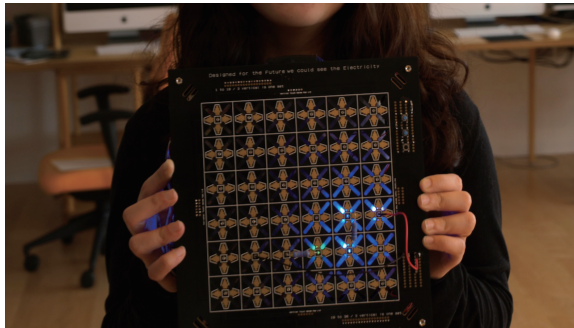


The Visible Electricity Device: Visible Breadboard

- touchable, visible, easy controllable; the making of an entirely new kind and type of breadboard -

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(a)



(b)

Figure 1:(a) Overview of the Device, (b) Top Board.

Abstract

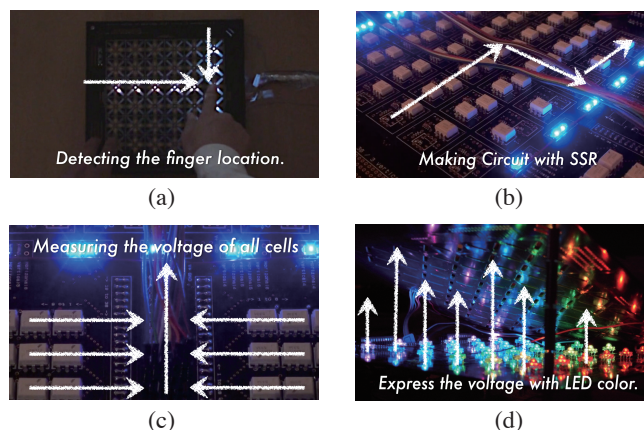
Visible Breadboard is the Breadboard like interface which shows voltages of each and every hole by full color LED and enable us to make wiring by tracing with finger tips. Users could insert electrical material into the holes and make a circuit on this device. Users could understand what is happening in the circuit and correct the connections with finger tracing.

1 Introduction

Many devices for prototyping has been developed such as the "Algoblock"(work of Suzuki and Kato[1]). In prototyping the electrical circuits, people use a tool called breadboard. It has many holes and user can make electrical circuit on it. In this paper, I would like to introduce the breadboard like interface for making the electrical circuit.

Today the electrical circuits are generally made by various tool kits with the help of computing. These tool kits such as the Arduino can easily be connected to sensors or actuators with simple coding. This is all good and handy. However, there is a problem with this method. That is we cannot see what is happening inside the circuits.

In order to solve this problem I have worked on a new device



(a)

(b)

(c)

(d)

Figure 2: Four Basic Functions: (a)Finger Detecting Function, (b) Wire Connecting Function, (c)Voltage Mesuring Function, (d) LED Displaying Function.

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which I call the "Visible Breadboard". I would like to explain some of the salient points of this new device. The Visible Breadboard shows voltages of each and every hole by LED, thus enabling us to see specifically any mis-wiring or malfunction in the circuits. Another convenient aspect of this device is "finger tip wiring". If you want to make a certain wiring, all you have to do is to trace it on the board with your finger tips. This way makes it easier for you to change the circuit if necessary at an instance. Additionally it gives a good educational lesson as to how the electrical circuits work.

2 Device's Functions

The Visible Breadboard offers four basic functions.

Firstly, finger detecting function(Figure2(a)). This can be done by touching the top part of the board to make the change of capacitance possible to detect where the finger touches.

Secondly, the wire connecting function(Figure2(b)). There are dozens of SSRs(Solid State Relays) embedded at the bottom of the board. The system selects a proper SSRs and open its way for the wire connection thus making a circuit.

Thirdly, Voltage Mesuring function(Figure2(c)). It measures the voltage of each and every hole of Top board. The system uses SSR to change the connection of the holes to AD converter.

Fourthly, LED Display Function(Figure2(d)). It shows the voltage of LED colors and brightness. It is like a thermometer, thereby you can see which hole's voltage is high or low.

The Visible Breadboard is user friendly interface for making circuit and understanding basics of electronics. It is simple, touchable, visible to the details and easy to handle. I believe that this device can contribute and bring in newperspective to the fields of HCI and engineering of programability for hardwares.

References

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- [2] Ishii, H. and Ullmer, B. 1997 Tangible bits: towards seamless interfaces between people, bits and atoms. *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Atlanta, Georgia, United States, March 22 - 27, 1997)*. S. Pemberton, Ed. *CHI '97. ACM, New York, NY*, pp. 234-241.