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# TouchGhosts: Guides for Improving Visibility of Multi-Touch Interaction

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**Abstract**

Multi-touch interfaces are becoming increasingly fashionable in public spaces, but the majority of users are not familiar with multi-touch interaction. While multi-touch interfaces try to support intuitive interaction, techniques beyond the traditional move-rotate-scale are often inaccessible to the general public. Moreover, users typically interact with interfaces in public spaces over short time-spans, and thus have limited time to explore the interface. To counter the specific requirements on the accessibility of a multi-touch interface, we introduce *TouchGhosts*: visual guides embedded in the interface, demonstrating interaction techniques to the user. TouchGhosts are activated while operating the interface, providing guidance on the fly and within the context-of-use. Configurable strategies decide how a TouchGhost should be activated and which visualisation will be presented to the user.

**Keywords**

Multi-touch, public spaces, help systems

**ACM Classification Keywords**

H.5.2 [Information interfaces and presentation]: User Interfaces - Training, help, and documentation.

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## Introduction

As a result of the standardization of graphical user interfaces, a user can often rely on prior knowledge of other applications when confronted with a new user interface. Traditional widgets in desktop environments provide certain affordances to the user, “suggesting” how an object may be interacted with, while the visibility principle states that designers should make the important aspects of a system perceivable to the user [5]. Ideally, direct actions a user can perform on an interface should be obvious just by looking at it.

In contrast, multi-touch interface components allow multiple concurrent points of control that are often not visually represented in the interface. Due to this characteristic design of multi-touch user interfaces, first-time users have a difficult time figuring out what can be done with the interface and how it can be done. Especially multi-touch setups in public spaces suffer from this problem: the limited time of use does not allow for much exploration. The multi-touch interface is supposed to support intuitive interaction through gestures that come rather close to real-world interaction [4]. Nonetheless, users experience difficulties finding out how to interact with such an interface due to the lack of visibility and familiarity. In our early deployments of multi-touch displays in public spaces [1], users often try to operate the interface with merely one index finger and only over time they gradually discover that multiple fingers can be used.

This work discusses an approach to learn multi-touch interaction “on the spot”: visual guides are merged with the actual user interface to inform the user about the interaction techniques that are supported on the surface.

## TouchGhost Interfaces

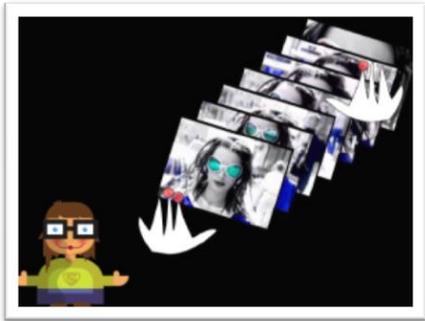
The foundation of our work is the concept of a self-explanatory touch-based interface: a *TouchGhost interface* [6]. It embeds context-sensitive help, illustrating the functionalities offered by the system. A TouchGhost is a meta-level interface object, providing help for a particular interface component by associating visual guides to every action the component supports. If an interface supports the moving, rotating and scaling of pictures, we call the set of visual guides demonstrating these actions the TouchGhost of the picture component.

Possible visualisations of a TouchGhost guide include showing short demonstration videos, representing the user’s fingers by small dots or simulating real actions with virtual hands. The latter options have the distinctive advantage of presenting the guidance within the context-of-use, on the interface components the user is currently working with, while a video only shows a generic example.

## TouchGhost Strategies

We strive for a loosely coupled architecture, where it is up to the designer of an application to configure the TouchGhost interface through *strategies*. These strategies determine how a guide is activated and which visualisation is presented to the user, and allow the designer to optimize the important initial interaction between users and help systems [3].

A straightforward example of an explicit strategy is simply pressing a ‘help’ button or avatar, which lists all the available actions on a particular interface component in a pie menu. The user can select the appropriate action in the menu, after which the



**figure 1.** Illustration of a TouchGhost interface, demonstrating how to interact with a picture collection.

corresponding visual guide is shown. Alternatively, if the hardware supports it, a user can hover with a finger above an interface component longer than a predefined threshold to invoke all the TouchGhost guides one after another. The order in which guides are presented, can be dependent on general usage statistics (e.g. show the guide related to the most common action first).

The user might be operating a multi-touch interface very ineffectively, without knowing the existence of more efficient techniques. Based on information collected from the system's previous users, such as the usage history (e.g. which actions occur often, rarely or never) and interaction patterns (e.g. which actions often, rarely or never occur consecutively), an implicit TouchGhost strategy can propose an improved way of interacting by launching the appropriate guides. A user might always scale a picture with only one finger, while it would be more efficient to use both hands. By showing a TouchGhost guide, the interface informs the user of the alternative method.

In public spaces, a dedicated strategy can invoke the available TouchGhosts one after another when the system has been inactive for some time, inviting passive bystanders to try some of the new possibilities of the multi-touch interface. When an explicit strategy is being employed, it might even be useful to show a TouchGhost guide on how to activate TouchGhosts as soon as a new user starts to interact with the system.

### **TouchGhost Example**

As figure 1 illustrates, our prototype uses an explicit strategy to make the TouchGhosts available: the user can call for help by touching an avatar. A pie menu displays all the related topics on the selected interface

component. Once the user selects a topic, the associated visual guide is shown. In this particular example, two animated hands demonstrate how to browse through a picture collection using multiple fingers: while holding the top picture with two fingers, the user can extrapolate a 'strip' by dragging the picture outwards with the second hand.

### **Discussion**

This work is a first step towards exploring a help mechanism for multi-touch user interfaces in public spaces. Our initial prototype makes use of an explicit strategy to trigger the TouchGhosts; the user touches an avatar to request help. We are currently exploring more advanced and implicit strategies, and we will assess the effectiveness of approaches such as detecting overabundant single-point interaction or measuring a user's hesitation.

In order to assist the designer in deciding on an appropriate strategy, we want to come up with a classification of which strategy suits which situation best. The choice of activation method and visualisation may depend on the possibilities of the hardware, on whether the system is in a public space or not, or if it is oriented toward a single user or multiple users, etc.

Another point of interest is examining how to deal with a system that targets multiple users at once. First of all, we want to provide 'multi-user guides', which demonstrate collaborative interactions. Two users might need to interact with a shared resource simultaneously to accomplish a goal, for example, to pass a 'private' item from one user to another. Secondly, problems arise when several users need different guides at the same time. If the visualization is

based on animated dots or hands, four or six instances may be demonstrating interaction techniques simultaneously, which leads to cluttering and confusion. We have to rethink some of the visualisations, to clearly differentiate multiple users.

We implemented our prototype with the use of a special purpose user interface toolkit that allows us to query the underlying semantics of a user interface: the COMETs toolkit [2]. To make TouchGhosts publicly accessible, we are exploring a more widespread framework, the Windows Presentation Foundation (WPF). However, we want to maintain our loosely coupled architecture: we will not put forward one particular implementation of a help system, but we provide the means for a designer to 'plug' a wide range of activation methods and visualisations into the interface.

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We are looking at the usage of graphical interaction description languages such as NiMMiT [7], which can express advanced interaction techniques. The interaction description language could also be used to build TouchGhosts, and so the interaction design and TouchGhost design can be connected directly to each other.

For now, we focus on multi-touch user interfaces, since there is an important need for these types of solutions, especially when targeting public spaces. However, we believe our approach can fit other systems (e.g. tablet PC, smartphone) as well, since a TouchGhost helps users to discover touch-based interaction techniques that are not directly perceivable by the graphical representation of the user interface.

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