

University of Idaho

College of Engineering

DESIGN REVIEW

PRESSURE ANGLES

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- Capstone projects with UI Marching Band on the Band-Beesten for the last several years
- Musical triangles are expensive and previous handles were more of a temporary solution
 - triangles themselves to be made of rebar to save \$
 - handle with lights that reacted from chime
- Previous project with Marching Band glasses with LEDs relying on 9 volt battery supply

-same battery type for simplicity -long life

MUSICAL TRIANGLES

OBJECTIVES



THE SCOPE OF THIS DOCUMENT WILL DESCRIBE THE SPECIFICS OF OUR DESIGN REQUIREMENTS FOR THE CREATION OF 150 MUSICAL TRIANGLES AND THEIR SUPPORTING ACCESSORIES FOR THE UNIVERSITY OF IDAHO MARCHING BAND. THE MUSICAL TRIANGLES CONSIST OF A CHIME, STORAGE ACCESSORY FOR BOTH THE TRIANGLE AND CHIME, THE TRIANGLES THEMSELVES, AND A HANDLE THAT WILL HOUSE OUR CIRCUIT BOARDS (2), LEDS (6-9), ARDUINO DEVICE, WIRES, AND PIEZO METRIC VIBRATION SENSOR.

<u>HANDLE</u>

- Ergonomic and fit all sizes of hands
- House battery
- House Arduino/piezo
- House LEDs
- Protect all electric components from typical abuse during and after use
- I Handle and triangle are orthogonal
- Connection from handle to triangle& backup connection
- I Insignias of both involved departments
- I Triangle can be removed
- I Storage of piezo on handle

TRIANGLE

- Made of rebar
- Sides are roughly 7 inches
- I Angles of corners must be 60°±3°
- Flat sides of rebar are aligned with vertical face
- Opening gap must be large enough for connections to be removed
- Consistency between triangles

POUCH

- I Hold handle, triangle, and chime
- Must be easy to access for user during performances
- Must not stand from performers outfit
- Must be non intrusive for band members to carry during performances
- I Durable material to handle years of future use



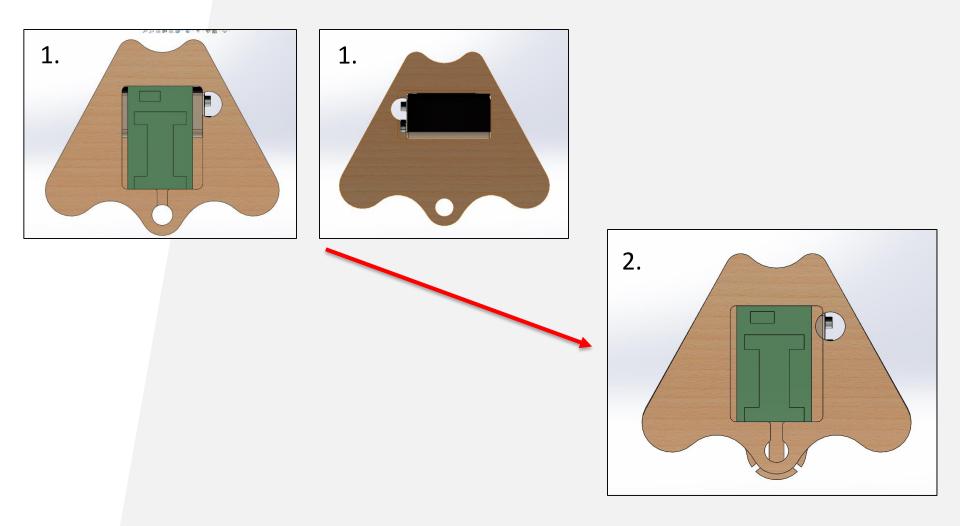
DESIGN PROGRESSION HANDLES

Initial Ideas:

- 1. CNC aluminum
- 2. 3D printed plastic
- 3. Laser cut plywood
 - Cheaper
 - Less time consuming
 - Easy to prototype

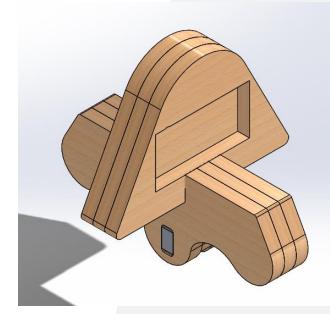


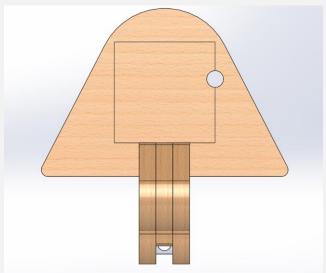
DESIGN ITERATIONS

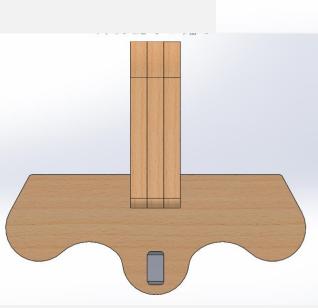




NEW DESIGN CONCEPT

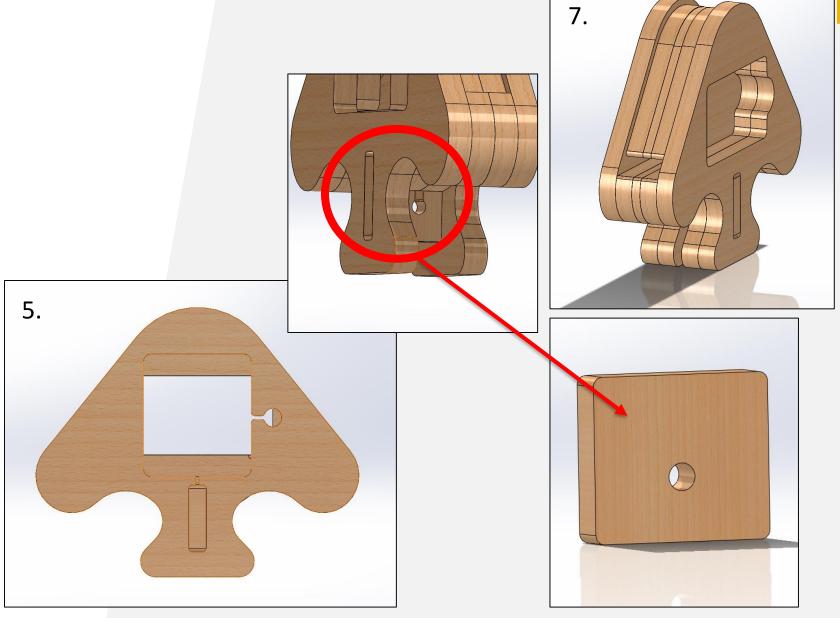






FURTHER ITERATIONS





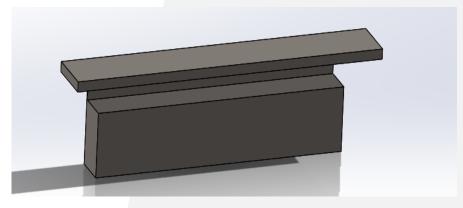


FINAL ASSEMBLY





I Old jig

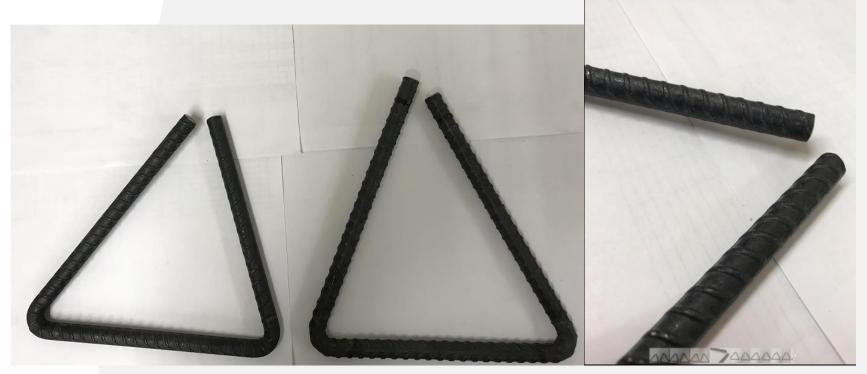


Problems

- Length
- Unstable
- Triangle guide
- Stopper in the x-axis

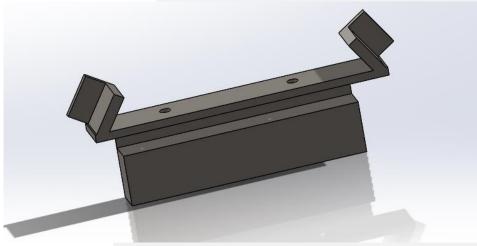


I Test 1





I Modified Idea



Solutions

- Angle indicator
- Threaded holes
- Add a block

Problems

- Angle indicator
- Threaded holes
- Stopper



Test 2



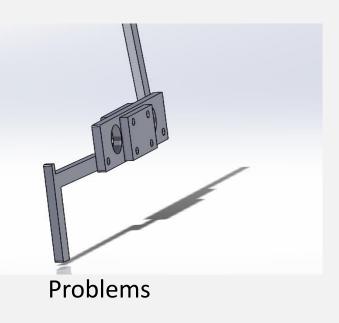


I Current Idea



Solutions

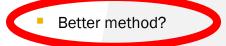
- Flat Surface jig
- Holes from the bottom
- Handle with a stopper





UNKNOWNS AREAS STILL TO BE DEFINED

- I Test Validation
 - Will magnet on piezo disrupt ability to send signal to Arduino when triangle is chimed?
 - Piezo will have an adjustable sensitivity so this variable can be changed as needed
- Will the strength of the magnet on the handle disrupt the circuit or battery?
- Screw hole locations for circuit board
 - Circuit board layout is currently undefined
 - Stand offs from center material to circuit board
 - Will center piece material stand up to the wear and tear as 1/8 inch thick wood
- LED's attachment to handle
 - Glued (superglue and/or hot glue)



BUDGET

Capstone Project Budget								
Project:								
Last Updated	Last Updated 7/10/2019							
		2019		lte				
Expense Items	June	July	Aug	Tot	tal			
Equipment/Tools:								
Bending jig		\$ 20		\$	20			
Travel:								
Supplies / Parts / Services:								
Sensors		\$ 150		\$	150			
Sheet of plywood (per 3/4 ")		\$ 94		\$	94			
rebar 0.5"		\$126.40		\$	126			
Arduino		\$ 943		\$	943			
Lights		\$ 350		\$	350			
Battary 9V (non- rechargable)		\$949.42		\$	949			
Accessories/ wires		\$ 50		\$	50			
pouch		\$ 800		\$	800			
circuit board		\$ 250		\$	250			
battery case		\$ 75		\$	75			
metel dowel rod		\$ 200		\$	200	\$	4,008	Subtota
ME Shop Usage (est. Hrs):				Ηοι	urs			
Lazer cut	20	3		23	3			
Saw		2		2				
Bending		20		20	0			
Sanding		1		1				
				0)			
	Gradu	iate Studei	nt s pport	Ş		inc	luding	fringe
		Shop	overhead	\$	-			
			Totals	\$4,				
			Budget		500			
			Excess	\$	492			

SCHEDULE



Capstone Project Schedule Template	- Summer Fall																											
· · · · · ·		Project:	Marching Band Triangles 7/10/2019 6/12 6/13 6/17 6/18 6/21 6/24 6/25 6/26 6																									
		Last Updated:																										
		Year									201	9																
		Month	June																				Aug	ust				
Task Description	Duration (hours)	Assign	6/12	6/13	6/17	6/18	6/21	6/24	6/25	6/26	6/27	6/28	6/29	7/1	7/2	7/3 7	/4 7/	8 7/9	7/11	7/13	7/16	7/18	7/20	7/22	7/25	7/30	8/1	8/2
Complete team contract	2	Team																										
Meet with Dr. Rinker	1	Team																										
Budget estimates	1	Abdullah																										
Concept design of the handle	15	Brock & Bryce																										
Pitch to Dr. Swenson	1	Team																									\square	
Get quotes on rebar from mult. Distributers	0.5	Brock																										
Prototype of handle	3	Brock & Bryce																										
Complete Product Req's	3	Bryce																										
Meet with Dr. Rinker	3	Team																										
Meet with Spencer Martin	1	Brock & Bryce																										
Purchace rebar	1	Brock																										
Meet with Dr. Rinker about circuitry	2	Team																										
First prototype of triangle	2	Abdullah & Faris																										
Design jig for triangle	1	Abdullah & Faris																										
Build jig	2	Abdullah & Faris																										
Purchace rebar for mass production	1	Brock & Bryce																										
Update project schedule	1	Abdullah																										
Update handle design	1	Brock & Bryce																										
Verify triangle jig works as needed	4	Abdullah & Faris																										
Design Review	2	Team																		DR								
Produce triangles for mass production	3	Abdullah & Faris																										
Produce handles for mass production	3	Brock & Bryce																										
Get quote on bags	1.5	Bryce & Brock																										
Get a quote on rods	1	Brock																										
Instal circuits	10	Brock & Bryce																				l	JNKN	OWN				
Finish Portfolio	2	Team																										
Work with bag supplier to manufacture them	1.5	Bryce																		[]								
Purshase rods	1.5	Brock																										
Complete Design Validation Plan	2	Team																										
Prepare for Snapshot 1	2	Team																										
Complete Value Proposition	2	Team																										
Prepare for Snapshot 2	3	Team																										