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DE0976 Experiential Design



The Electric Swear Box

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Introduction

Experiential Design

The process of designing a journey, or series of interactions within a physical space, to be experienced over a set period of time.

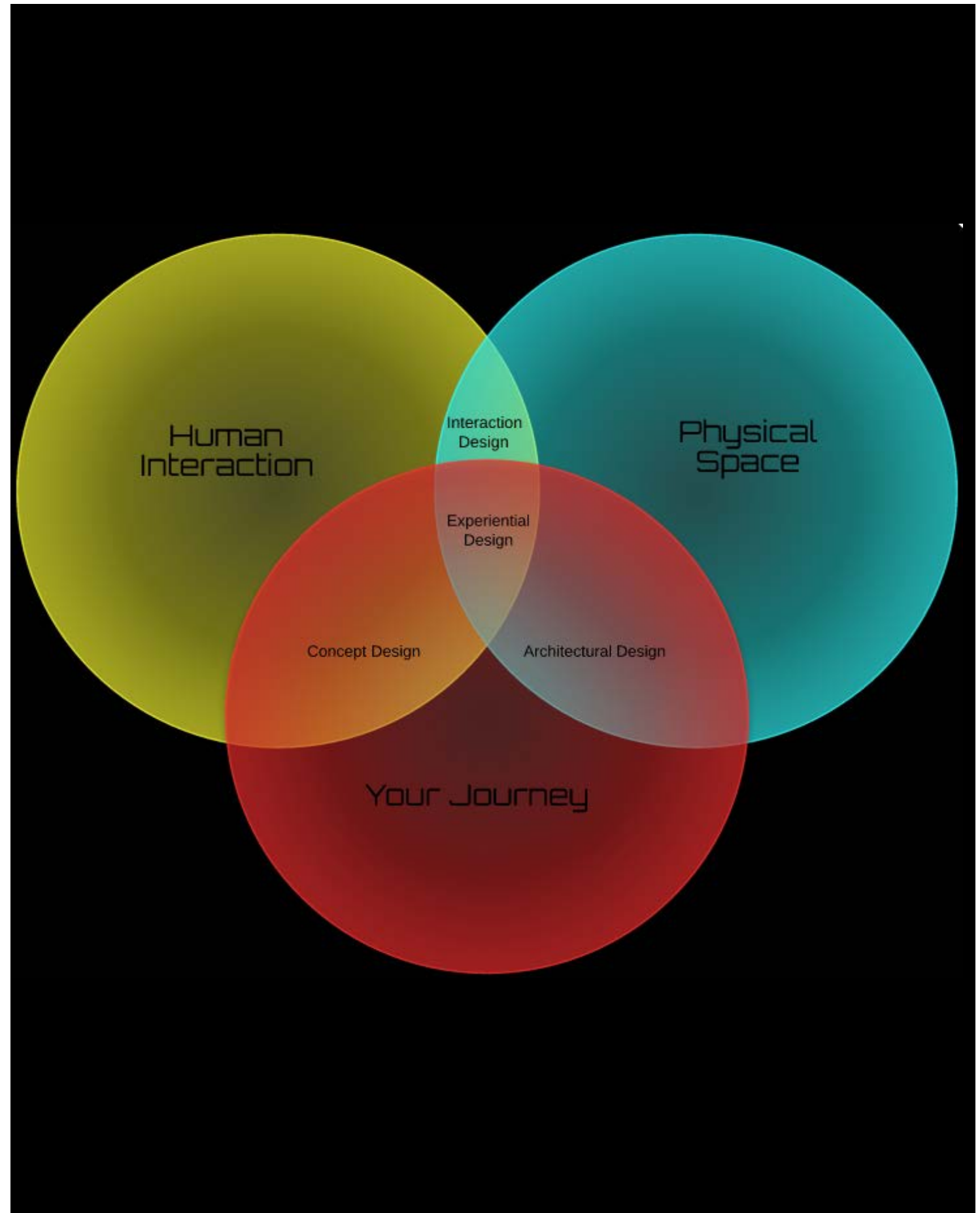
Experiential design is a multi-faceted profession that is geared toward stimulating human activity and based on the understanding of behavioral science.

Experiential design is subjective in nature because, it is based on an individual's perception of an environment.

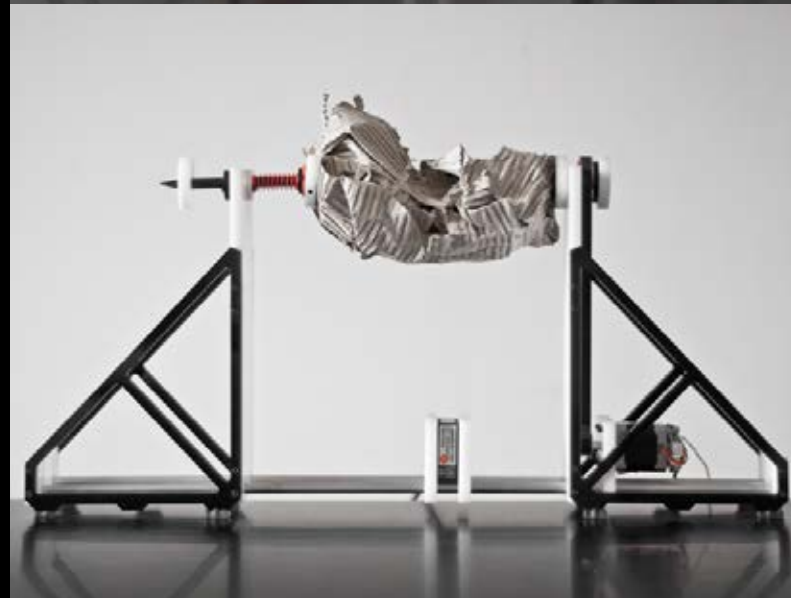
The Brief

Option 1- Design a thought provoking audio/visual piece, to be displayed in a public space. This could be either a large scale projection on to a building or something that could be displayed well in an exhibition space.

Option 2- Design sensor-based interface to allow users to interact with. This could be based on a physical computing model using tools like the Arduino system.



Research



AN INSTRUMENT FOR THE SONIFICATION OF EVERY DAY THINGS

What does a cardboard box sound like? A lot like a weird clown head, it turns out.

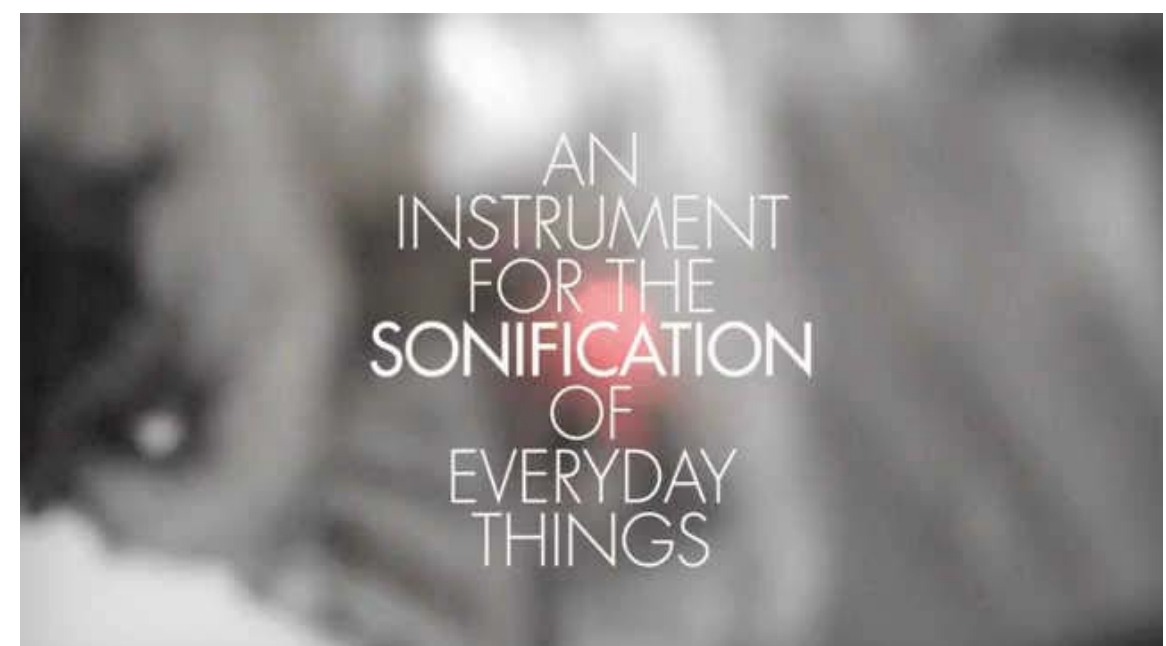
Actually, most of the items that get sonified by designer Dennis Paul's "Instrument for the Sonification of Everyday Things" end up sounding pretty similar, but that's not really the point. The point is that Paul squeezes sound out of cardboard boxes and weird clown heads!

The machine rotates objects, repeatedly scans their surfaces, and translates the measured distance values into audible frequencies, notes, and scales using a custom-programmed translator and controller module. Silhouettes of the goods define the loops.

Paul, a professor of interaction and space at HFK Bremen in Germany, built his instrument from aluminum tubes, plastic, acrylic glass, a high-precision distance measuring laser, a stepper motor, and a "few bits and bobs." (But first he built a Lego prototype.)

He says playing the theramin-like instrument is a "*mixture of practice, anticipation, and serendipity.*" Let the rave begin.

<https://vimeo.com/49484255>



Projection Mapping

Video Projection Mapping is an exciting projection technique that can turn almost any surface into a dynamic video display. Specialized software is used to warp and mask the projected image to make it fit perfectly on irregularly shaped screens. When done right, the end result is a dynamic projection installation that transcends ordinary video projection.

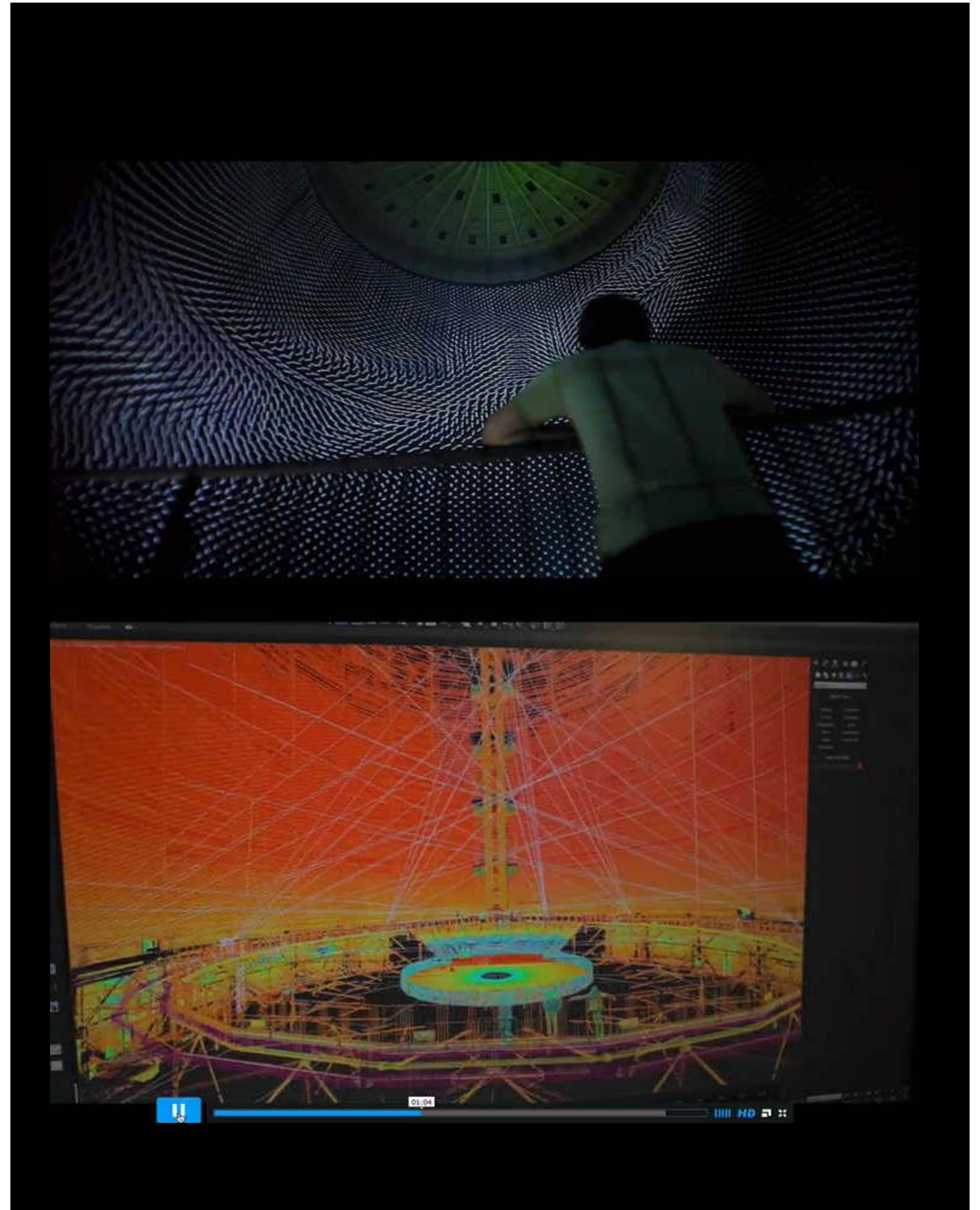
320° Licht

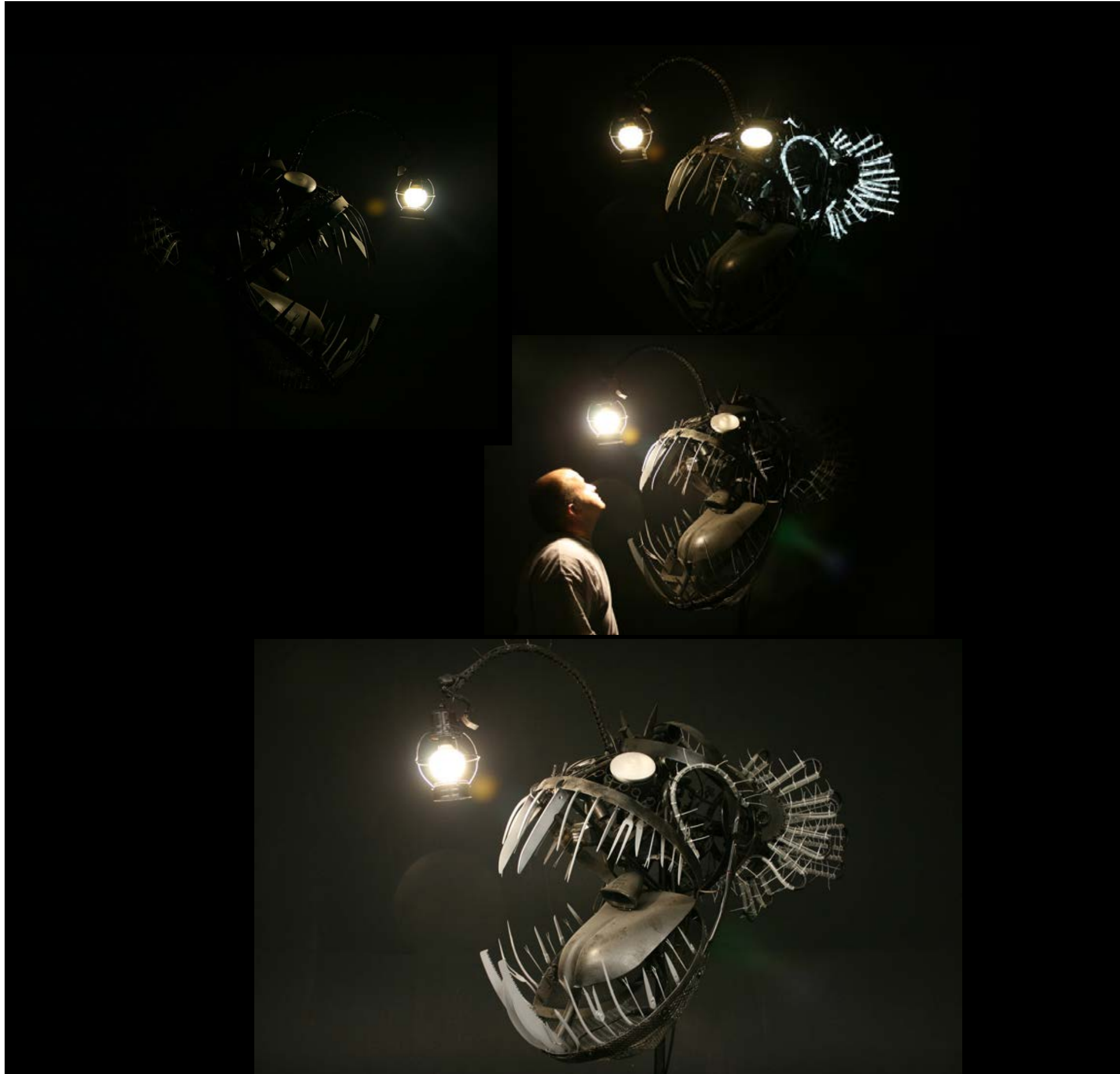
What do you do with an empty, 112-meter high, former gas tank?

The large black cylinder known as the Gasometer Oberhausen looms over the Rhine. Once the pressure valve between early 20th Century oil industries, this industrial petroleum holder, now an exhibition space, stands today a giant, tar-coated question mark to all artists with the scale and scope to fill its astounding volume.

Before Bremen-based, site-specific projection mapping collective URBANSCREEN got their hands on it, they first had questions of their own: “Who is the storyteller in projection mapping?” asks creative director Thorsten Bauer. The answer led to 320° Licht, a projection-mapping installation in which the colossal tank is the canvas for large-scale visual virtuosity, part of the exhibition “The Appearance of Beauty” at Gasometer Oberhausen

Part of the upcoming exhibition “The Appearance of Beauty,” exhibition at Gasometer Oberhausen, that runs through December 30, the installation features 21 high-powered Epson projectors, displaying graphic animations on the interior walls, stretching a cumulative surface radius of 320 degrees. It even includes sounds that play to the unusual acoustics of the structure, creating an immersive experience that challenges the spectator’s perception of the surrounding space..





Deep Sea Angler Fish Lamp

With a lantern suspended inches above its razor-sharp gnashers, the Deep Sea Angler Fish is a lamp that will make you think twice before turning the light on. The five-foot-tall lighting fixture, designed by artist Justin La Doux, is inspired by bioluminescent creatures that inhabit the shadowy realm of deep waters. Its teeth are made of knives, forks and scissors, while various bicycle parts, shovels and other discarded objects make up the rest of its body.

Just like the real Angler Fish, creating a natural lure to draw its next meal, the lamp lights up slowly with a motion sensor mechanism. Protruding above the huge toothy mouth is an element called 'the fishing pole,' which baits prey close enough to be snatched. At first, the light over the head glows brightly, followed by the rest of the structure, as the 'victim' gets closer.

The Deep Sea Angler Fish Lamp uses energy efficient lighting sources and turns recycling into an art form.

This piece is part of larger sculpture entitled Deep Sea "Creatures of the Deep" that was entered into the 2010

Arduino

Arduino is an open source electronics prototyping platform based on flexible easy-to-use hardware and software.

It is intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators.

The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing).

Arduino projects can be stand-alone or they can communicate with software running on a computer (e.g. Flash, Processing, MaxMSP).

There are lots of controllers to choose from so you can tailor the board to your project i.e underwater or in clothing



Concepts

Concept 1

Torch Cycling Helmet

The Torch Helmet is a bicycle helmet that has 10 integrated LEDs built into the front and the back that both help you see where you are going on your bike, and help you be seen by cars in the dark. The Torch Bicycle Helmet has four different light functions that include flashing and steady, has rechargeable batteries that will run for up to 12 hours which take 1.5 hours to recharge, and have separate buttons that will control the front and rear lights separately. The helmet comes in red, white, and black, and was recently successfully funded on Kickstarter and is available to buy now.

I would like to take this idea and add some gas sensors that would enable this helmet to light up when the pollution levels were to get beyond a certain level the lights could be representant of the pollution levels. i.e green for low levels and red for high levels possibly accompanied with an unobtrusive alarm or minor bleep.

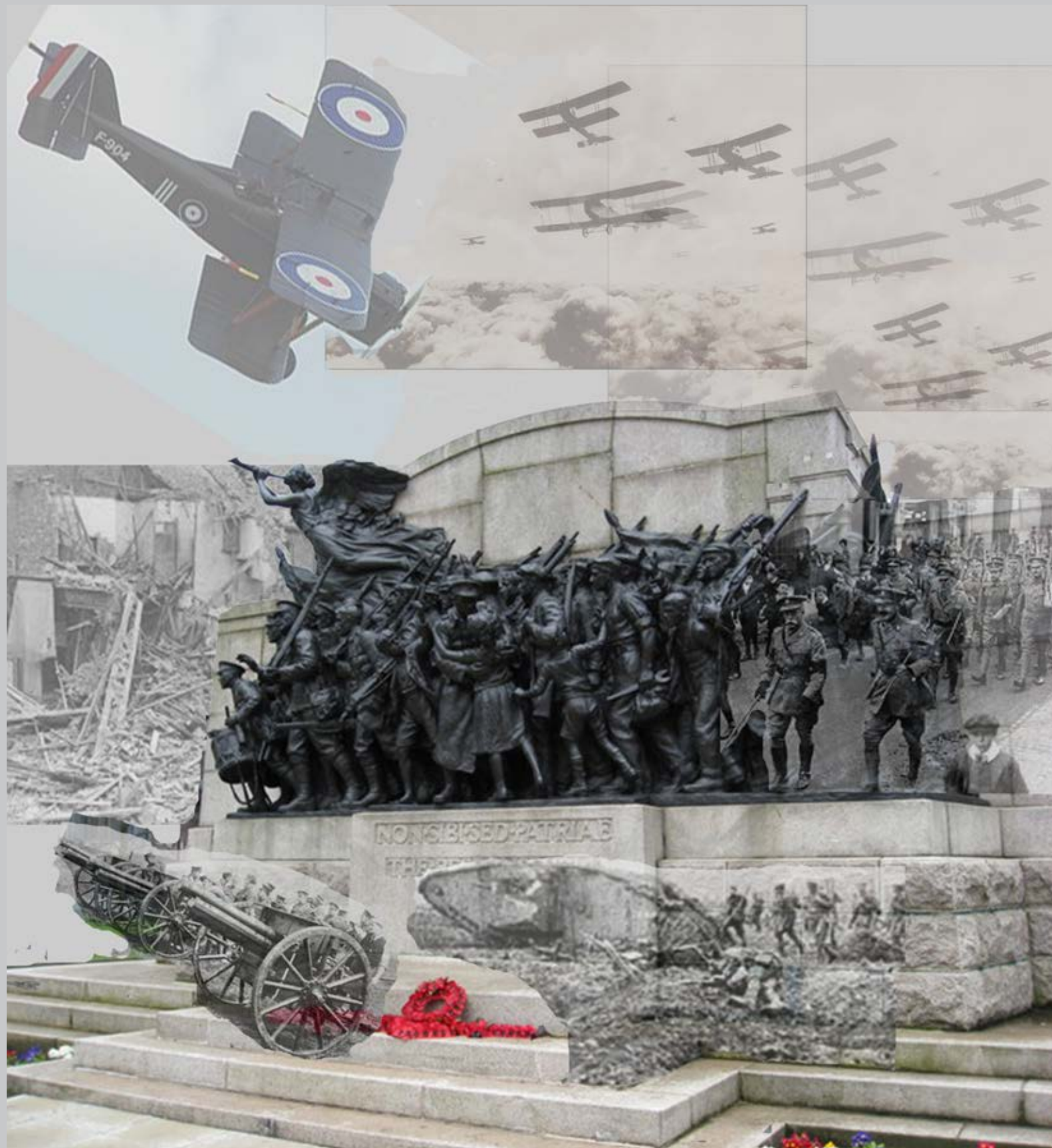


Concept 2

Projection Mapping

The Grade II* memorial to commemorate the raising of several battalions of the Northumberland Fusiliers in Newcastle, known as “The Response”, or the Renwick War Memorial, is a large pale granite monument with a group sculpture or frieze of bronze showing soldiers leaving for war. The thirty figures are sculpted nearly in the round. A drummer boy at the front beats a drum and most of the men carry guns over their shoulders. Children run alongside the group as the soldiers say farewell to their families and above the men a winged figure blows a horn.

The centenary year for the 1st World war is this year and to commemorate it I thought about projecting images and sounds of the 1st World War on to the War memorial at the civic centre. I created this montage to show the soldiers heading off to war as the drone of war planes carries overhead with bombed Newcastle in the background. It would have been great to invite some of the folks who were children in Newcastle at that time to talk about their experiences of growing up in newcastle during those first years.



Concept 3

Electric Swear Box

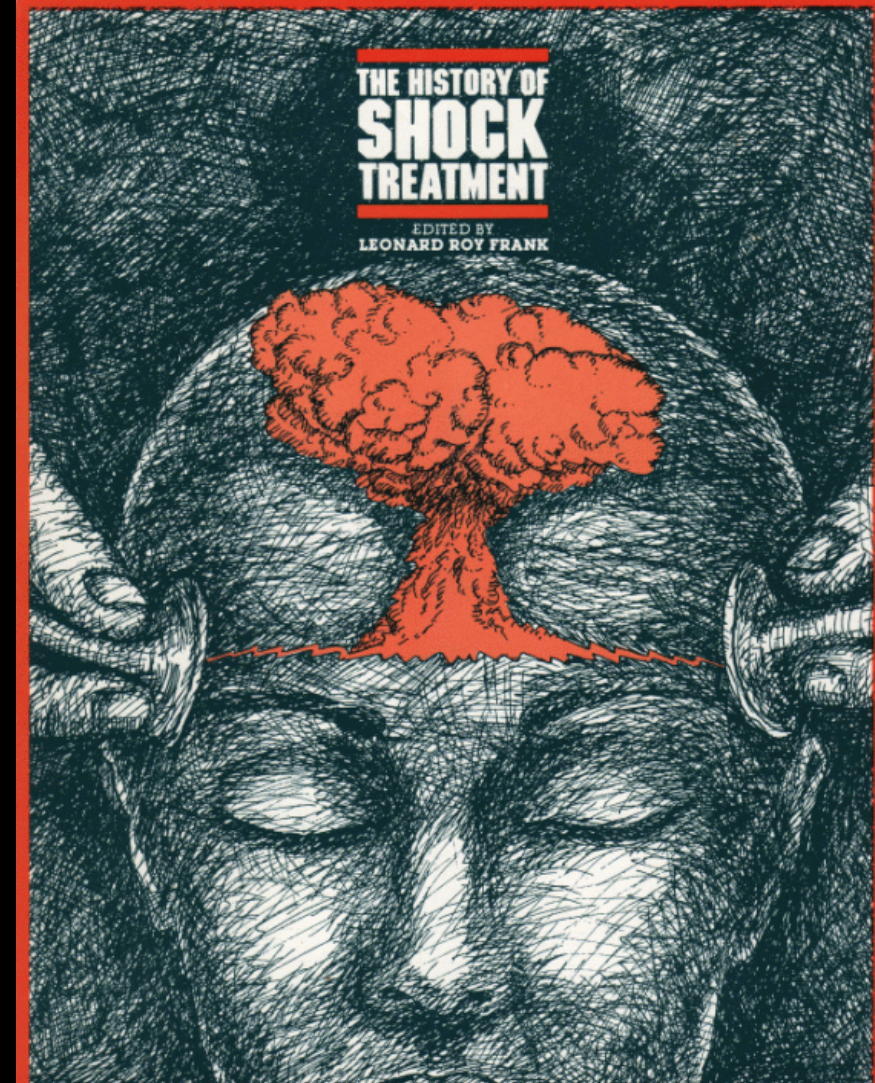
I have 2 Young children at home now and being from Scotland I have a natural ability to swear creatively. However my Fiance does not share my enthusiasm for swearing....Especially around my 3 year old who just the other day asked me if my computer was F!!!!KED. Which just happens to be one of my top 3 swears. My Fiance has decided to punch me every time I swear in front of the kids, which is resulting in a big purple bruise on my arm.

I needed something to give me a short sharp shock every time I swore. I was watching one flew over the cuckoos and something sparked to life in my mind.

What if I could take a tens machine and use it to give me a short electrical shock every time I swore.

The Premise

Connect a Tens machine to a voice recognition module that will be able to pick up whenever I say a pre programmed swear word and sending a signal to the tens machine telling it to zap me with a short electrical current.



The Design

Parts List

1) Tens Machine (top)

TENS machine (Transcutaneous Electrical Nerve Stimulation) is a highly effective drug free treatment for pain, used worldwide and recommended by sports coaches, physiotherapy departments, pain clinics, doctors and other medical practitioners.

TENS provides pain relief for a number of different pain conditions, including Back Pain, Sciatica and Sports strains/ sprains, covering almost all muscle related injuries.



2) Arduino Uno (bottom)

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

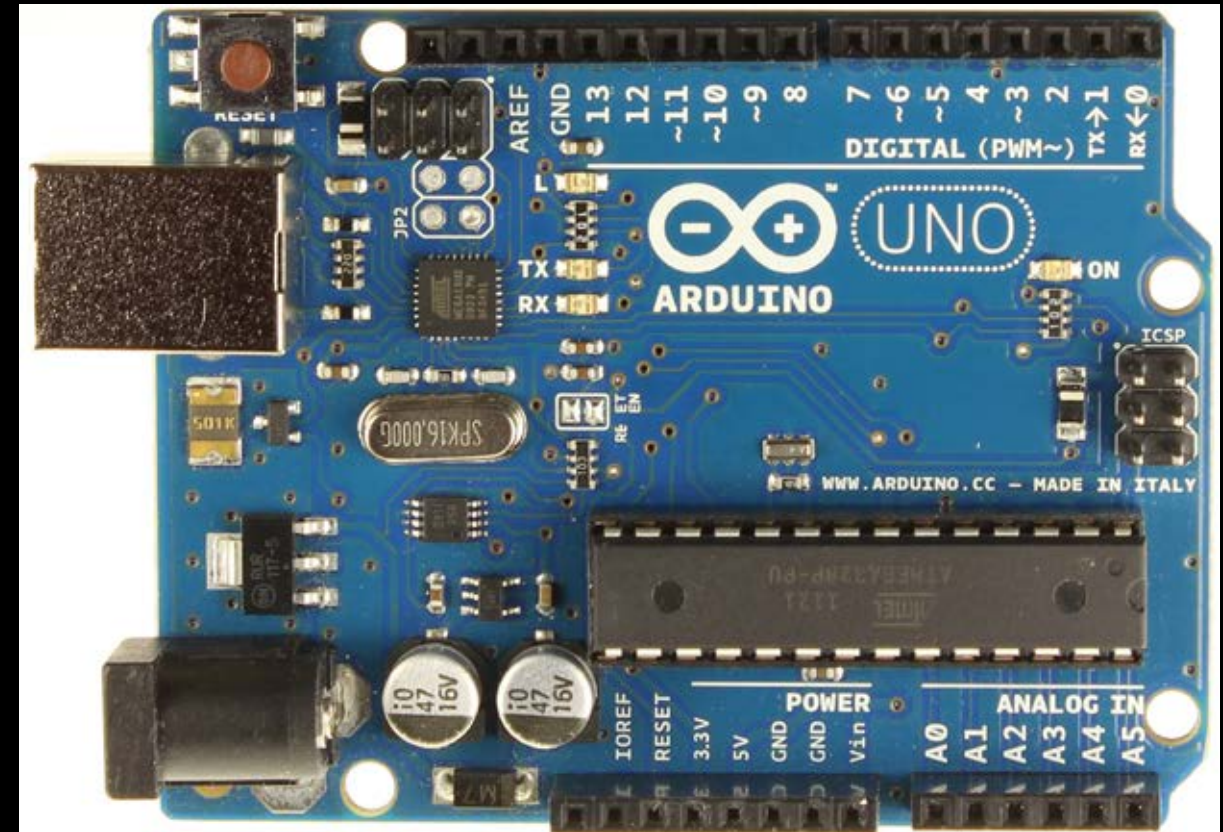
Revision 3 of the board has the following new features:

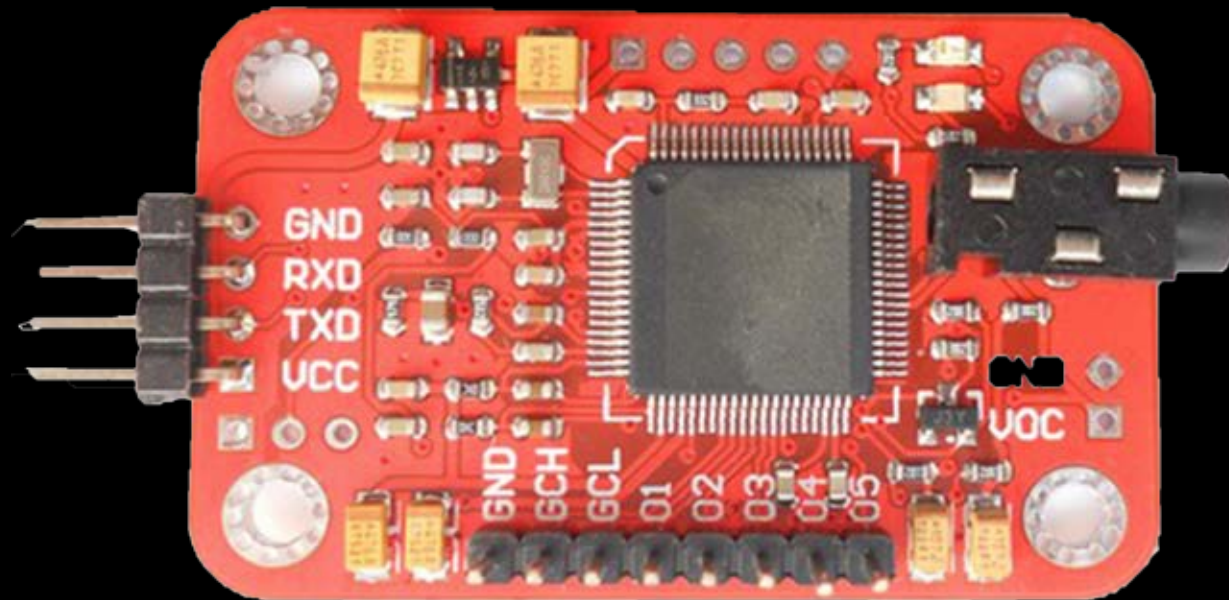
1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

Stronger RESET circuit.

Atmega 16U2 replace the 8U2.

“Uno” means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward.





Parts List

3) Voice Recognition Module (top)

We all know that there is a kind of module which can control the light on and off. You make a sound, the light turns on. Then after a while it turns off. This is not voice recognition. We may call it Sound Control. Voice recognition is something that knows exactly what you are saying.

Parameters

Voltage: 4.5-5.5V

Current: <40mA

Digital Interface: 5V TTL level UART interface

Analog Interface: 3.5mm mono-channel microphone connector + microphone pin interface

Size: 30mm x 47.5mm

This module can store 15 pieces of voice instruction. Those 15 pieces are divided into 3 groups, with 5 in one group. First we should record the voice instructions group by group. After that, we should program one group by serial command before it could recognize the 5 voice instructions within that group. If we need to implement instructions in other groups, we should program each group first. This module is supposed to be speaker independent. If your friend speaks the voice instruction instead of you, it should not identify the other speakers instruction.

4) TTL - USB convertor (bottom)

The voice recognition module can be programmed with a TTL - Usb convertor using a serial tool called CoolTerm. You then use hex codes to tell the module when to record and when to delete things.

Parts List

RF BEE Seeduino (top)

The Relay Shield is an Arduino compatible smart module with 4 mechanical relays providing an easy way to control high voltage-age.

The max switching power is 35VDC 70W for each channel. It can be directly controlled by Arduino/Seeeduino through digital IOs with external 9V DC supply.

With the XBee form socket and 315/433MHz RF module interface, the Relay shield can be remotely controlled, making it easy to use in robotics, industry control, smart houses etc.

(bottom)

4 groups of channels for High voltage connection

Terminal 1:

COM1- Common pin

NC1- Normally Closed, in which case NC1 is connected with COM1 when D0 is set low and disconnected when D0 is high;

NO1- Normally Open, in which case NO1 is disconnected with COM1 when D0 is set low and connected when D0 is high.

Terminal 2-4 are similar to terminal 1, except that the control ports are D1-D3.

9V DC power supply connection

The function of the Terminal and the Jack is the same since they are internally connected, and you can choose either of them in needs.

IO controlling 4 on-board relays

D0-D3 4pins could be connected directly with Arduino pin number of 7-4, so that four relays could be easily controlled by the Arduino.

315/433MHz RF control interface

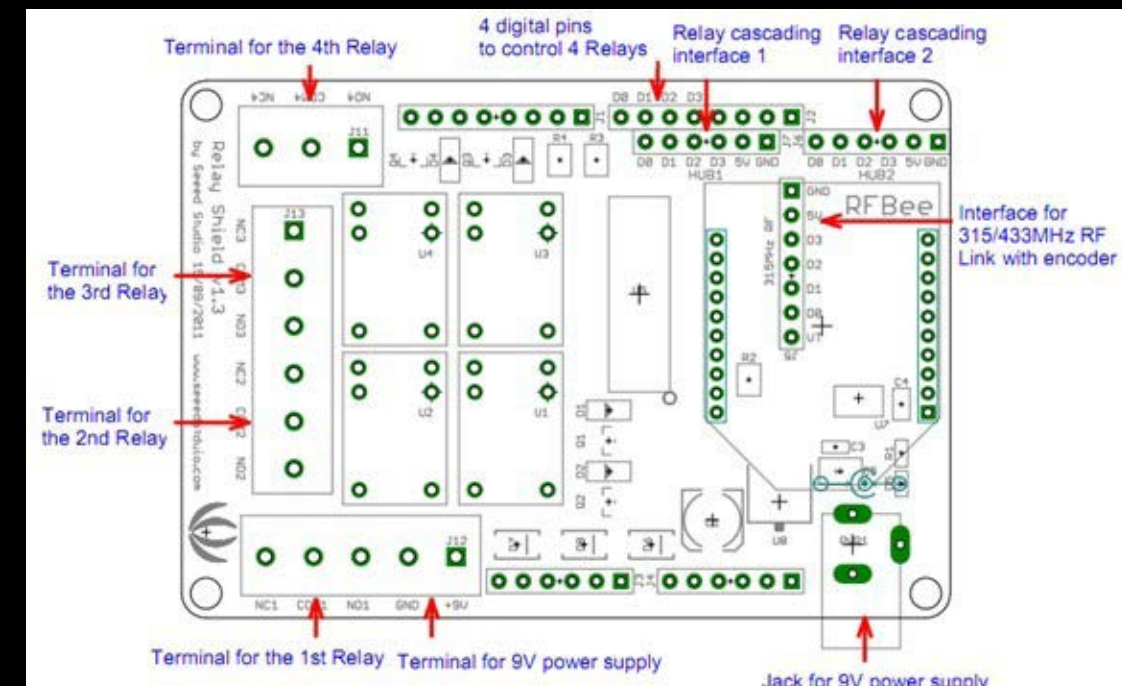
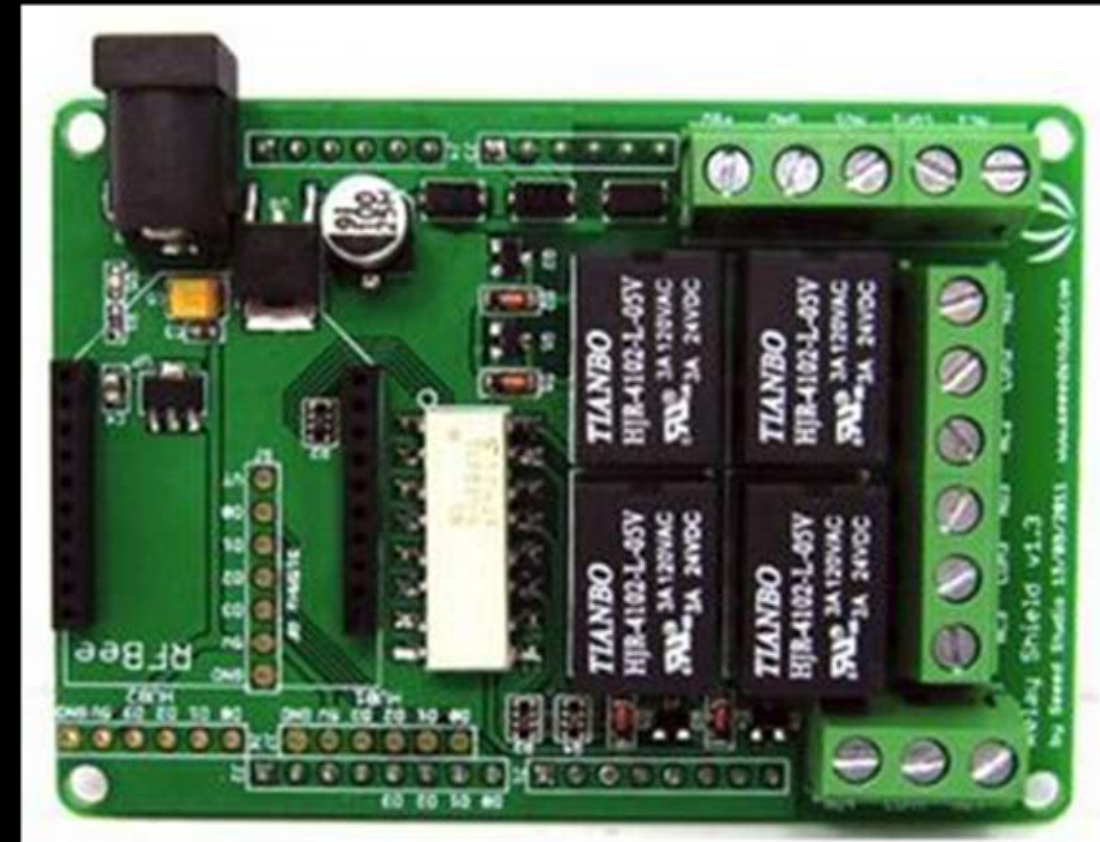
Together with pin of GND and 5V, they are the interface for 315/433MHz RF with encoder module (can be bought separately from Seeed Studio) to control the 4 relays remotely.

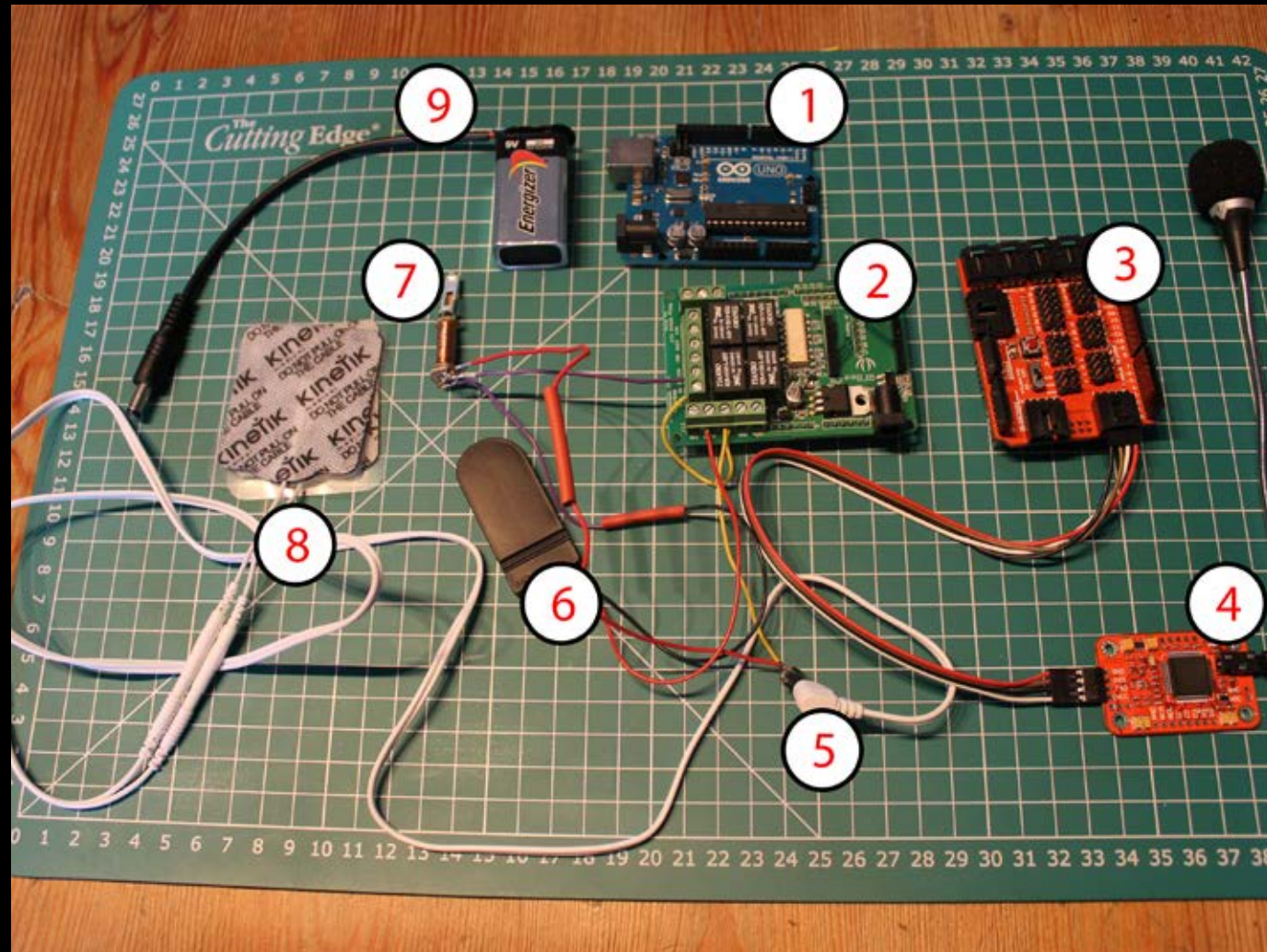
XBee form Socket for directly control by Seeed RFBee

The 4 relays can be directly controlled by the RFBee through the 4 DIO ports of RFBee (can be bought separately from Seeed Studio).

RFBee cascading control interface

As the RFBee has 12 DIO ports, 2 more Relay Shield (8 more relays) could be controlled through one RFBee. HUB1 and HUB2 are the drawn-out ports of RFBee (4 as a group), which is connected to 315/433MHz RF interface of the cascading Relay Shield.





The rest of the Bits and Bobs:

- 1} Arduino Uno
- 2} RF BEE Relay Shield
- 3} Elechouse Sensor Shield
- 4} Elechouse Voice Recognition
‘ Module
- 5} Electrode connector (taken from
tens machine)
- 6} 6Volt coin cell battery holder
- 7} Copper Coil *(taken from joke
electric shock pen)
- 8} Electrodes from Tens Machine
- 9} (volt power supply)

* I broke the tens machine while I was soldering it...(very fiddley) so decided to take the coil from a joke electric shocker pen which worked really well.

The Build

To Make my electric swear box, the first thing that I had to do was program the Voice module. To do this I needed a serial terminal program.

Serial Terminal Overview

COM ports. Baud rate. Flow control. Tx. Rx. These are all words that get thrown around a lot when working with electronics, especially microcontrollers. For someone who isn't familiar with these terms and the context in which they are used, they can be confusing at times.

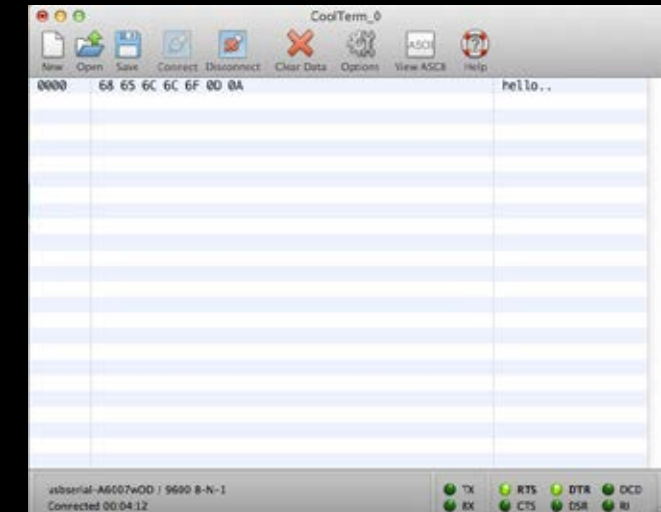
In short, serial terminal programs make working with microcontrollers that much simpler. They allow you to see data sent to and from your microcontroller, and that data can be used for a number of reasons including troubleshooting/debugging, communication testing, calibrating sensors, configuring modules, and data monitoring. Once you have learned the ins and outs of a terminal application, it can be a very powerful tool in your electronics and programming arsenal.

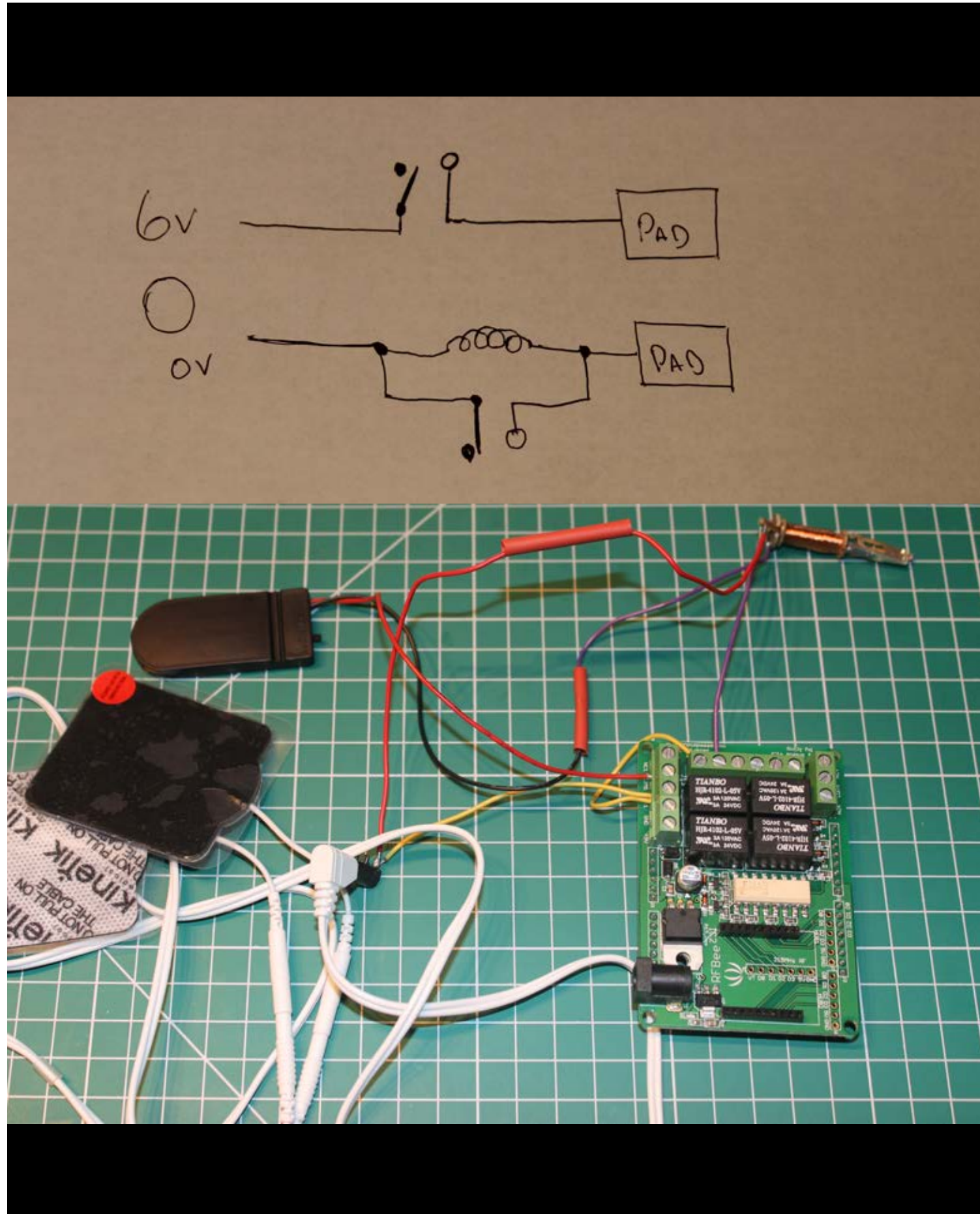
CoolTerm is useful no matter which operating system you're using. However, it is especially useful in Mac OS where there aren't as many terminal options as there are in Windows.

TOP: VR module from <http://www.elechouse.com/elechouse/>

BOTTOM LEFT: VR Module Prgramming

BOTTAM RIGHT: Cool Term, Serial terminal program
Available @ <http://freeware.the-meiers.org/>





The Build Cont'd

The Circuit Diagram (top)

The circuit diagram for my Swear Box is relatively simple: It starts with a 6 Volt power supply going into the relay, From the relay it goes to the Pads and to the copper coil which is also put through another relay. I had to build a short circuit in to the relay around the coil as I had short circuited the coil while I was soldering it, and it wouldn't discharge providing the shock (the little yellow wire looping through the relay bottom image)

The short circuit allowed me to build an on/off loop into the Arduino code which turned the relay on and off ten times per second in order to get the electrical pulses to give me the shock through the pads.

How it works

The Arduino is connected to the voice recognition module which is programmed with 15 voice commands (the voice commands all being my chosen swear words) when ever a voice command is recognised by the module a signal is then sent to switch the relay on and off ten times per second, this in turns charges and discharges the coil ten times per second, giving the wearer of the pads a series of mild electrical impulses for one second.

The Techie bit (I've simplified this as much as possible)

The shock is produce by the back EMF provided by the coil.

Back EMF is the spike of current that is released through the pads when the circuit is broken i.e when the connection is made and then broken again 10 times per second (which is what the code is telling it to do) then you get ten electrical shocks per second.

The program then waits for another voice command to start the process again.

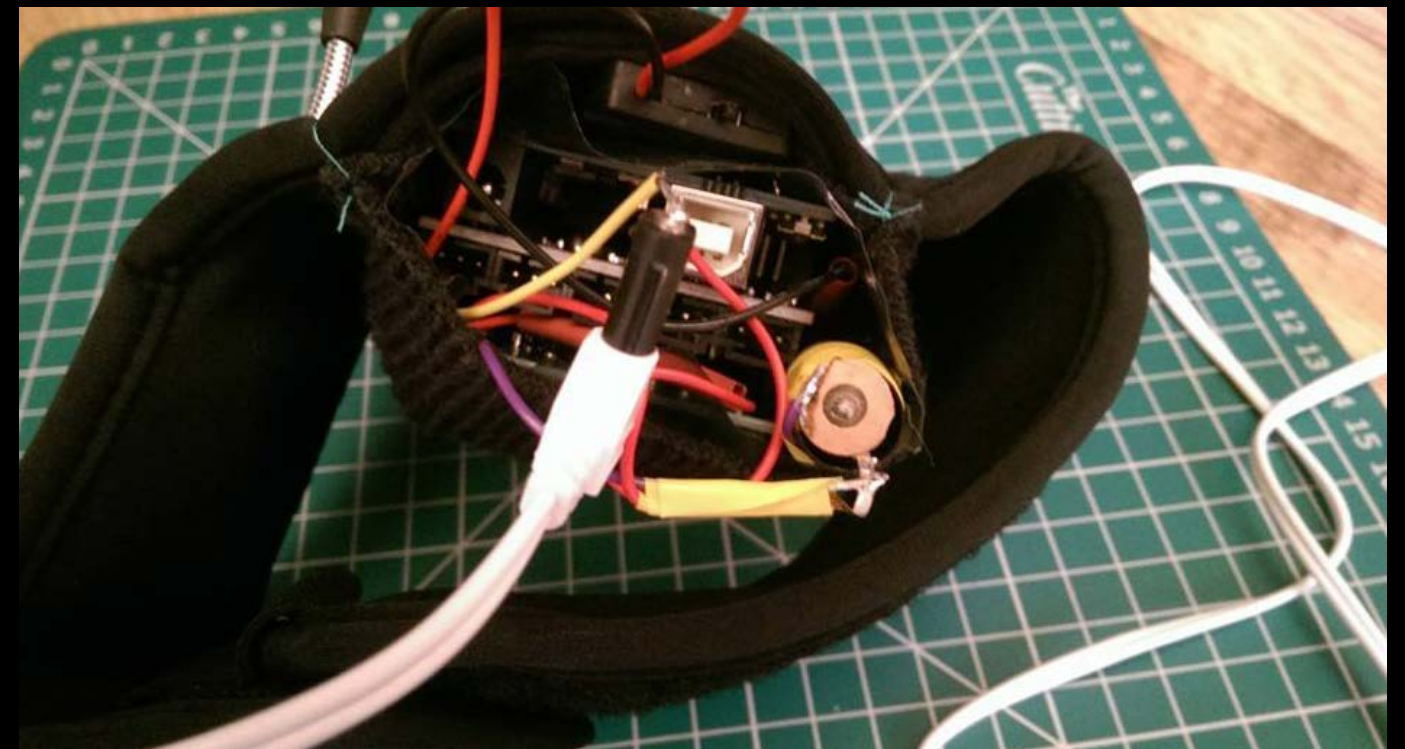
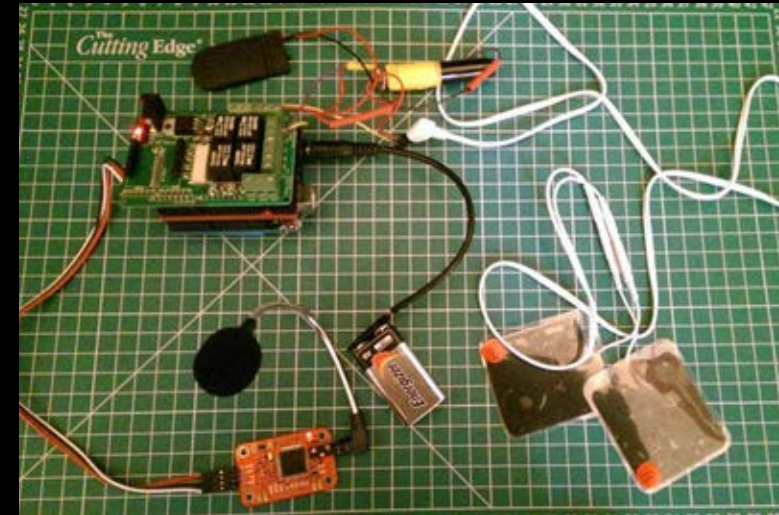
The Finished Product

SWEAR BOX

I wanted the 'Electric Swear Box' to be a portable device that I could wear around the house. I found an old phone arm band for exercising. This was ideal, I connected the parts like so:

The Arduino goes on the bottom then the sensor shield with the VR module connected to it, plugs into the top of the Arduino. The Relay Shield is then plugged into the top of the sensor shield. The soldered coil is put inside a small plastic pen cover to keep it from breaking.

After stitching a new lining into the armband I was able to carefully place everything inside it and power it all with the 9V battery connection.



Evaluation



Conclusion

I am very happy with my finished prototype, it works as well as the cheap module can be expected. The site I bought the VR module from stated that the module was 99% effective in that it should only have been able to recognise my own voice. However the module would sometimes activate when random people were talking in the room. Also it was supposed to be able to recognise voice command in the middle of a sentence but I think I might talk a bit too quickly for it. I had to speak really slowly to make it work in a sentence.

There is an American version of this module which is a bit more expensive but really reliable called 'easy VR 2.0'. If I had a bit more money to spend I would have used that module instead and my device would have worked a treat.

That was the only fall back.

For some continuation, this device would probably be able to work as a mobile phone app maybe.

All the relevant parts are in most smart phones you could use the voice recognition to recognise the swear words and then the phone could vibrate to simulate the electric shock as reminder to stop swearing.

Thanks For Reading