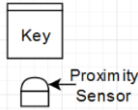
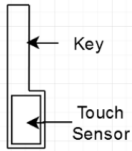
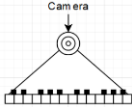
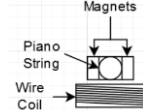
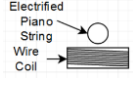
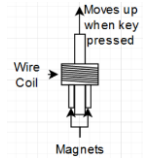
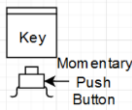
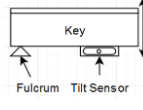








































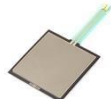

Nick’s Morphological Chart: Nick’s chart has been slightly modified and used as the team’s chart

David's Morphological Chart:














Functions	1	2	3	4	5	6	7	8	9	10
Feedback Module/ Sensors	Proximity Sensor: 	Capacitive Touch: 	Camera Tracking: 	Accelerometer: 	Contact Mic: 	Magnetic Field: 	Electric Field: 	Wire Coil on Wippen: 	Push Button: 	Tilt Sensor: 
Controller	Computer Mouse: 	Trackball: 	Trackpad: 	Touch-screen: 	Mobile Phone: 	Voice: 	Smart Speaker: 	Game Controller: 	Hand Gestures: 	Mind Controller: 

Jeff's Morphological Chart:

















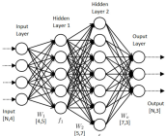


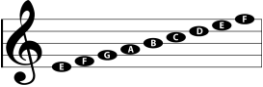


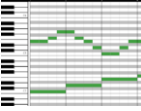
Function	Option 1	Option 2	Option 3	Option 4
Volume Calibration	Microphone 	Vibration Sensor 	Accelerometer 	
Noise Dampening	Rubber 	Foam 	Gaskets (planned) 	Vacuum Chamber 
Pedal Actuation	Worm Gear 	Linear Actuator 		
Piston Firing Mechanism	Electric Solenoids  (in place)	Pneumatic Solenoids 	Hydraulic Solenoids 	
User Interface	Touchscreen 	Knobs/Buttons 	Mobile App 	Website 
Power Supply	(1) 36V Supply, (1) 5V Supply (in place) 	(1) Consolidated Power Supply 	Batteries 	Solar Panels 
Software Platform	Raspberry Pi 3 w/ Teensy  (in place)	Microcontroller 	Arduino 	
Solenoid Controller Boards	Bus Connection 	PWM Adafruit Board 	Microcontroller 	Custom Built Board (designed) 
Programming Language	Python 	C/C++ 	Javascript 	

Signal Transfer Medium	Copper Wires (in place) 	Bluetooth 4.0 Bluetooth 	Fiber Optic Cables 	
Mounting System	Stainless Steel Rails (in place) 	Suspended 	Zip Ties 	Velcro 
Circuit Board Mounting System	Shelf 	Suspended 	Zip Ties 	Velcro 
Method of Playback	"Guitar Hero" style 	Audio playback 	System generated report 	Traditional Player Piano 
Feedback Sensor	Pressure 	Contact Microphone 	Microphone 	Button 
Feedback Sensor Mounting Location	On strings 	Under Keys 	On hammer connectors 	On top of key 
Communication to Software	Bluetooth 4.0 Bluetooth 	Hardware/Copper Wires 	Laser 	

# Steven's Morphological Chart:

Functions	1	2	3	4	5	6	7	8
Interface	 <p>App - Quick and Easy to access, although requiring new development</p>	 <p>Laptop - can be portable and non-instructive</p>	 <p>Attached Computer - Makes the piano a complete unit, although requires large design or purchase</p>	 <p>Website - no physicality need, although requires internet connection</p>	 <p>Analog - Simple and straightforward but no graphical representation and a new line of design</p>	 <p>On-board device - same pros as analog although lacking in actual live physical controls a la volume</p>	 <p>Desktop - impressive computing power but large and expensive</p>	 <p>Analog/On-board Mixed - combines intuitive controls and display functionality although adds a lot of complexity</p>
Note Display	 <p>Staff Roll - simple and well known but complicated to display live</p>	 <p>MIDI Roll - well known although difficult to read live</p>	 <p>Vertical Piano Roll - well known, but will not be intuitively above each note</p>	 <p>Sound Transients - great for volume control, but no information on note</p>	 <p>Sequencer Style - blocked off and no note representation, but great rhythmic potential</p>	 <p>Static Piano Representation - no sense of time, but great for direct representation</p>	 <p>Direct Note Name e.g. 'G#' - able to quickly tell notes, but assumes knowledge of scales</p>	 <p>Direct to Paper Representation - a callback to the previous forms of player pianos, but virtually useless to read</p>

# Josiah's Morphological Chart

Functions	1	2	3	4	5
Controller For UI					 facial recognition
UI Design Layout	 mobile/app	 olden days website	 physically on paper		 oral tradition
Software		HTML			
Recording device	 microphone	 someone directly watching and writing down note timing	 video recording	 midi controller	 buttons (in current prototype)
Transcripti on method	 neural network (audio to midi)	 calligraphy (write it down)	 store it in RAM (store sound as it comes in, translate to MIDI after)	 musical staff	
Realtime feedback (How do you keep track of whats being played)	 listen	 metronome	 visually display notes as they come		