Study of A New User Interface For Interaction Between The Smartphones And Perosnal Computer .

Mr. Gokul P. Nagare
BE Student
Mr. Vishal P. Shelke
BE Student
Mr. Amey S.Akole
BE Student
Mr. Chetan V. Pardhi
BE Student
Mr. U. R Patole
Assistant Professor
Sir Visvesvaraya Institute of Technology, Chincholi, Nashik Maharastra

Abstract

The huge influx of mobile display devices is transforming computing into multi- device interaction, demanding a fluid mechanism for using multiple devices in synergy. during this paper, we present a completely unique interaction system that permits a collocated large display and alittle handheld device to figure together. The smartphone acts as a physical interface for near-surface interactions on a display screen . Our system enables accurate position tracking of a smartphone placed on or over any screen by displaying a 2D colour pattern that's captured using the smartphones back-facing camera. As a result, the smartphone can directly interact with data displayed on the host computer, with precisely aligned visual feedback from both devices. The possible interactions are described and classified during a framework, which we exemplify on the idea of several implemented applications. Finally, we present a technical evaluation and describe how our system is exclusive compared to other existing near-surface interaction systems. The proposed technique are often implemented on existing devices without the necessity for extra hardware, promising immediate integration into existing systems.

Keywords:-*Multi-device Interaction; Tangible Magic Lens;*

Introduction

A growing number of individuals own a smartphone additionally to their computer. The collocated interaction with those devices poses the question of the way to seamlessly connect the various display spaces and their afforded interactions. Some existing systems mediate users actions across multiple devices, however, their use scenarios are mostly focused on employing a secondary device as mere a foreign controller or a viewport .

Our research focuses on the spatial fusion of the 2 display devices through near surface interaction. this enables to best leverage both devices affordances to make a fluid experience. The human body of the phone affords tangible manipulation, while the screens on both devices can display virtual graphics that augment or interact with one another . If the interaction between the devices happens in close proximity, the phones physicality and therefore the refore the graphics on each device together with our strong visual-motor skills bridges the gap between spatial reality and the digital as shown in prior research within the fields of Augmented Reality (AR) and Tangible User Interfaces (TUI).The two domains aren't mutually exclusive, having slightly different focuses on visual augmentation and tangible interaction respectively. during this paper we present G-VAC, a system that permits near-surface interaction with ordinary computer displays and smartphones with none necessary hardware modifications. We present the underlying technology and supply a classification of possible interactions. The implemented applications explore scenarios to transfer digital content between two devices, novel game mechanics and map navigation with multiple users.

Literature survey

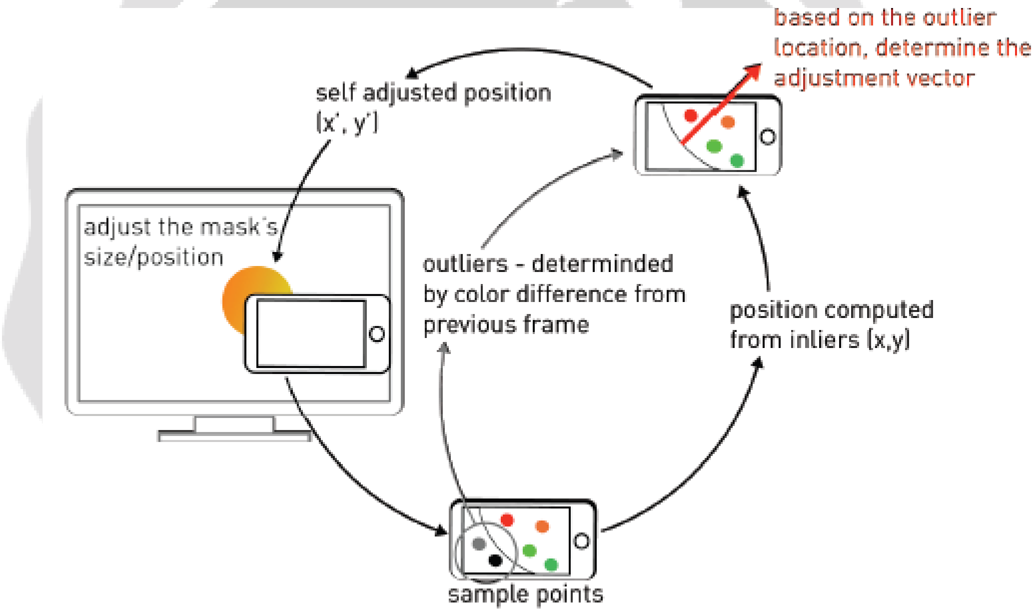
Commercially available gaming systems just like the Wii U provide a game controller consisting of alittle touchscreen . The controller acts as a position-tracked window which will display a further layer of data . Touch Projector , by Boring et al., may be a system that permits manipulating digital content on an outsized screen through pertaining to live video captured by smartphones. Baur et al. presented Virtual Projection, simulating projections of graphics onto computer screens inferring a phones 3D position in space. thanks to the character of the tracking techniques utilized in these systems, the hand-held screen are often operated only from a substantial distance to the screen. Particularly within the graphics on the pc screen are used as a tracking pattern, which has got to be updated every frame creating significant latency.

There are systems that explored closer range interactions using mobile phones on top of a bigger display. Rohs et al, Sanneblad and Holmquist, and Reilly et al. explored the appliance of digital maps. Hansen et al. used a fiducial marker on a monitor for tracking the position of a smartphone hovering above it. For the aim of their studies, they used model systems, fiducial markers printed on a map, or a pseudo tracking setup employing a commercial touch pen, which were at a yet preliminary stage for practical uses. Chan et al. and Cuypers et al. presented hardware systems that project a tracking pattern from beneath a tabletop display. Blue Table tracked phones on a table top using external cameras. the sunshine Sense system tracked a phones ash light with a camera installed behind a surface or with embedded light sensors. These systems allowed continuous tracking of the phone, but are quite complex in their setup and enormous in size

Project Implementation

The very close distance from the smartphone to the screen (<2cm) makes conventional feature-based tracking impossible due to the cameras lack of near-focusing capability and limited field of view (FOV). In our system, a computer screen displays a distinct colour pattern. The phones back-facing camera detects the pixels colour shown on the screen behind the phone. Sampled points are used to infer the phones position from the RGB values through linear transformation. Constantly displaying the colour pattern to enable tracking limits the aesthetics and readability of many applications. To minimize this interference we use a masked pattern that only shows in the cameras field of view. Its position and size are updated based on the previous frames tracking result.

For the implementation we used the iPhone 5S and 4S on a 15-inch Retina MacBook Pro as well as a 50-inch HI sense 1080p LED TV. The software is built upon open Frameworks. On the host computer, a server listens for incoming connections from the smartphone. Once a connection is established the devices exchange the calibration and tracking information. For data communication between the devices, we used Open Sound Control (OSC), an UDP-based communication library.



. Figure 5.1: Sequence diagram of the tracking algorithm

System Architecture

In our system, the surface of a screen represents the main space for interactions. A handheld screen device is put on top of a larger screen, allowing a user to manipulate the handheld device in a very close proximity to the larger screen. As the user moves the handheld screen, the graphics on both screens respond accordingly, right at the location of the users action. Our strong visual-motor skills help us to make the perceptual connection between our hands motion and the visuals on the screen, producing a believable experience of connecting both display spaces.

In this section we present our classification of possible interactions with the G-VAC system. The phone can be used as a physical token to directly interact with digital entities based on their relative positions. It can act as a lens for controlling or augmenting objects on a computer screen and also offers an additional space to be used for extended control or as a physical clipboard. The presented interactions can be building blocks for more sophisticated interactions as will be presented in next section.

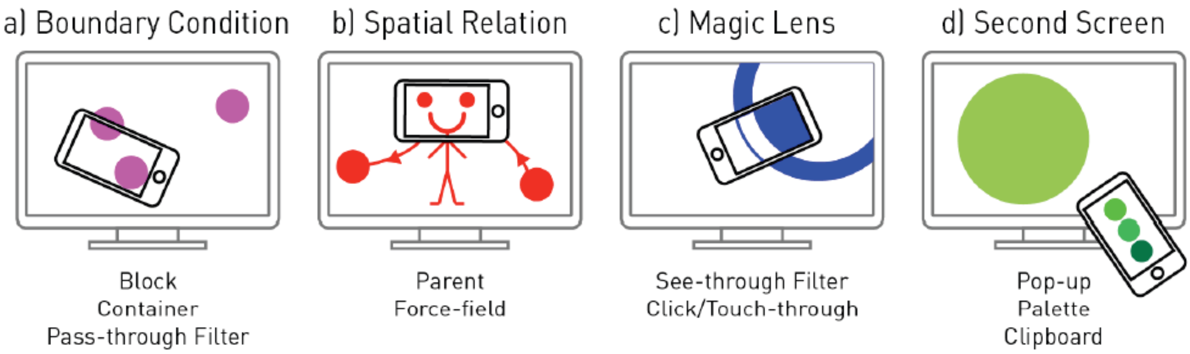


Figure 4.1: Classification of interaction on our system. Each represents different modes of direct, near-surface interactions.

System Design:-

Prior see-through augmentation styled interaction systems explored interactions between a phone and a computer screen over a certain distance, however, none thoroughly explored near-surface (on-screen) interactions. This is mainly because the proposed tracking techniques require a certain distance between the devices to work properly or special tracking hardware / setups.

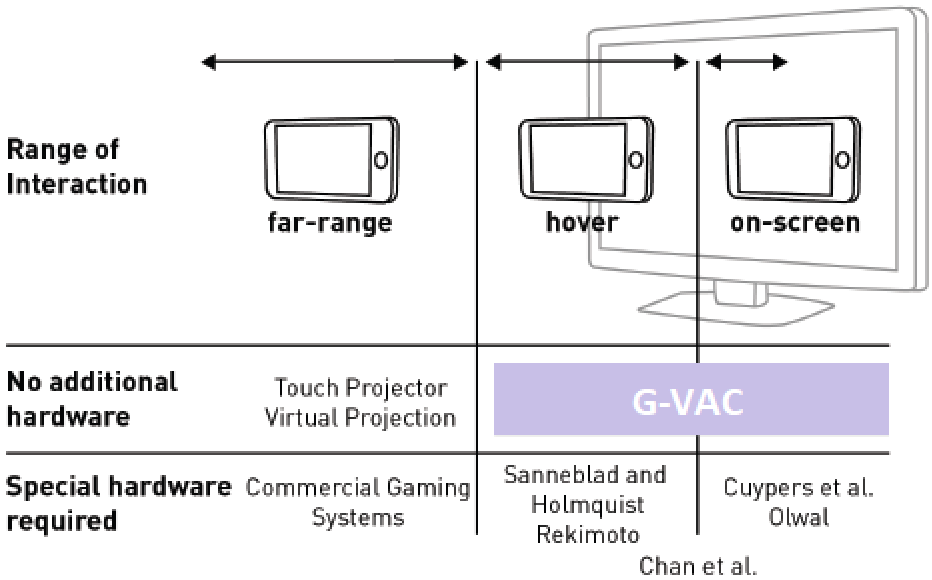


Figure 1.1: Systems based on tracking of handheld devices. G-VAC fills the void of systems that offer near-surface interaction and are easy to deploy.

Hardware Requirements:-

1. iPhone with dual camera (depth sensor & wide angle)
2. Mac O.S. X

Software Requirements:-

1. ios 13
2. X code 11.1

Conclusion

In this paper, we proposed an easy to deploy technology as well as interaction scenarios to better utilize the near surface space of computer screens with handheld smart devices. We show that the combination of AR and TUI enables versatile user interfaces for context aware seamless interactions. A growing number of people own computers and mobile phones, and with no need for additional hardware, the G-VAC system could work with those existing devices immediately. We believe this that this will open up a new space and tools for interaction designers to create fluid experiences using multiple personal devices.

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