

# The mini project

- Session December 16 team presents mini project proposal (all in LG 1.105)
- Sessions January 4/6/11 no lectures, but support in and around e-lab for mini project development
- Session January 13 (LG 1.105, E lab) team presents mini project result (demo + mini poster) to assignor

# The mini project

- You are free to choose your project, but:
  - Use Arduino
  - Use at least one sensor and one actuator
  - Report on design choices (transistor, configuration, etc.)
  - Draw schematics
  - Present it as a **prototype** (user experience, packaging) !



# Spaghetti in code, schematics and circuits



Code:

- Use comments /\* like this \*/ or // this
- Use functional variable names
- Use functions

Schematics:

- Draw the complete circuit (correctly!!)  
(component names, values)

Circuit (soldered or breadboard)

- Should be structured
- Use color coding in wires
- Think about component placement

Otherwise:

- Debugging becomes difficult
- You lack evidence in your report

# Code

The screenshot shows the Arduino IDE interface with the following details:

- Title Bar:** DG233\_DecimalCode | Arduino 0022
- Toolbar:** Includes icons for play, stop, upload, download, and others.
- Code Editor:** Displays the following C++ code:

```
const int Baudrate = 19200;
const int Analog_Input_Pin_A = 0; // Sensor A is connected to this pin
const int Analog_Input_Pin_B = 1; // Sensor A is connected to this pin

void setup()
{
    Serial.begin(Baudrate);          // For sending data to the computer over USB
    WriteStartCommand();
    InitialiseSensors(Analog_Input_Pin_A, Analog_Input_Pin_B);
    InitialiseTimers();
}

void loop() {
    Read_Sensors_and_Write_Data();
    if (SerialCommand()) {
        Do_Something_With_Command();
    }
}

/* Implementation of subroutines: */
void WriteStartCommand(void) {

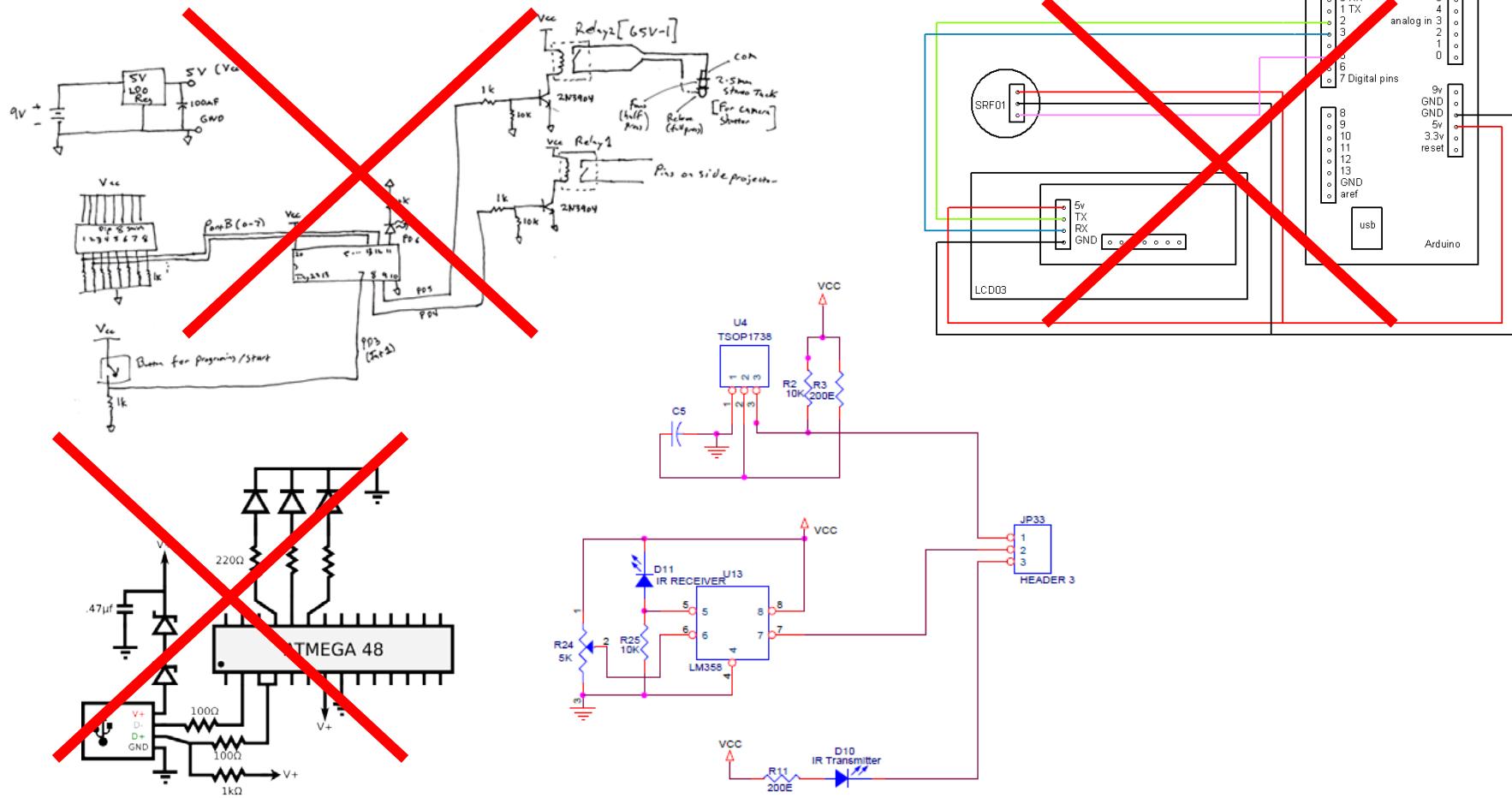
}

Done Saving.
```
- Status Bar:** Binary sketch size: 1372 bytes (of a 30720 byte maximum)
- Page Number:** 20

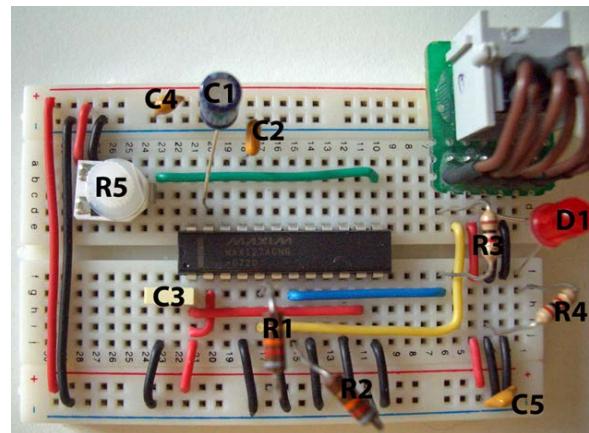
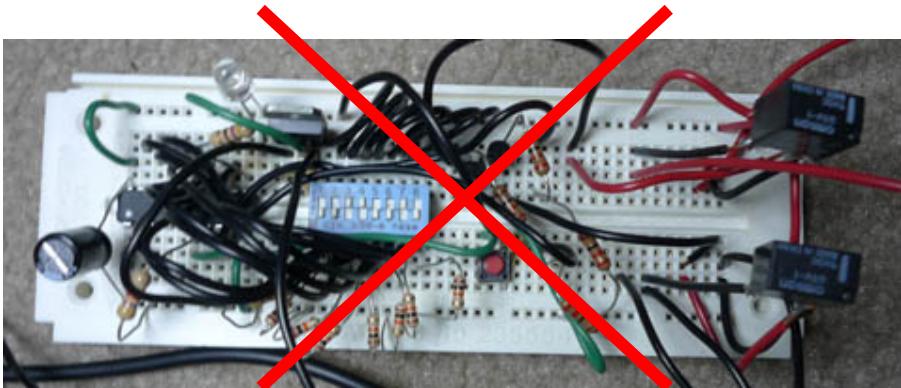
## Code:

- Clear variable names
- Proper use of local and global variables
- Functions `setup()` and `loop()` are self-explaining
- Proper function names
- Comments (Header)
- Examples
  - [Bad example](#)
  - [Good example](#)

# Schematics



# Circuits

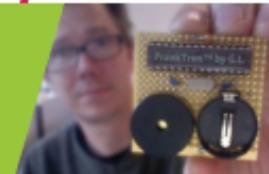


# Poster

- Explanation
- Schematic
- Code
- Pictures

## PrankTron: your nightmare

Geert Langerelis (B24.1)



### Introduction

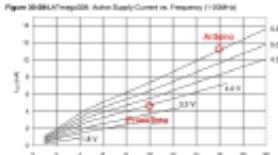
PrankTron is a small electronic module that selects randomly one out of four sounds and bothers you with that at irregular times between 10 minutes and 1.5 hours. It is small enough to fit in any obscure location, for example in the board room of a study association. PrankTron is inspired by the commercially available Annoy-a-Tron<sup>1</sup>.

### Specifications

- Small size (smaller than Arduino)
- Low power (should stay active for 10 days)
- Several sounds

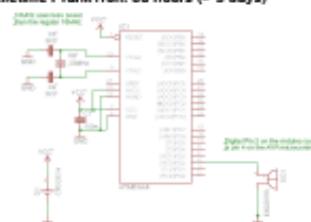
### Electronics

The only thing needed for a PrankTron is a buzzer. A 5V buzzer can be connected to an Arduino board directly. However, to make a low-power version, the Atmel microcontroller was taken off the Arduino board, and placed on a piece of experimentation board. Now I could use a 3V battery and a 10MHz clock (instead of 16MHz), which gives a huge reduction of power<sup>2</sup>:



So, what is achieved is:

- ATMEGA current: 3mA
- Battery CR2032H: 240mAh
- Lifetime PrankTron: 80 hours (> 3 days)



/ Industrial Design

### Code

The code has two tricky parts. First of all, a function for long delays had to be made, and next, a method to deal with the 10MHz clock. Debugging was done on a normal 16MHz Arduino board with `Serial.println()` commands.

```
PrankTron_10MHz.ino | Arduino 1.8.1

void setup() {
    // put your setup code here, to run once:
    Serial.begin(9600);
    tone(10, 1000);
}

void loop() {
    int m = random(2000); // 0 to 2000 ms
    delay(m);
    tone(10, 1000);
}

void toneGen(int t, int f) {
    int i;
    int t0 = 1000000000 / f;
    int t1 = t0 * t;
    int t2 = t1 + t0;
    int t3 = t2 + t0;
    int t4 = t3 + t0;
    int t5 = t4 + t0;
    int t6 = t5 + t0;
    int t7 = t6 + t0;
    int t8 = t7 + t0;
    int t9 = t8 + t0;
    int t10 = t9 + t0;
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# Resources

- Look at wiki page:
  - <http://wiki.id.tue.nl/ce/AssignmentDescription>  
(and checkout the “Resources” section)
- Installation
  - <http://arduino.cc/en/Guide/Windows>
  - <http://arduino.cc/en/Guide/MacOSX>