

A study into natural building materials augmented to responsive media façades.

Motivation and Inspiration

When researching media façades for the response surface research critique assignment, I came across Dominik Kommerell and Angela Renz's Concrete LED Façade,¹ in which they embedded a matrix of LEDs into a rectangular section of poured concrete. The LEDs were programmed to display one of several animation patterns. The research question that led them to design the project was:

Can a deactivated media façade transform into an architectural surface?

or conversely,

Can an architectural surface temporarily become a media façade?

This question inspired me to create an augmented architectural surface that responds to the information environment. More specifically, I sought out to build a responsive media façade by embedding simple electronics into a natural building material.

Design

Because concrete material had already been explored in Kommerell and Renz's work, I decided to use a natural brick wall as the building material that would be augmented. I constructed a 16" x 16" wall using garden paving bricks, mortar bonded. The wall had four layers of brick, and in each mortar layer I embedded six clear-lens red-color LEDs.

For the electronic component of the project, I chose to embed a range finder within the wall to detect motion in front of it. The output of the range finder sensor would act as the input to an Arduino microcontroller. Software running on the Arduino would compare the input to a threshold level and change the brightness of 24 LEDs depending on the proximity of detected motion. The software controlled three brightness states: if motion was detected within the maximum threshold (120") the LEDs would switch to a high brightness level; if motion was not detected within the maximum threshold the LEDs would switch to a low brightness level; if motion was detected below the minimum threshold (within 50") the LEDs would turn off.

Feedback

Brick+ was on display April 20-21, 2009 on the third floor of the University of Michigan Architecture building. On April 22, I moved it to another location within the building to observe how passers-by interacted with it.

¹ <http://www.mediaarchitecture.org/media-augmented-architectural-surfaces-hft-stuttgart/>

I received several pieces of feedback from exhibition attendees and observers:

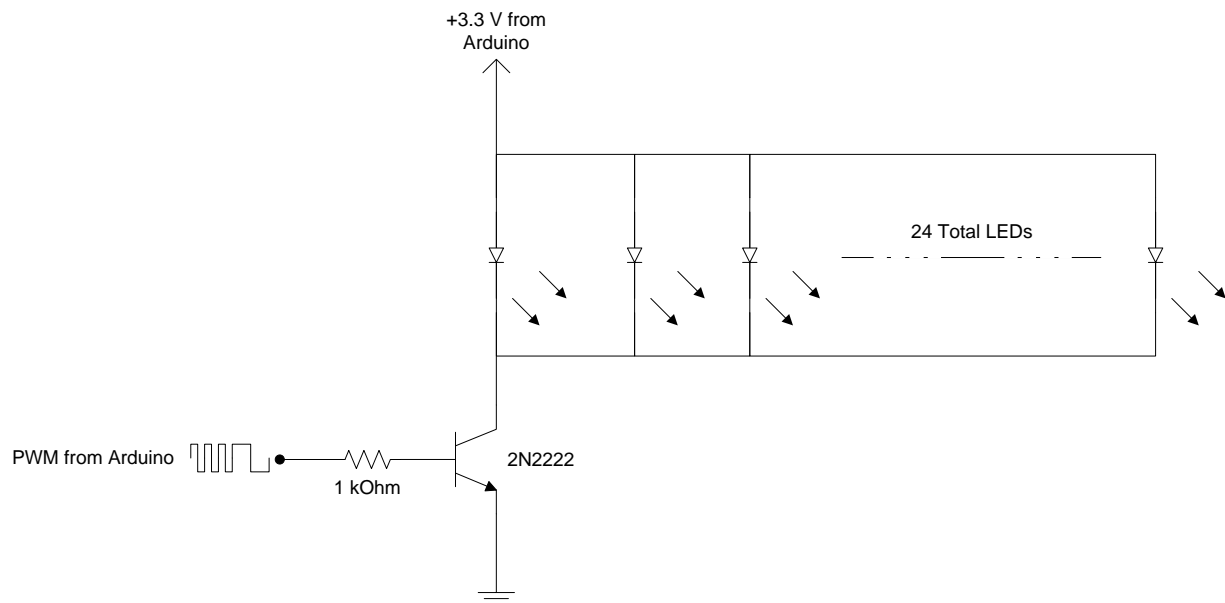
- The fast response time of LED brightness change was pleasing
- The high threshold level allowing the surface to respond affords interaction from afar
- Brick+ could be easily scaled to create a larger or denser display
- Brick+ is non-intrusive and does not require persistent interaction to see its ambient effect
- The transition zone near thresholds boundaries produced a fascinating high/low brightness quirkiness

Future Work

Future work on Brick+ may include the following enhancements:

- Replace all red LEDs with tri-color RGB LEDs
- Add more LEDs to the wall to create a denser display (64-100 LEDs)
- Implement a multiplexor and shift register to address individual LEDs from Arduino
- Use sound rather than motion to control LED brightness

Circuit



Arduino Code Listing

```
int sensPin = 2;
int pwmPin = 11;
int val;

void setup() {

  pinMode(sensPin, INPUT);
  pinMode(pwmPin, OUTPUT);
  Serial.begin(9600);

}

void loop() {

  val = analogRead(sensPin);
  Serial.println(val);

  if (val < 50 ) {
    analogWrite (pwmPin, 1);
  }

  else if (val > 120) {
    analogWrite (pwmPin, 50);
  }

  else if (val <= 120) {
    analogWrite (pwmPin, 255);
  }

  delay(0.25);

}
```



