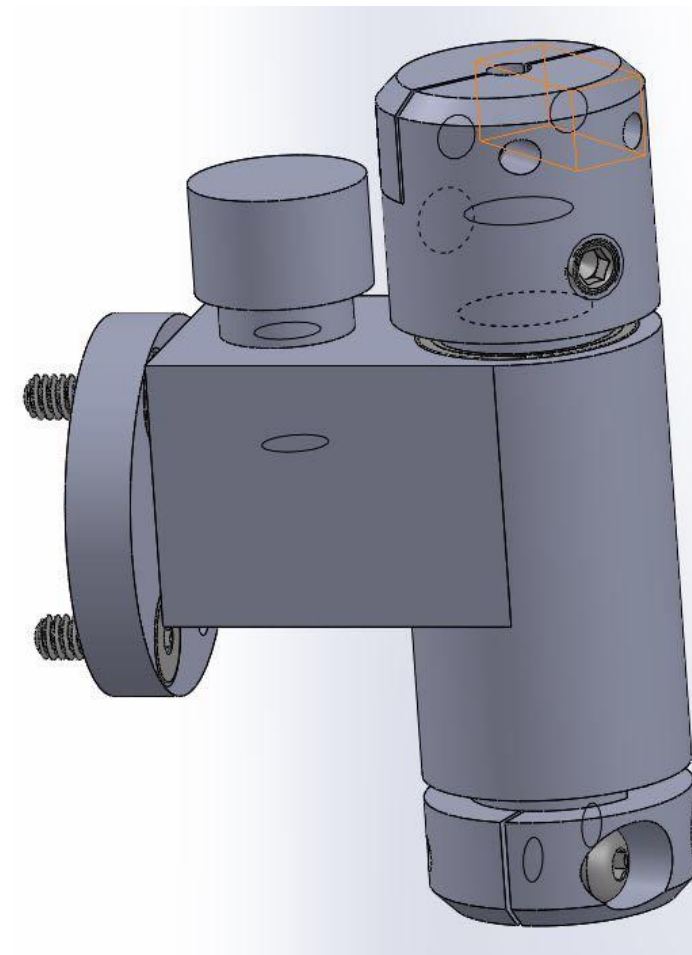
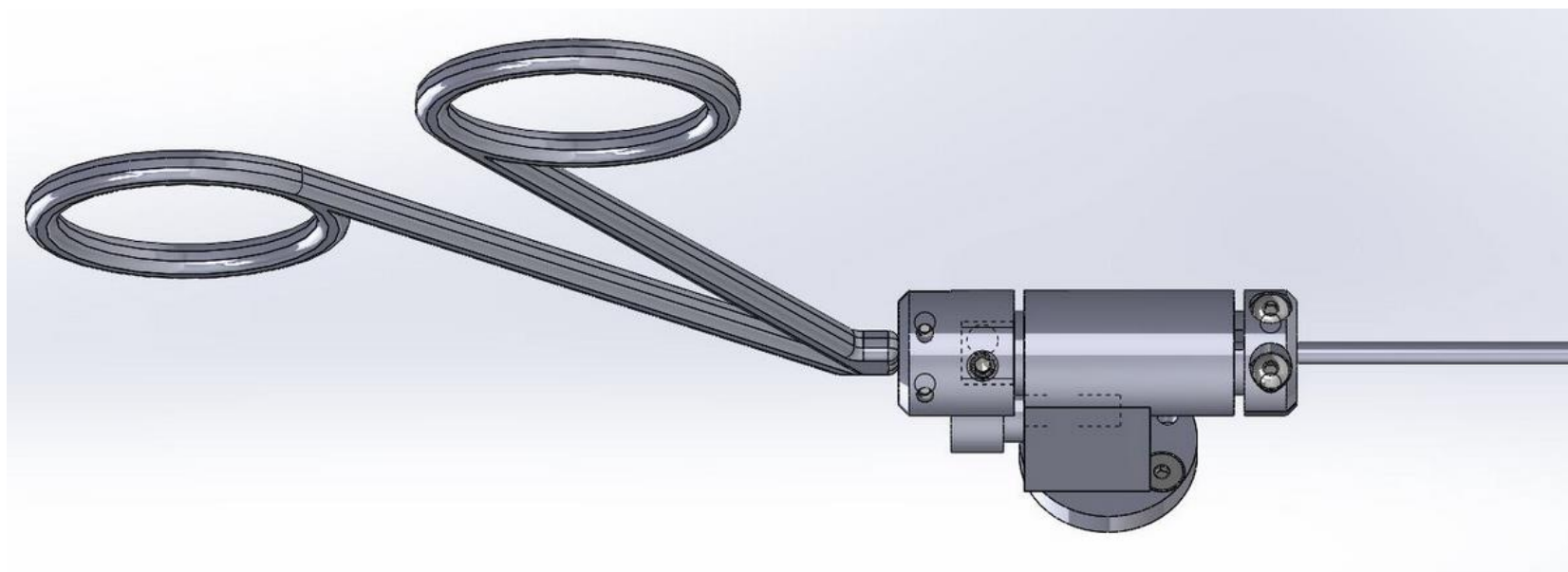
Expected

- Build designed suture needle holder and tool attachment unit
- Implementation of tools with REMS robot
- Perform surgical tests in mock OR by Dr. Richmon

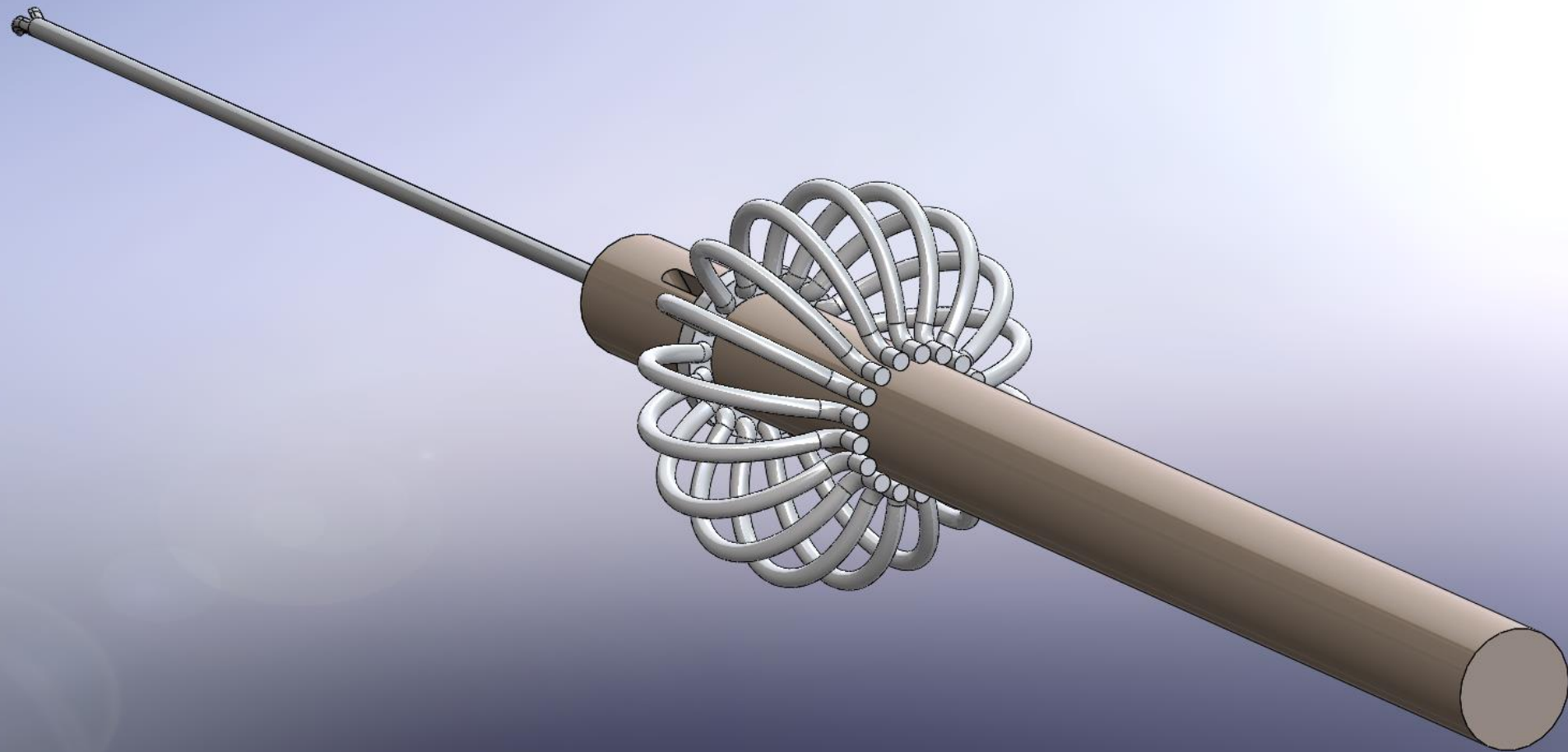
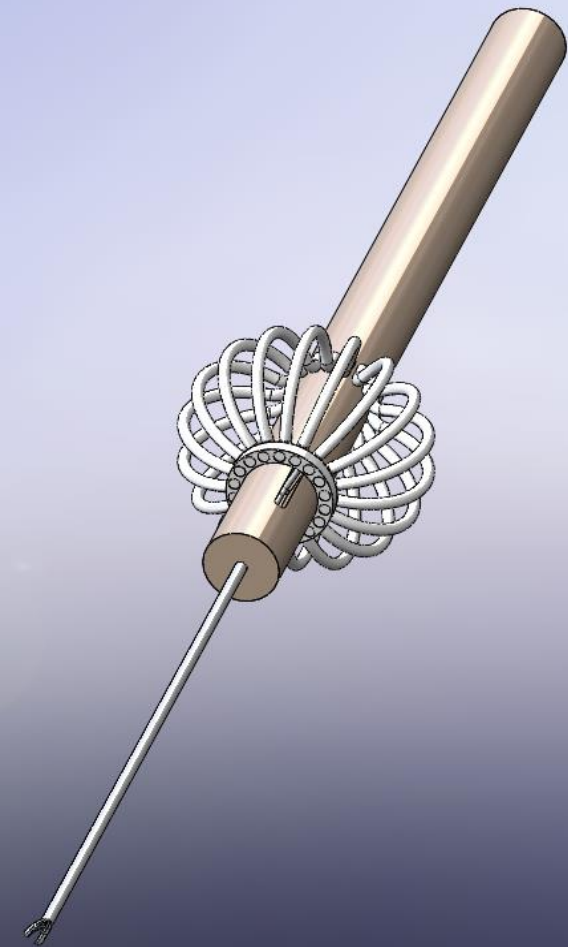
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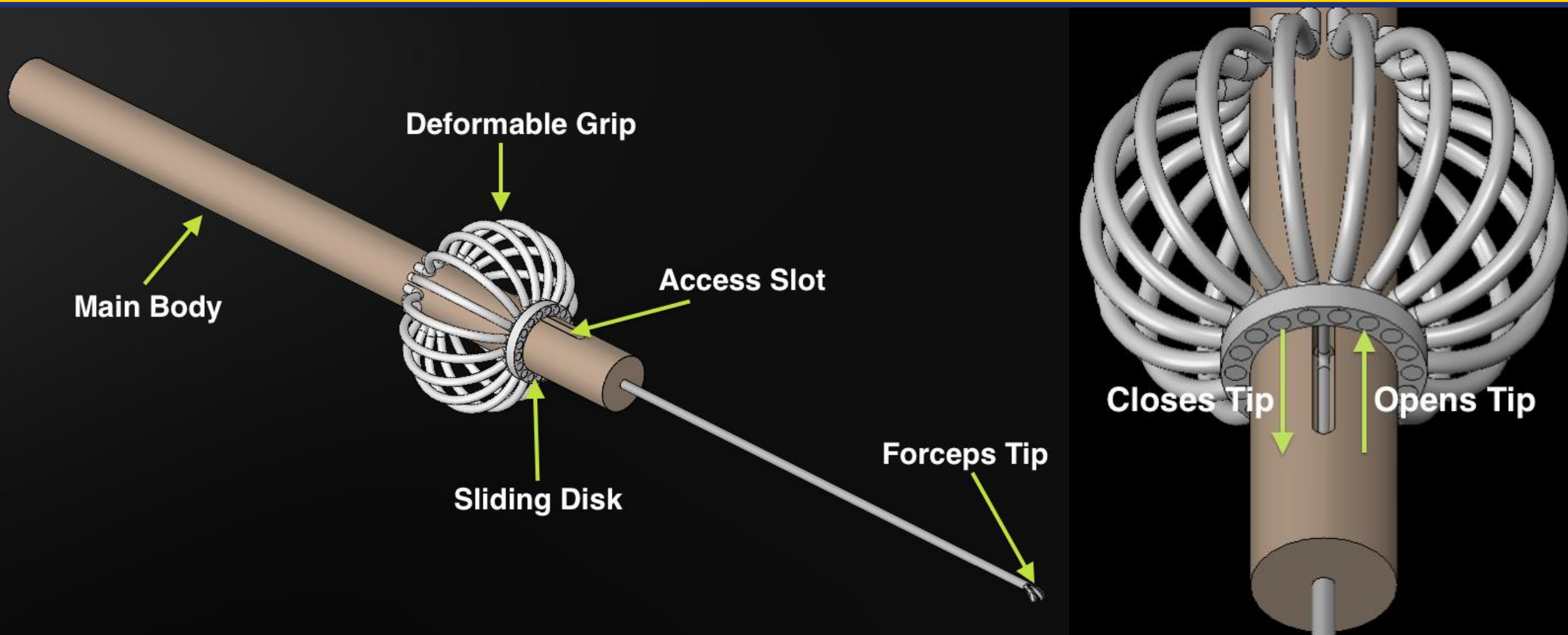
Designs



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Designs



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Experimental Procedure

- Sample size:
 - 10 medical students
 - 5 residents
 - Possibly 1 attending physician
- Tested on store-bought chicken
- Evaluate both freehand and robot assisted







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Rapid Prototypes



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- Re-design and optimize the REMS movement algorithm and/or mechanisms

Updated Deliverables

Minimum

- ✓ Design of forceps adapter
- ✓ Computer-aided design of:
 - suture needle holder
 - tool attachment unit
- Pilot study with simple tool

Expected

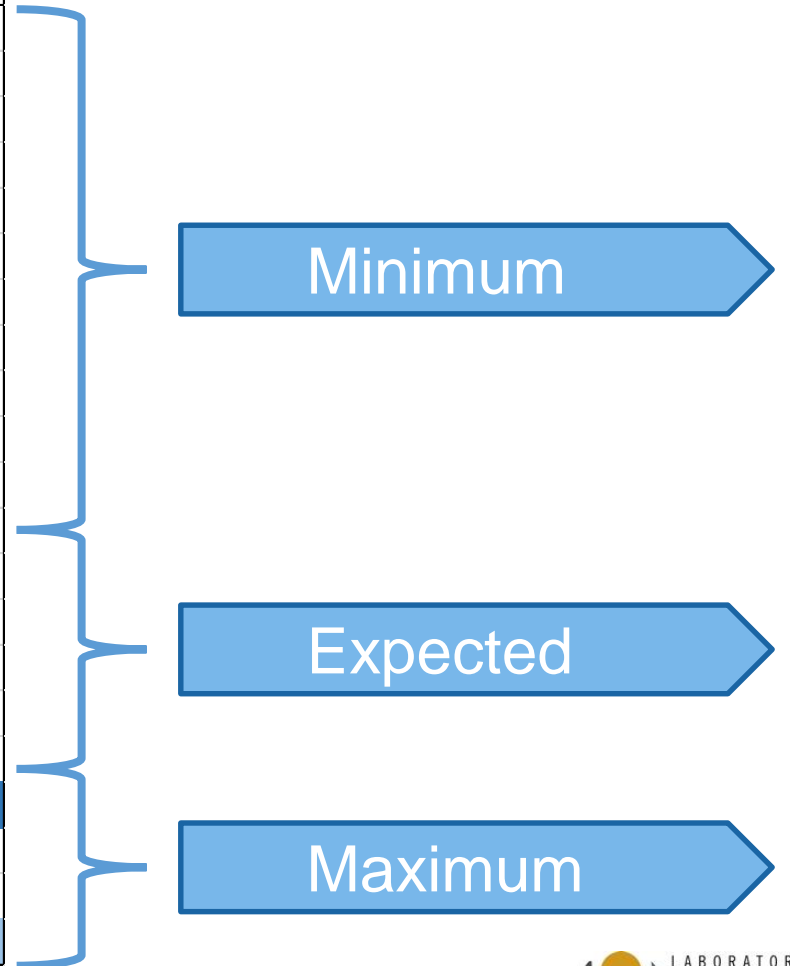
- Build designed suture needle holder and tool attachment unit
- Implementation of tools with REMS robot
- Perform surgical tests in mock OR by Dr. Richmon

Maximum

- Conduct clinical study on viability of new tools with medical students, under the supervision of Allen Feng and Dr. Richmon
- ~~Re-design and optimize the REMS movement algorithm and/or mechanisms~~

Original Timeline

	February	March	April	May
Preliminary Research	[Dark Blue Bar]			
Obtain CAD diagrams for REMS robot	[Light Blue]			
Finish project plan	[Light Blue]			
Read background studies	[Light Blue]			
Written project proposal	[Light Blue]			
Design and Rapid Prototyping		[Dark Blue]		
CAD designs for needle holder and tool attachment unit		[Light Blue]		
Rapid prototyping of designs		[Light Blue]		
Approval of designs by mentors		[Light Blue]		
Pilot Study		[Dark Blue]	[Dark Blue]	
Recruit medical students as subjects for studies		[Light Blue]	[Light Blue]	
Conduct pilot study with existing tools		[Light Blue]	[Light Blue]	
Implementation		[Dark Blue]	[Dark Blue]	
Construct working models of tools		[Light Blue]	[Light Blue]	
Implement modified tools into REMS robot		[Light Blue]	[Light Blue]	
Assess viability of solution (phantom testing)		[Light Blue]	[Light Blue]	
Redesign and reconstruct prototypes as necessary		[Light Blue]	[Light Blue]	
Evaluation			[Dark Blue]	[Dark Blue]
Conduct mock operations with Allen and/or Dr. Richmon			[Light Blue]	[Light Blue]
Conduct full clinical study			[Light Blue]	[Light Blue]
Optimize movement mechanism and algorithm of REMS			[Light Blue]	[Light Blue]



Updated Timeline

	February	March	April	May
Preliminary Research				
Obtain CAD diagrams for REMS robot	Completed			
Finish project plan	Completed			
Read background studies	Completed			
Written project proposal	Completed			
Design and Rapid Prototyping				
CAD designs for needle holder and tool attachment unit	Completed	Completed		
Rapid prototyping of designs	Completed	Completed		
Approval of designs by mentors	Completed	Completed		
Pilot Study				
Recruit medical students as subjects for studies		In Progress	In Progress	
Conduct pilot study with existing tools		In Progress	In Progress	
Implementation				
Construct working models of tools		In Progress	In Progress	
Implement modified tools into REMS robot		In Progress	In Progress	
Assess viability of solution (phantom testing)		In Progress	In Progress	
Redesign and reconstruct prototypes as necessary		In Progress	In Progress	
Evaluation				
Conduct mock operations with Allen and/or Dr. Richmon			Upcoming	Upcoming
Conduct full clinical study			Upcoming	Upcoming

Completed

In Progress

Upcoming

Upcoming Milestones

Milestone	Date
Control trial of simple tool with Dr. Richmon	Scheduled for April 2
Construction of new tool	April 10
Mock operations with Allen and Dr. Richmon	Complete by April 20
Clinical trials	Complete by April 30
Poster Presentation	May 8

Summary

- Currently in building phase
 - Acquiring materials
 - Construction, testing, and redesigning in progress
- One week behind original schedule
- Updated maximum deliverables

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