

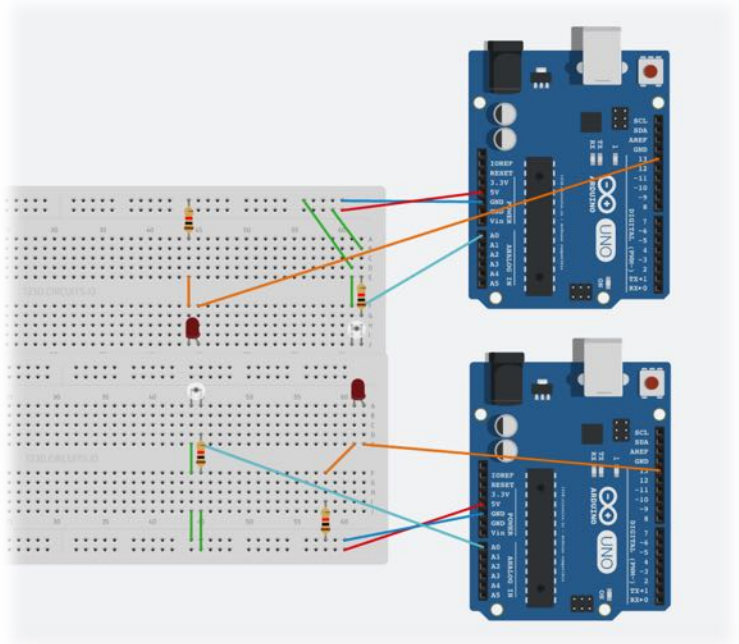
ARDUINO REPORT

WHY WE DID THIS

We wondered if there was a way of communicating any kind of information between two sources without using the communication standards (wire, Wi-Fi, Bluetooth...).

Let's say 2 people are on the opposite side of a valley on the hardest hike of their lives and they wanted to communicate at all cost. The phone service doesn't work, their voices are too weak to get the message through and they are too far away to communicate through hand gestures; however, they can see whether the other person's flashlight is on or off. Since they're experienced computer scientists, they know all ASCII code by heart; they thus succeed in simulating binary language using light flashes and manage to get the message through the merciless storm haunting them ("Do you want to meet for a cup of tea?").

We decided to apply this paradigm to a game such as "Noughts and Crosses", so that the two people don't need to meet for a cup of tea to enjoy a fun game of "tic-tac-toe".



INTRODUCTION

In our project, we wanted to get the two Arduino to communicate without wires - we decided to use LEDs and light resistors. Next we had to decide what information we would be communicating. We decided on playing a game, where the moves one player makes are sent to the other player

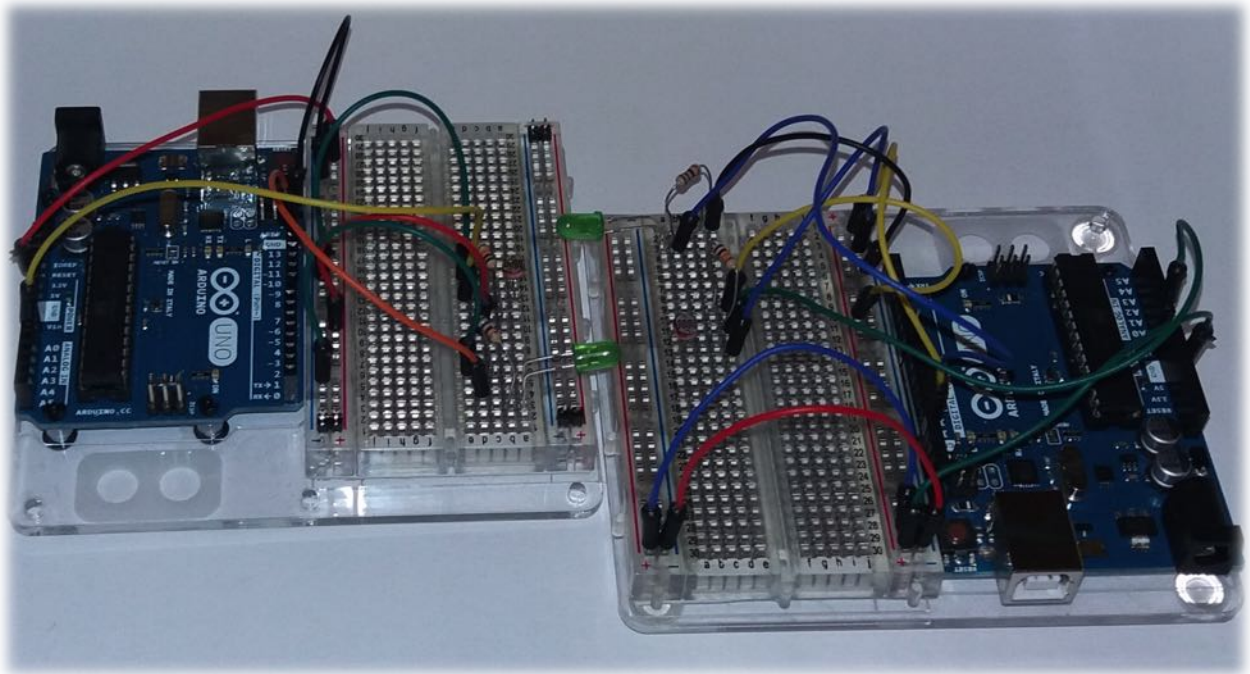
via the LED/light resistor set up. The game we decided to play was nought and crosses. The programs on the two computers would be slightly different, as one player must go first - meaning their light resistor must be reading when the other's light resistor is not, and vice versa. When player one wants to make their move, they write the number of the square want to fill in the serial monitor input. The new board with this square filled in gets printed out on the first computer's screen. Then, the number inputed gets sent to the Arduino connected to that computer. The Arduino then translates that number into "binary" and flashes the LED accordingly. The number isn't translated into actual binary but a number system closely related to it that we created. We did this to communicate the least significant digit first. The light resistor on the other Arduino picks this up. The second Arduino then translates the LED flashes back into "binary" and then back into a decimal number. It then edits the board to fill in the square the other player just filled and prints the new board to the second computer's screen.

DESCRIPTION (hardware)

- LEDs: the LED flashes to communicate the move the player just made. It flashes a "binary" number that represents the square the player just filled in. The squares are labelled from one to nine from left to right, top to bottom. The first blink is to notify the receiver (or slave) that a coded message is about to be sent, the receiver is aware that this notice lasts 100ms. Here's a list that more clearly shows the correspondence between decimals and

binary (we used a different codification from the usual binary conversion): 1 : 1000, 2 : 0100, 3 : 1100, 4 : 0010, 5 : 1010, 6 : 0110, 7 : 1110, 8 : 0001, 9 : 1001. Each flash representing a digit also lasts for 100ms.

- Light resistors: we pushed this last component to its limit, as a matter of fact it can record light values at a rate slightly faster than 50ms (we tested this empirically) and we used exactly 50ms as a light reception range; this means that inside each 100ms chunk of light message we “cut out” 50ms from the middle of the blink period (whether the LED is on or off) in order to be 100% sure that we are reading the correct bit at the right time. We implemented the blinking mechanism in such way that any message can be read in less than half a second.



During the development of the project, as it was less practical to work in the dark we placed the two Arduinos inside a box with a lid thus allowing us to test the project regardless of the external light conditions.

As illustrated in the pictures, the LED of each Arduino is as close as possible to the light resistor of the other; in the first picture, we can see LEDs have been bent (by the last kit owner, we did nothing) to gain some more millimetres.