



Iron Man Helmet - MK3, Articulated, Wearable Plus Dimmable Eyes

Steps:

1. Size the helmet
2. Print all parts
3. Upload code into Arduino
4. Wire electronics
5. Dry assembly
6. Smooth, prime, paint
7. Glue Up
8. Enjoy

Sizing the helmet:

1. Print "Sizing" ring
2. If this part passes over the ears tightly, you are ready to print
3. If "Sizing" is too big/small, print out this part again until it does pass over the ears tightly (Helmet padding will help if Sizing part is slightly larger, so no need to adjust in this case)
4. Note percentage change you made.
5. Apply this size change to all parts **EXCEPT** these parts: Brain_base, Brain_cap, Dimmer_arm, Dimmer_mount, ServoArm_active, ServoArm_passive
6. Apply sizing in X-Axis only to ServoMount_face, ServoMount_head
7. Use Dome_04-Resize when resizing for the purpose of attaching battery holder.

Printed Parts List (blue indicates no re-sizing):

Bolt - x8

Brain_base

Brain_cap

CheekL

CheekR

Chin

Dimmer_arm

Dimmer_mount

Dome_01

Dome_01-trenchL

Dome_01-trenchR

Dome_02

Dome_03

Dome_04

EarL

EarR

Eyes

Face

Jaw

Mouth

ServoArm_active

ServoArm_passive

ServoMount_face

ServoMount_head

Visor

Hardware Parts List (Links available on Youtube page):

Servo - ES08MA x 2

Board - Arduino Nano Every

Slide Switch 3 pin

Push Button Switch

Potentiometer

LED eyes

4X 1.5V 4 AAA Battery Holder with Leads

m2 bolts

m2.5 bolts with countersunk heads

self-tapping screws kit under m2

2x6x2.5mm bearings

Wires

Weld-On 16

Helmet padding kit

Arduino Code:

```
#include "ServoEasing.h"
ServoEasing servoTop;
ServoEasing servoBottom;

const int action_pin = 2;
const int ledPin = 6;
const int potPin = A0;
int location = 31;
int bottom_closed = 107;
int top_closed = 167;
int bottom_open = 20;
int top_open = 20;
int value;
int maxBrightness;

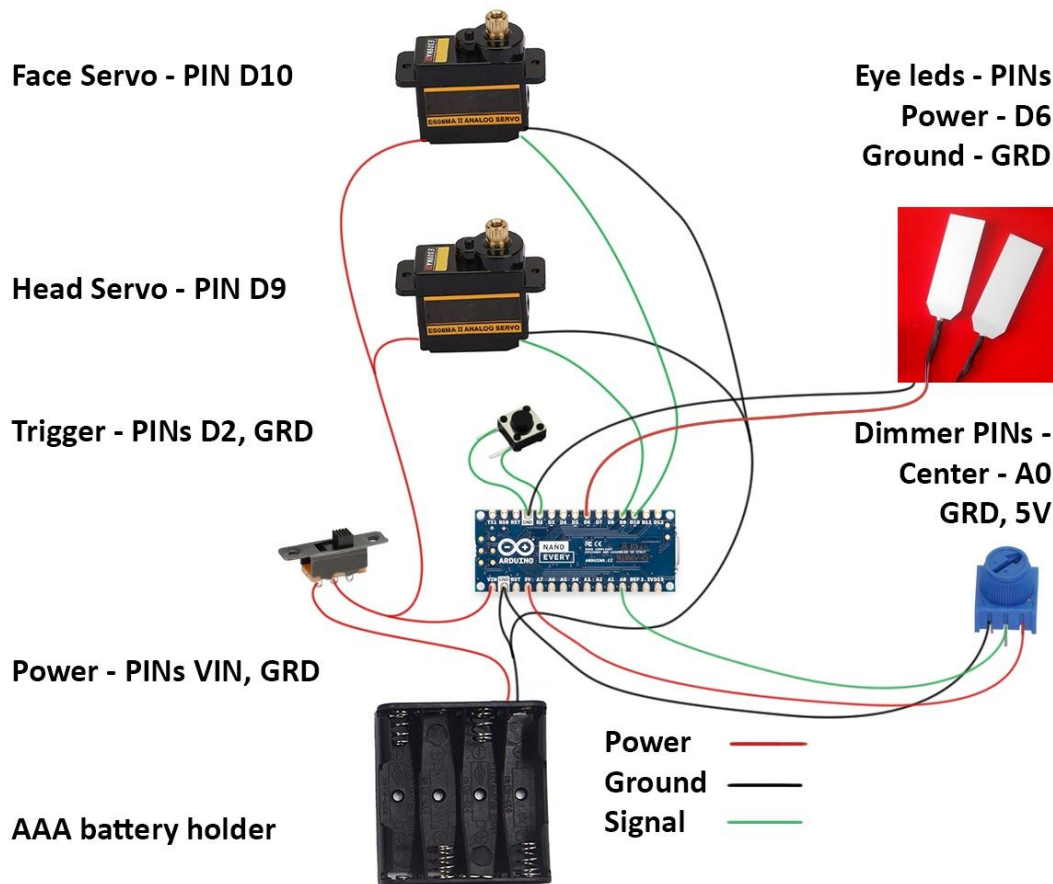
void setup()
{
  pinMode(action_pin, INPUT_PULLUP);
  pinMode(potPin, INPUT);
  servoTop.attach(9);
  servoBottom.attach(10);
  setSpeedForAllServos(190);
  servoTop.setEasingType(EASE_CUBIC_IN_OUT);
  servoBottom.setEasingType(EASE_CUBIC_IN_OUT);
  synchronizeAllServosStartAndWaitForAllServosToStop();
}

void loop()
{
  value = analogRead(potPin);
  maxBrightness = map(value, 250, 750, 0, 255);
  int proximity = digitalRead(action_pin);
  if (proximity == LOW)
  {
    if (location > bottom_open) {
      servoTop.setEaseTo(top_open);
      servoBottom.setEaseTo(bottom_open);
      synchronizeAllServosStartAndWaitForAllServosToStop();
      location = bottom_open;
      delay(10);
      analogWrite(ledPin, 0);
    } else {
      servoTop.setEaseTo(top_closed);
      servoBottom.setEaseTo(bottom_closed);
      synchronizeAllServosStartAndWaitForAllServosToStop();
      location = bottom_closed;
      delay(50);
      analogWrite(ledPin, maxBrightness / 3);
      delay(100);
      analogWrite(ledPin, maxBrightness / 5);
      delay(100);
      analogWrite(ledPin, maxBrightness / 2);
      delay(100);
      analogWrite(ledPin, maxBrightness / 3);
      delay(100);
      analogWrite(ledPin, maxBrightness);
      delay(100);
    }
  }
}
```

Uploading Code to Arduino Nano Every

1. Download Arduino IDE
2. Add "servoeasing" library
3. Connect arduino using USB
4. Compile and Upload code

Wiring Diagram



1. Once the wiring and arduino is ready, test it for rotation
2. During the assembly, make sure the position is "closed"
3. Once the servo mounts and passive arm are assembled, reposition the white servo arm (the one that comes with the servo) for proper alignment of face and head. Then attach the active arm
4. "Active" arm for servos has some play intentionally to allow some freedom of movement vertically

Dry Assembly

1. Follow the video guide for assembly
2. Parts that have pilot holes through the model, can be drilled with 1/16" bit for easier assembly
3. Parts that have pilot holes on one side of the shell, should not be touched
4. Self-tapping screws are meant for alignment, but can hold the helmet together for testing fit and functionality
5. If the helmet was re-sized, servo alignment holes will not work anymore.
 - a. Assemble Servo parts separate from the helmet
 - b. Attach the face to head with tape
 - c. Place the servo assembly and align vertically
 - d. Mark new holes or use self-tapping screws to attach
 - e. Battery holder will no longer align with holes, so print Dome_04-Resize
 - f. Mark new holes for battery bolts and drill them out
6. Find the best placement for the "Trigger" button. Behind the ear, on the chin, up to you
7. Find the best placement for the "Dimmer".
8. Helmet padding kit should come with self-adhesive mounting velcro strips. Those can be used for wire management
9. Add as much or as little padding as necessary for tight enough fit. I would suggest placing pads to cover head servo and battery/arduino pack.
10. Follow video guide for eye assembly (optional)

Smooth, Prime, Paint

Video guide available

<https://youtu.be/xsrnA712-SU>

Full Assembly

1. Follow the same video guide and apply Weld-On 16 glue to all overlapping areas and behind the seams
2. Screws should be used for alignment, but clamps/tape should be used to keep parts in place

Enjoy