

with((in)(out))  
with((in)(out))

# with((in)(out)) collaboration between 4 artists

- tracy hill
- dan wilkinson
- matthew birchall
- tao lashley-burnley

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The logo consists of the text 'with((in)(out))' in a white, sans-serif font. To the right of the text are three overlapping, dark grey crescent shapes that resemble stylized parentheses or signal waves. The top crescent is the largest and is positioned furthest to the right. The middle and bottom crescents are smaller and overlap the top one and each other.

# manifold exhibition

- group show at the pyramid art centre warrington
- the 4 artists plus magda stawarska-beavan



# the piece

- sonic hemispheres
- projection mapping
- sensor based a/v changes in a gallery context
- unique experience in the gallery
- voyeur vs participant

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# sonic hemispheres

- sound behaves very differently when your head is inside a hemisphere
- as you move your head around, the sound changes, as reflections become localised and amplified
- the transducer is attached to the hemisphere and acts as a speaker cone
- certain resonances are hugely amplified through the sonic characteristics of the hemispheres

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# the technology

- passive infrared sensor (pir) detection sensors
- sonic hemispheres that have inbuilt transducers
- arduino microcontroller
- max-msp – visual programming
- resolume – projection mapping software

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# ultrasound sensors

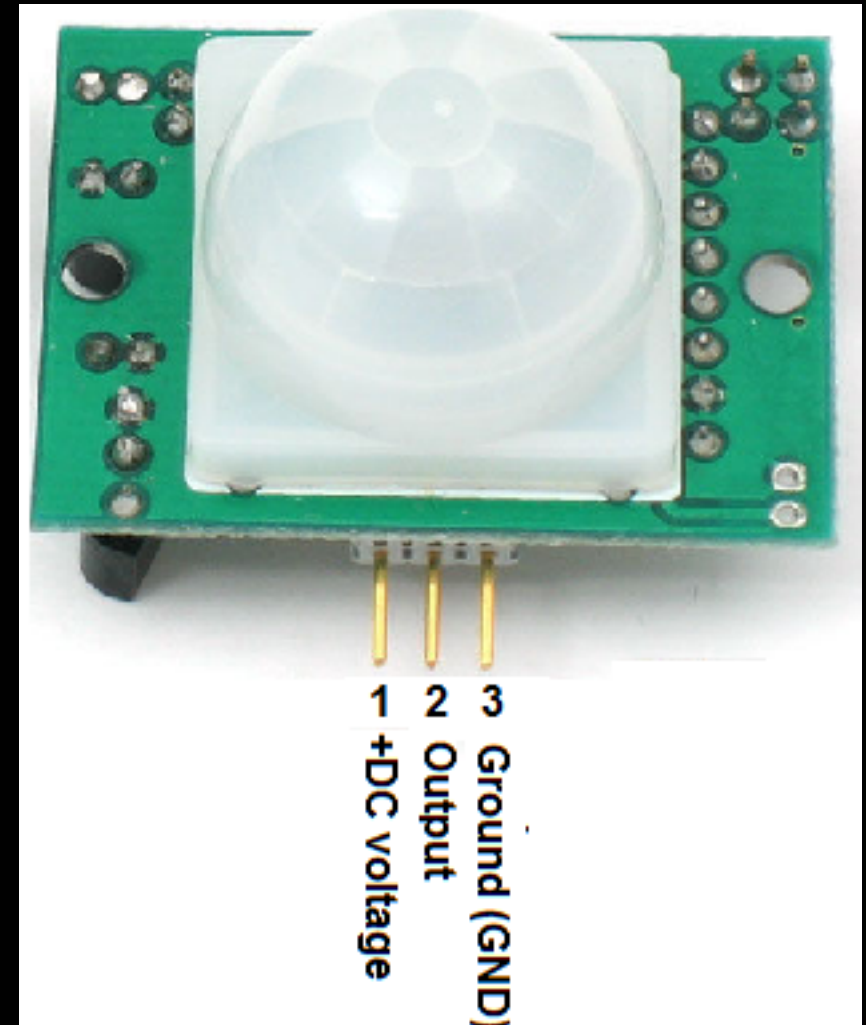
- initially ultrasound range-finding sensors were used (the HC-SR04)
- the sensors proved to be too sensitive
- and needed smoother power than could be supplied over long cables



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# pir sensors

- sensors were changed to standard pir sensors
- low power and consistent
- and needed smoother power than could be supplied over long cables

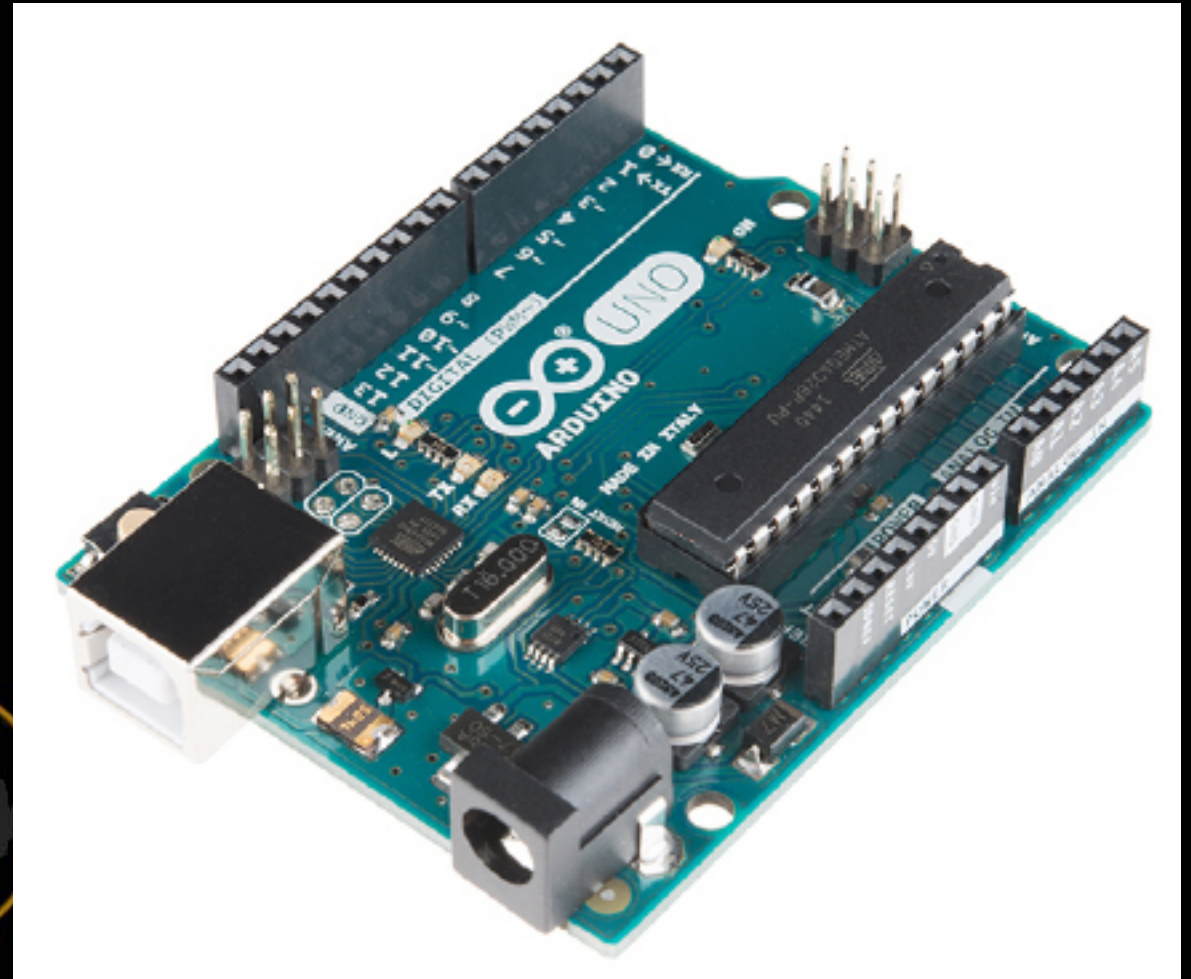


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# arduino microcontroller

- 6 sensors connected to an arduino



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# surface transducers

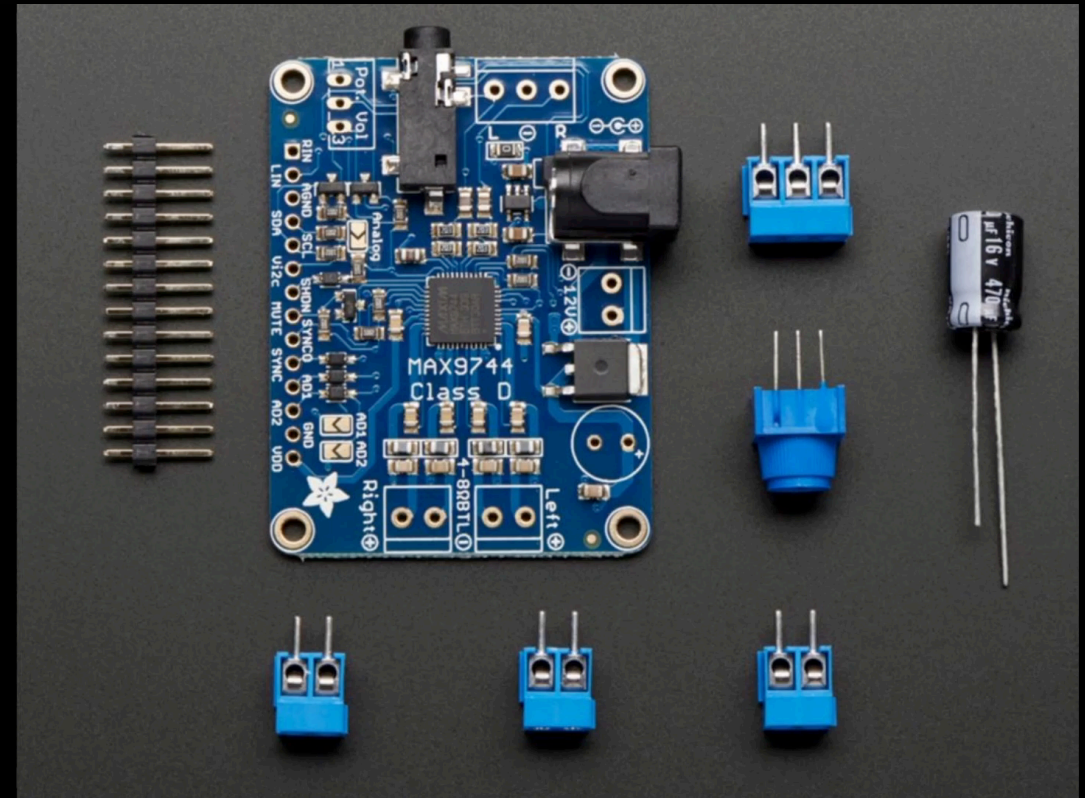
- transducers are connected directly to the hemispheres, thus making the hemisphere akin to a speaker cone



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# amplifiers

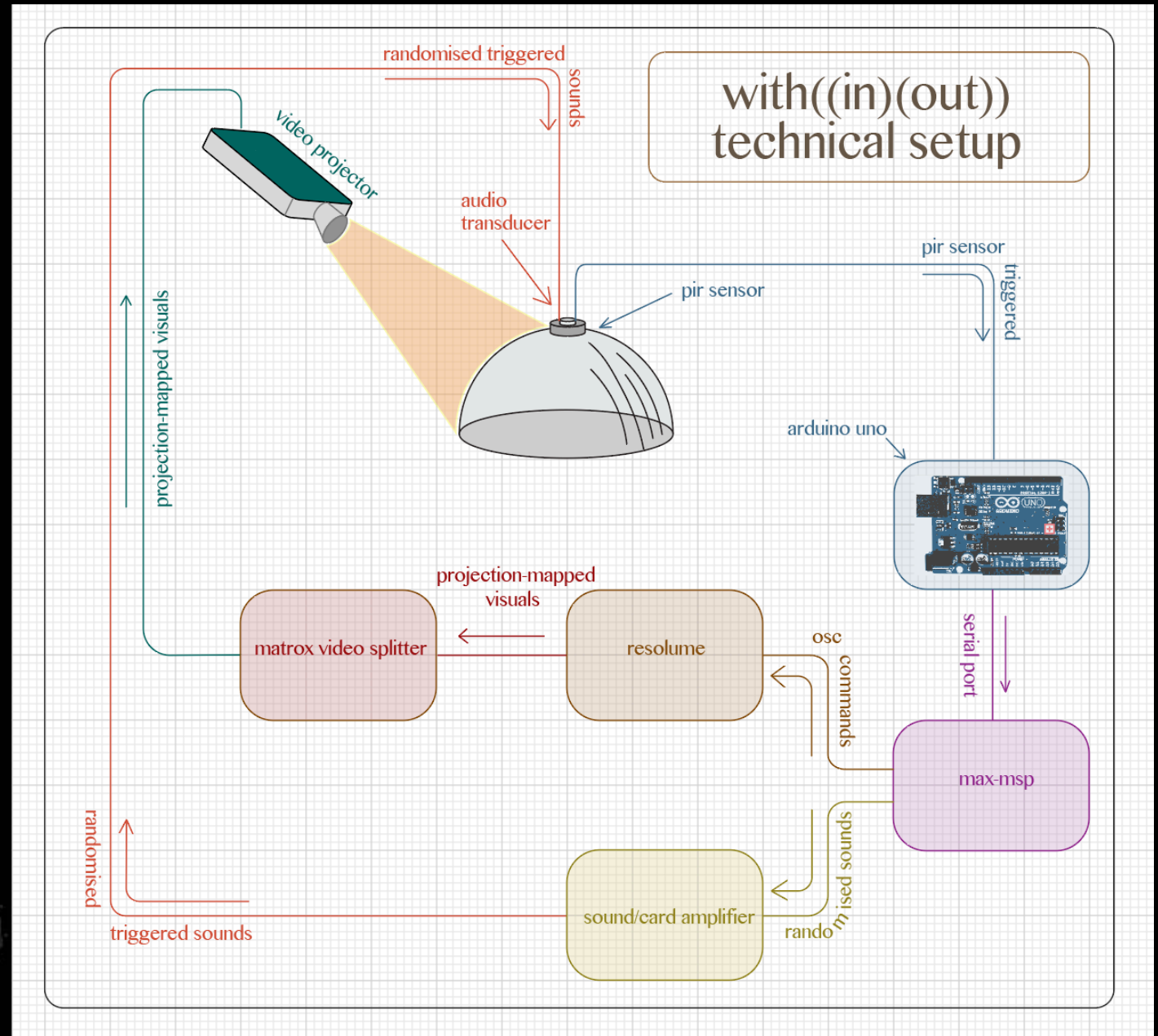
- 20w amplifiers
- digital or analogue (controls)



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# setup

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# arduino code

```
manifold_sensor_multiple_pirs | Arduino 1.6.8
manifold_sensor_multiple_pirs user_main.c
//input pins (for PIR sensors)
int inputPin1 = 3;
int inputPin2 = 4;
int inputPin3 = 5;
int inputPin4 = 6;
int inputPin5 = 7;
int inputPin6 = 8;
// variables for reading the pin statuses
int val1 = 0;
int val2 = 2;
int val3 = 4;
int val4 = 6;
int val5 = 8;
int val6 = 10;

void setup() {
// declare sensor inputs
pinMode(inputPin1, INPUT);
pinMode(inputPin2, INPUT);
pinMode(inputPin3, INPUT);
pinMode(inputPin4, INPUT);
pinMode(inputPin5, INPUT);
pinMode(inputPin6, INPUT);
}

Save Canceled.

69 Arduino/Genuino Uno on /dev/cu.usbmodem1411
```

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# arduino code

```
manifold_sensor_multiple_pirs | Arduino 1.6.8
manifold_sensor_multiple_pirs user_main.c

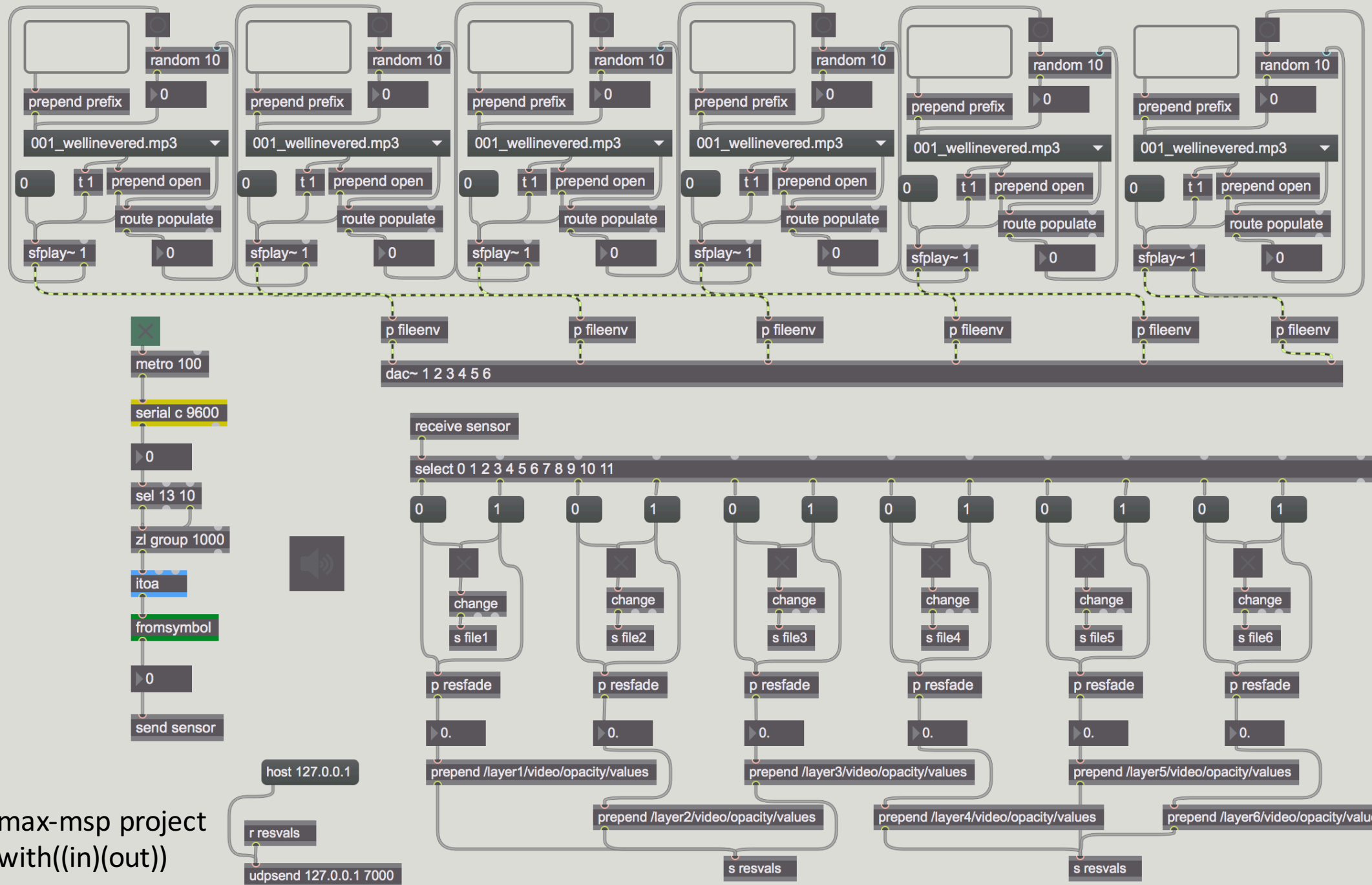
Serial.begin(9600);
}
//sensor 1
void loop(){
val1 = digitalRead(inputPin1);
if (val1 == HIGH) {
Serial.println("1");
}
else if (val1 == LOW) {
Serial.println("0");
delay(5);
}
//sensor 2
val2 = digitalRead(inputPin2);
if (val2 == HIGH) {
Serial.println("3");
}
else if (val2 == LOW) {
Serial.println("2");
delay(5);
}
//sensor 3
val3 = digitalRead(inputPin3);
if (val3 == HIGH) {
Serial.println("5");
}
else if (val3 == LOW) {
Serial.println("4");
delay(50);
}
```

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# arduino code

```
manifold_sensor_multiple_pirs | Arduino 1.6.8
manifold_sensor_multiple_pirs user_main.c
}
//sensor 4
val4 = digitalRead(inputPin4);
if (val4 == HIGH) {
  Serial.println("7");
}
else if (val4 == LOW) {
  Serial.println("6");
  delay(50);
}
//sensor5
val5 = digitalRead(inputPin5);
if (val5 == HIGH) {
  Serial.println("9");
}
else if (val5 == LOW) {
  Serial.println("8");
  delay(50);
}
//sensor6
val6 = digitalRead(inputPin6);
if (val6 == HIGH) {
  Serial.println("11");
}
else if (val6 == LOW) {
  Serial.println("10");
  delay(50);
}
}
}
Save Canceled.
```

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max-msp project  
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host 127.0.0.1  
r resvals  
udpsend 127.0.0.1 7000



