Glassified: Near surface interactions through transparent screens

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Abstract
Looking at the world through a piece of glass is the most common/natural probing activity. Be it looking outside from a window, a person using spectacles, or a child looking at ants through a magnifying glass. This paper presents our approach to interactions to use transparent displays as a kind of window to the world in context of near surface based interactions such as paper. Using our prototype that augments a common see-through ruler, the user visually augments his pen strokes a user can visualize several 'unseen' facts about the object

Author Keywords
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ACM Classification Keywords
H.5.1 Multimedia Information Systems

General Terms
Design

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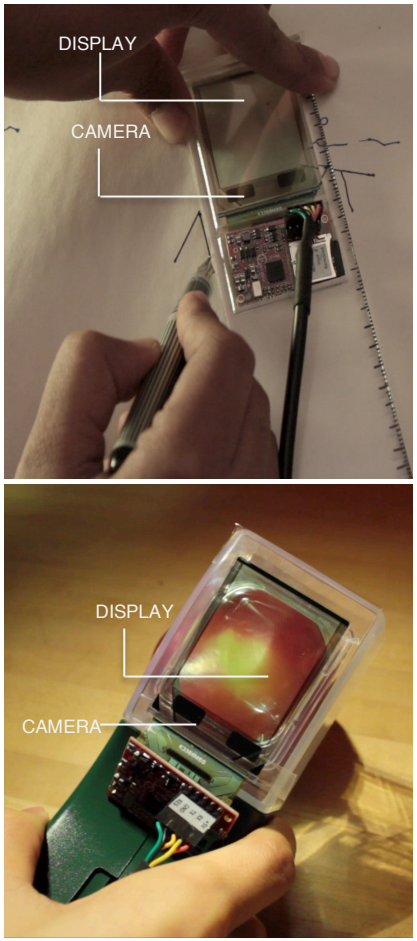

Figure 2: Prototype in multiple form factors (a) Ruler (b) handheld magnifier

Introduction

In recent years augmented reality based interfaces have become widely available. augmented reality using current screens has been proposed by [4][5]. However, most of these systems enable graphics overlay on a camera feed. The proposed system, Glassified system allows user have graphical overlays and yet see through it. Work by Lee[3] allows transparent displays to see through but the system relies on an over head camera which makes it hard to carry around.

System Design

Figure 1 shows the system layout which comprises of a 2" OLED that facilitates RGB channel graphics on transparent display which looks like a piece of glass.

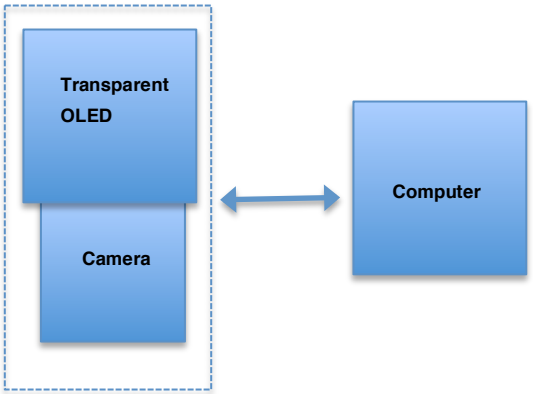

Figure 1: System architecture

A stripped down camera sensor is placed on the front of display that looks for the objects and markers around. The display connects to the computer via serial communication.[FIG.2] The objects seen by the camera, processed by the computer generate an event on the displays *'e.g'* a text string, animation, stroke completion etc.

Paper based interactions

In one of the proposed interactions the user makes a stroke on the paper which is optically sensed by the camera in the handheld part of the system. When the user writes on the paper the stroke coordinates are sent to the computer wirelessly and matched with corresponding output such as animation or color filling or append a virtual object to add to the the user's stroke. Context can be selected by sliding through four

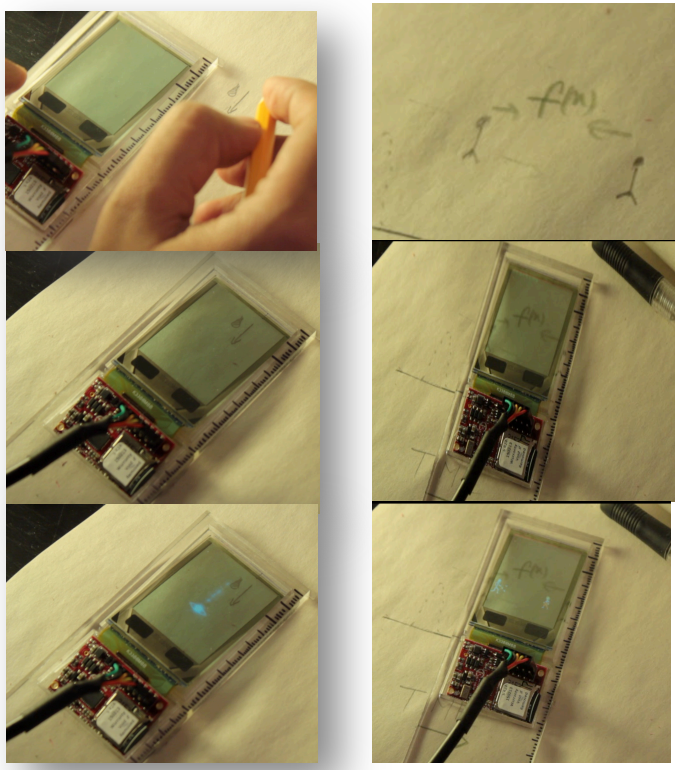

Figure 3: Interactions with paper, animation mode

options on the side of the ruler. a) translation, b) animation c) fill-up d) Add another drawing. The augmentation on the ruler depends on those buttons.

Magnifying glass

Another proposed interaction is through the magnifying glass form factor. The idea is to combine the optical properties of magnifier and digital properties of the transparent screen.[Figure 4]

Figure 4: Apple's scientific name and cell structure overlayed

This probing interface could be used to learn more about the unseen aspects of environment. E.g. a curious child can point this at a leaf and see it magnified optically. In addition rich digital data could be overlayed just in time, e.g. scientific name, 1000x magnification etc.

Future Work

We're dealing with problems such as computer vision from close proximity. Currently we're working on implementing a line scanning tube into the ruler so that it can read paper strokes from 1mm proximity.

We're also designing a calibration program that allows display to automatically know its spatial position on the paper.

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