[NC-Rase 18]
DOI: 10.5281/zenodo.1488735

ISSN 2348 – 8034
Impact Factor- 5.070

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

DRAWING THE ELECTRIC CIRCUIT USING CONDUCTIVE INK

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ABSTRACT

This thesis explores the intersection of craft and electronics by way of paper and conductive ink, a domain that I call electronics-a synthesis of electronics, drawing, and painting. I inspect craft-the manual process-as a means for embedding new kinds of personally significant meaning in electronics, re-positioning electronics fabrication as the creation of personal, unique, hand-crafted creation. Through a sequence of studies, I inspect the personal connection and venture that comes with making, as well as the handmade creation's place in technology.

I. INTRODUCTION

Over the last several years, no products have pushed rapidly into our lives than those associated with technology. Computers have become universal, sensors ubiquitous Everywhere. It is not my intention to reclaim industrial production for the individual, nor rollback the curse of an increasingly-interconnected world.

I want to understanding *gap-the* chasm between that which we use and that which we can make and understand. **i** will study the act of making through the lens of paper craft electronics, focusing on both the expert and the practitioner.

II. CONDUCTIVE INK

Conductive inks are a rich opportunity for the design of paper craft technologies. Recent advances in the manufacture and distribution of conductive ink. It has made them widely-accessible, both in research &hobbyist**.** Conductive inks offer untraditional advantages. Melding electronic design with craft techniques, like drawing, painting, and printing, making electronics with conductive inks has as much in common with creating art as it does with bread boarding circuits. Conductive inks can mount existing surfaces and structures. Without any native structure, they can adapt to unconventional form factors and unusual substrates. Inks allow for a full range of creative expressivity. Conductive inks can be sketched from a pen, drawn with a paintbrush, or screen-printed on a wall.

Such artistic techniques permit an intersection of two kinds of making. There is the natural creativity of craft, of mark-making, and of design. All the inks used are detailed below:

Conductive Compounds **AG- 510** . Conductive Compounds WB-530 . Acheson Henkel Electrodag
725A . Bare Conductive carbon-based ink
. Pen-on-Paper flexible electronic silver nano-particle inks.

III. PAPER

Paper is unmatched in its versatility affordability, and ubiquity. Nowhere is this more true than in the making of art an infinite variety of forms can be created with a sheet of paper and a pencil, and the direct nature of making a mark on a surface is meaningful and natural. It is not surprising that art supplies are among the earliest tools that children become familiar with. Through the studies to follow, we used a large no. of papers with good results.

Conductive inks perform better on coated, non-porous papers, but such plasticized papers do not have the tactility and texture that makes working with paper so intriguing to begin with. For that reason standard light-weight and medium-weight papers were used. Some workshops made use of colourful construction paper, which allowed us to create new designs with the paper itself. In other cases, a standard, white 241b paper-stock, obtained from a local crafts store. It was stiff enough to be folded into a variety of forms, while remaining legible as a simple sheet of paper.

IV. CONDUCTIVE INK PEN

While pen-dispensers for conductive ink have been available for some time, they have been of low-quality, targeted chiefly at small circuit and windshield-defroster repair. More recently, conductive inks have been targeted at the hobbyist and maker community, chiefly through Bare Conductive, a UK manufacturer of carbon-based conductive inks. While highly- resistive, when coupled with a higher-voltage source. e.g a 9-volt battery, LEDs and other papercraft devices can be powered. It is not suitable for use with a microcontroller without a regulator. Bare Conductive' s carbon ink is skin safe, which offers an alternative interactive mode not explored here. It is available both as an easily-applied paint and as a squeezable pen.

V. SILVER INK

A different formulation of commercially-available silver-based conductive ink was used in the Story Clip creativity. In experimenting, we found that solvent-based inks had generally better performance-particularly when it came to cracking during folding and bending-so we attempted to use it in this workshop.

The manufacturers specifications, the ink was diluted with a solvent-butyl collusive. a thickness consistent with conventional acrylic paints and applied with an inexpensive plastic-fiber brush. The resulting mixture air-dries in several minutes on a porous sheet of 501b drawing paper. It is conductive when dry, with a resistance of15Q square, which is more than adequate for the purposes of sensing touch. In some cases, we speeded the drying process by curing the ink in a conventional toaster oven.

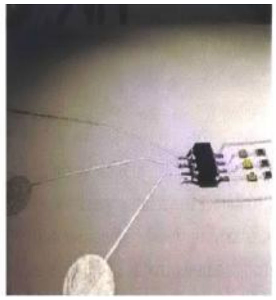
While that process significantly increased the ink's conductivity, we found it generally unnecessary for basic capacitive sensing. As sensors become ubiquitous our awareness of their presence dims. Our devices grow more powerful, making it more and more difficult to understand just how and what they're sensing. vibration? How does an accelerometer work. These paper sensors explore the nature of the self-made device, in both its functioning and its efficiency. The initial work here establishes a design space for paper-based sensors and embedded electronics-not a technical delineation of the space, though that is a certainly difficult part.

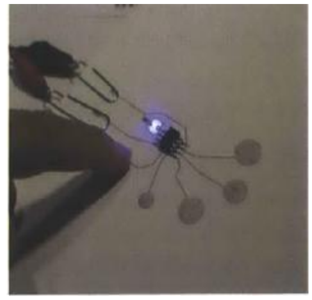
VI. CAPACITIVE SENSORS

The papercraft sensors are designed using two classes of capacitive sensing, one to detect the human body, the other, to detect the relative position of two electrodes. The first, used in the touch sensor, is loading mode capacitive sensing.

Touch Sensor
When it detects the touch of a finger on a painted capacitive pad, it lights an LED to indicate contact.

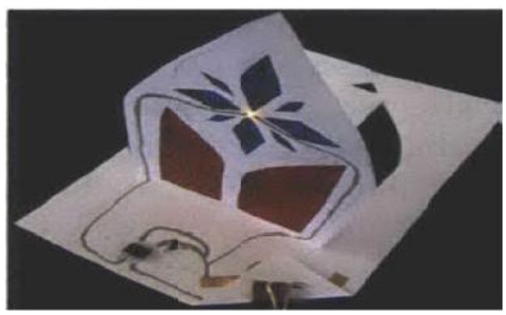
The touch sensor paper craft circuit, like the others, was constructed by painting a laser-cut mask designed in EAGLE. the power is delivered through paper clips attached to conductive traces painted to the edge of the page.

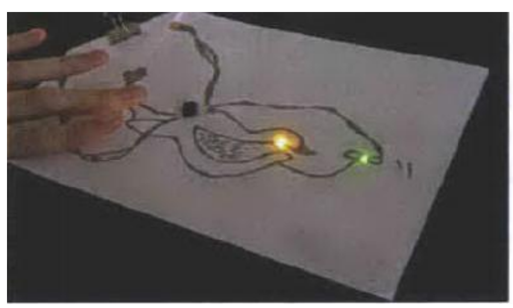




VII. ARTIFACTS

The final artifact's that participants constructed expressed a wide variety of interests.One participant, drawing on her own art experience, drew a human figure with a blinking eye. Other projects were more utilitarian a small, working lamp and an interactive greeting card. While some chose to use the conductive ink as a design element, others chose to hide it beneath layers of paper. All projects were self-contained, incorporating a microcontroller, one or more LEDs, and battery. The microcontrollers were programmed with different behaviours, from simply fading or blinking various lights to responding to touch input. One participant, drawing on her own art experience, drew a human figure with a blinking eye. Other projects were more utilitarian a small, working lamp and an interactive greeting card.





VIII. CREATIVITY

A number of participants used StoryClip as a storyboarding tool, recording their voices to animate a series of frames, similar to a comic strip. One participant drew a conductive border around a series of panels. When each panel was touched, it played out the sequential narrative contained within.

 ISSN 2348 – 8034
Impact Factor- 5.070

Another participant used the interactive nature of the drawings to create an unanticipated class of artifacts, "This is the lifecycle of the frog. When you touch one of the stages it says what stage the frog is in." The same participant also drew a picture of the interior of the earth, marking each layer with conductive paint. When the layer was touched, the software played back its name. A similar drawing depicted an aquatic scene.

IX. FUTURE SCOPE

While testing it explores creativity and the act of making, it leaves much to be desired. The nature of the StoryClip board make it unweildly, tethered as it is, to a separate computer. What could be a low-cost, easy-to-use device, is instead a complex one, requiring significant amounts of dedicated hardware and software. This limits certain kinds of expression, and prevents users from taking full ownership of their papercraft artifacts, as it requires significant auxiliary infrastructure.

X. APPLICATIONS

1. Home Automation
   It is applicable for home automation ,like we can make a switch board on the wall with the help of conductive ink. It decreases the required of maximum hardware.
2. Home security
   It is also useful for making some security system in for home. With the help of conductive ink and some electronic component like arduino , we can make a security alarm system .
3. Touch synth
   It is applicable for creating the design work in which people can create "sound pieces' in which a finished drawing can be clipped into the TouchSynth board and generate a variety of predictable sounds.

XI. CONCLUSION

The Papercraft and TouchySynth projects have explored the dissemination of connect embedded programming and papercraft it is better for understand and also for individual to create technology by themselves.

REFERENCES

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