Electronic Paper Display Using Organic Electronics

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Abstract- *It is also called E-paper. It is a display technology using organic electronics designed to mimic the appearance of regular ink on paper. An Electronic Paper Display is also known as EPD. It is a display device that possesses a paper-like high contrast appearance, ultra-low power consumption, and a thin, light form. It gives the viewer the experience of reading from paper, while having the power of updatable information.*

Unlike a conventional flat panel display, which uses a backlight to illuminate its pixels, electronic paper reflects light like ordinary paper and is capable of holding text and images indefinitely without drawing electricity or using processor power, while allowing the paper to be changed. One important feature is that the state of each pixel can be maintained without a constant supply of power.

I. INTRODUCTION

An Electronic Paper Display is also known as EPD.It is a display device that possess a paper-like high contrast appearance, ultra-low power consumption, and a thin, light form. It gives the viewer the experience of reading from paper, while having the power of updatable information.

II. HISTORY

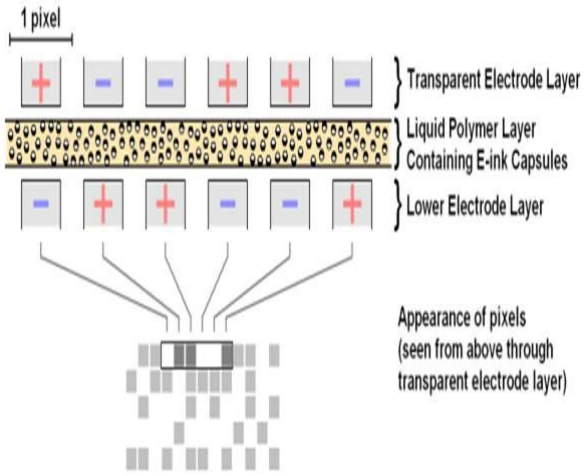
Electronic paper was first developed in the 1970s by Nick Sheridonat Xerox's Palo Alto Research Center. The first electronic paper, called Gyricon, consisted of tiny, statically charged balls that were black on one side and white on the other. The "text" of the paper was altered by the presence of an electric field, which turned the balls up or down.

In the 1990s another type of electronic paper was invented by Joseph Jacobson, who later co-founded the corporation E Ink which formed a partnership with Philips Components two years later to develop and market the technology.

III. TECHNOLOGIES USED

Now The basic material used in the electronic paper display is ELECTRONIC INK. Electronic ink is a proprietary material that is processed into a film for integration into electronic displays. Although revolutionary in concept, electronic ink is a straightforward fusion of chemistry, physics and electronics to create this new material.

IV. BLOCK DIAGRAM



The principal components of electronic ink are millions of tiny microcapsules, about the diameter of a human hair. In one incarnation, each microcapsule contains positively charged white particles and negatively charged black particles suspended in a clear fluid. When a negative electric field is applied, the white particles move to the top of the microcapsule where they become visible to the user. This makes the surface appear white at that spot.

At the same time, an opposite electric field pulls the black particles to the bottom of the microcapsules where they are hidden. By reversing this process, the black particles appear at the top of the capsule, which now makes the surface appear dark at that spot. To form an E Ink electronic display, the ink is printed onto a sheet of plastic film that is laminated to a layer of circuitry.

The circuitry forms a pattern of pixels that can then be controlled by a display driver. These microcapsules are suspended in a liquid "carrier medium" allowing them to be printed using existing screen printing processes onto virtually any surface, including glass, plastic, fabric and even paper. Ultimately electronic ink will permit most any surface to

become a display, bringing information out of the confines of traditional devices and into the world around us.

V. ADVANTAGES

- Paper-like readability.
- Sunlight and non-uniform light visibility.
- High reflectivity , high contrast & resolution.
- Viewing angle ~180 degree.
- Highly flexible.
- Ultra Low Power Consumption.
- Long-term Bi-stable Image content preserved without power.
- Prolonged battery life.
- Capable of color& video.

VI. ADVANTAGES OVER OTHER DISPLAY MATERIAL

Highlights of this display include a thickness of 300 microns and is reported as flexible as construction paper. The 10.1 inch display has a resolution of 600-800 and a pixel density of 100 pixels per inch. Most LCD / CRT monitor displays have a pixel density of 72-96 PPI. The contrast ratio is at a low 10:1 and the display can show 4 levels of grey. While this seems low, it is more than adequate for reading in well lighted conditions.

VII. DRAWBACK

- Very low switching speed.
- Electrochemical complexity.
- Slow response to change.
- Too slow for video.

VIII. APPLICATIONS

EPDs are ideal for many consumer and industrial applications where the reading experience and range of lighting and viewing angles are of the utmost importance. Transportation signage can be utilized in a myriad of locations previously impossible due to sunlight or viewing angle.

eBooks that strained the eye with their emissive light can now give the reader the true book-like experience. Cell phone screens that had to be shaded and turned continuously for a glimpse of the numbers now have high contrast and brightness in the widest of lighting conditions. EPDs give power to product designers to use their imagination in ways never before possible.

IX. CONCLUSION

Beyond today's generation of technology which offers the visual look of paper (in terms of contrast, brightness and viewing angle), future versions will integrate E Ink's flex-ready products with plastic electronics [link to flexible displays page] being developed by several companies including a Philips spin-off called Polymer Vision, Epson, and UK-based Plastic Logic. The integration of these two technologies will allow something that not only has the look of paper, but is also much closer to its form - thin, light, flexible.

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