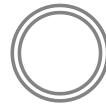


# Virtual Reality Simulator

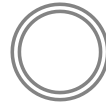


**CLIENTS: PROFESSOR ROBERT RADWIN, PHD  
&  
BENJAMIN MANDEL, M.D.**

**ADVISOR: PROFESSOR THOMAS YEN**

**PATRICK HOPKINS  
KATIE JEFFRIS  
ASHLEY MULCHRONE  
SPENCER STRAND**

# Clients

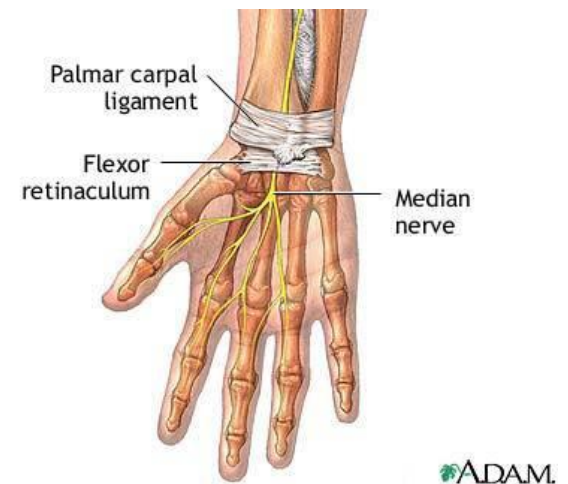


- **Professor Robert Radwin**
  - Founding Chair of Biomedical Engineering Department at Madison Wisconsin
  
- **Benjamin Mandel, M.D.**
  - General Surgeon at UW Health

# Introduction



- Carpal Tunnel Syndrome is pressure on the median nerve
- Causes pain, tingling, numbness, and weakness
- Affects 8 million Americans
- Costs \$20 billion annually in worker's compensation

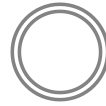


# Carpal Tunnel Surgery



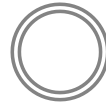
- Median nerve and tendons pass through narrow carpal tunnel
- Swelling pinches this nerve and causes the pain
- Surgery cuts the carpal tunnel transverse ligament to relieve the pressure
- About 465,000 surgeries are performed each year
- Only practice available is on cadavers – sparse and expensive

# Design Criteria



- Create the simulation as realistic as possible
  - Visually
  - Physically
- Durability
- Accurate feedback
- Professional Appearance
- Budget ~ \$100 for parts/improvements of current prototype
  - Replication

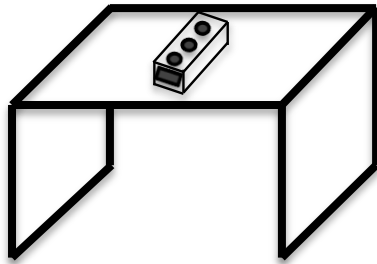
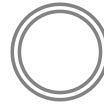
# Proposed Components



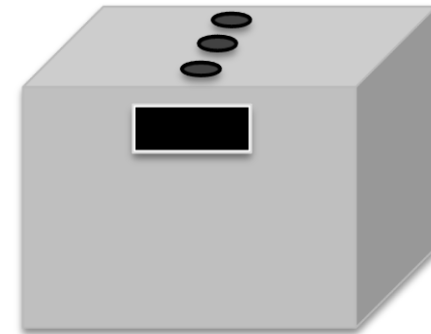
- Software / Hand Model
- Wii remote
- Mounting LEDs onto the trigger
- Additional LED options



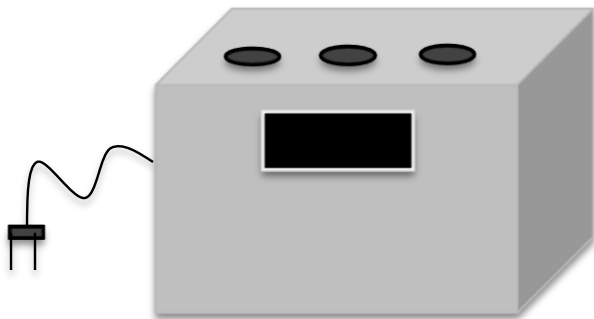
# Proposed Designs - Wii



Design #1: As is

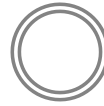


Design #2: Hidden



Design #3: Simplified Circuit

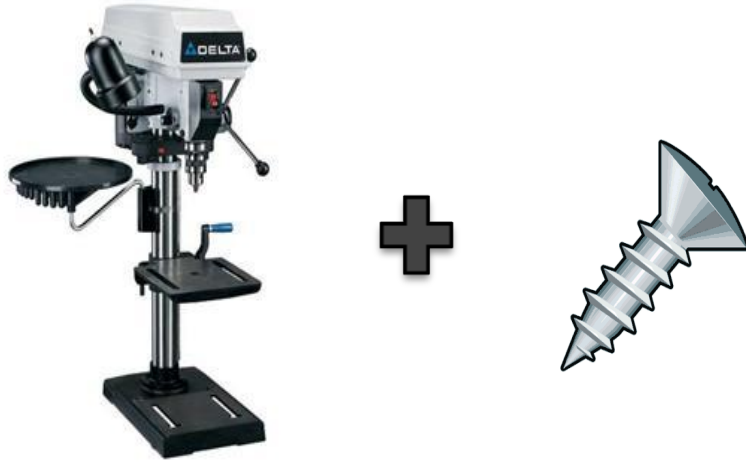
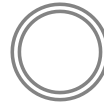
# Design Matrix - Wii



Criteria	Weight	As Is	Hidden	Simplified Circuit
Professional Appearance	40	20	32	36
Durability	20	12	12	14
Ease of Use	15	11	11	14
Ease of Fabrication	15	15	12	11
Cost	10	10	9	9
<b>Total</b>	<b>100</b>	<b>68</b>	<b>76</b>	<b>84</b>



# Proposed Designs – Mounting LEDs onto Trigger



Design #1: Drilling/Screw



Design #2: Clips

Expanding Bolt

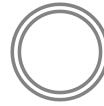


Design #3: Internal Lock

Luer Lock

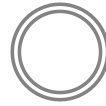


# Design Matrix - Mounting LEDs onto Trigger

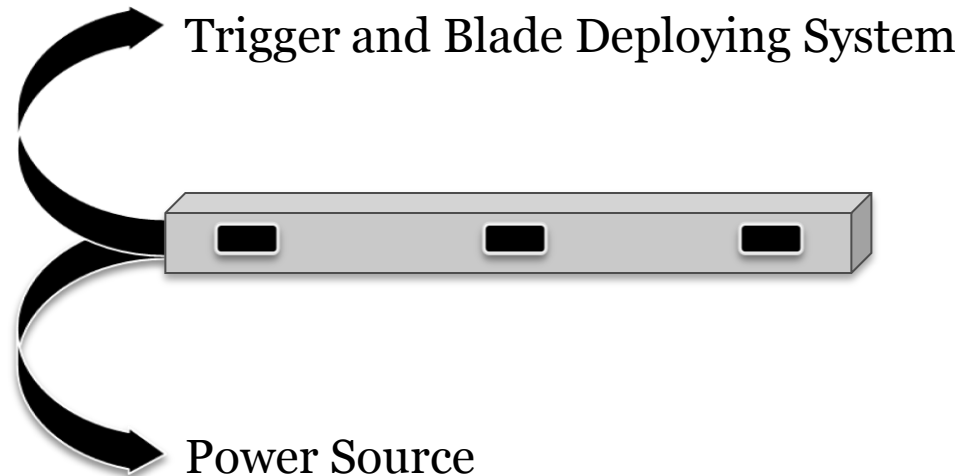


Criteria	Weight	Drilling/Screw	Clips	Internal Lock
Professional Appearance	40	35	15	40
Durability	20	18	10	18
Ease of Use	15	14	13	14
Ease of Fabrication	15	5	8	8
Cost	10	9	9	7
<b>Total</b>	<b>100</b>	<b>81</b>	<b>55</b>	<b>87</b>

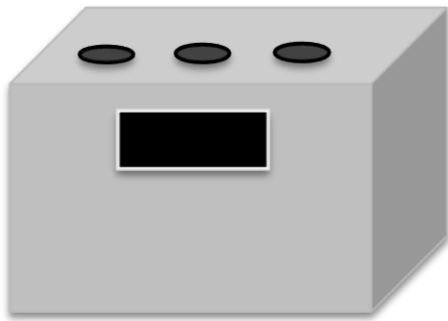
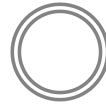
# LEDs and Housing



- Flat Infrared-Emitting LEDs
- Infrared-Transparent Housing
  - Shorter housing
- Power cord exit site



# Final Design



OR

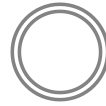


Trigger and Blade Deploying System



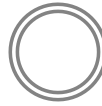
Power Source

# Future Work



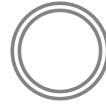
- Software
  - Being completed by Mason Jellings
- Fabricate housing for the Wii remote
- Further research:
  - Internal locking mechanisms
  - Infrared sensor technology
  - Infrared transparent materials
- Fabrication
- Testing
  - LED distance
  - Survey experienced doctors

# References



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- [http://www.google.com/imgres?q=mixer,+beater&um=1&hl=en&rlz=1R2ADSA\\_enUS352&biw=1440&bih=739&tbm=isch&tbnid=Jx3\\_qqvr5KaW-M:&imgrefurl=http://www.vintagekitchenaid.com/index.php/whips-paddles/kitchenaid-mixer-k4b-flat-paddle-beater.html&docid=B9WaLLtou-qcZM&imgurl=http://www.assetrenew.com/database/media/catalog/product/cache/2/image/5e06319eda06fo20e43594a9c230972d/k/i/kitchenaid\\_mixer\\_k4b\\_flatpaddle\\_beater.jpg&w=809&h=648&ei=lTaeTrPJLaGHsALspNzpDw&zooom=1&iact=rc&dur=169&sig=112128968015826916966&page=1&tbnh=123&tbnw=153&start=0&ndsp=24&ved=1t:429,r:26,s:0&tx=71&ty=81](http://www.google.com/imgres?q=mixer,+beater&um=1&hl=en&rlz=1R2ADSA_enUS352&biw=1440&bih=739&tbm=isch&tbnid=Jx3_qqvr5KaW-M:&imgrefurl=http://www.vintagekitchenaid.com/index.php/whips-paddles/kitchenaid-mixer-k4b-flat-paddle-beater.html&docid=B9WaLLtou-qcZM&imgurl=http://www.assetrenew.com/database/media/catalog/product/cache/2/image/5e06319eda06fo20e43594a9c230972d/k/i/kitchenaid_mixer_k4b_flatpaddle_beater.jpg&w=809&h=648&ei=lTaeTrPJLaGHsALspNzpDw&zooom=1&iact=rc&dur=169&sig=112128968015826916966&page=1&tbnh=123&tbnw=153&start=0&ndsp=24&ved=1t:429,r:26,s:0&tx=71&ty=81)
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# Thank you!



- Clients
- Advisor

## QUESTIONS?