MASSEY UNIVERSITY

A Near Touch User Interface for Touch Screen Based Systems

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Abstract

Industry has been heavily pushing for new methods of human-computer interaction in the last several years and this has seen many different technologies move into the mainstream, from infrared sensors[1] and z-cameras[2] to touch screens[3]. Because touch screens are a more mature and developed technology they provide an ideal platform for mainstream technology development, but their level of interactiveness is limited, and these limitations must be overcome or compensated for with clever interface design.

In this thesis, a solution to these inherent limitations in touch screen interface design is proposed by augmenting the touch screens interaction capabilities with one or two cameras to enable a near touch user experience on top of the standard touch screen. This offers flexibility in system design (the near touch is implemented as an extra layer, and can be activated only if present) as well as providing an inexpensive solution. Several Image processing algorithms relevant to this task are also discussed and their implementation evaluated.

Preface

The aim of this thesis is to demonstrate that a suitable near touch interface can be created to allow the cost effective augmentation of basic touch screens to further enhance their practicality and usability as a next generation human-computer interface.

Chapter 1 begins by describing the current issues with human-computer interfaces on touch screen devices, and why they are insufficient to replace the current standard of mouse and keyboard in a conventional desktop environment. This will be followed up by a description of the proposed solution to this issue, and an assessment of its advantages and disadvantages within the context of its intended application.

Chapter 2 will follow on by describing existing systems for human-computer interaction with touch screen devices, as well as non-touch based interaction methods, and list their strengths and flaws in relation to how they relate to the stated problem.

Chapter 3 will cover the design and implementation of this system, discussing relevant techniques, and then assess the quantitative and qualitative results gained. Finally, chapter 4 will describe the strengths and weaknesses that the system demonstrated, and what areas could be improved upon, as well as future development.

The project was carried out in conjunction with our industry partner

Unlimited Realities[1] under a Foundation of Research and Technology TIFF fellowship, and was designed to be integrated into their product Umajin™ [2], and enabled in any supporting Fingertapps™ applications built. It was also intended to create a set of image processing functions that could be implemented in any Umajin™ project on any image or video object.

[1]Unlimited Realities, PO Box 8015, 60 Princess Street, Palmerston North, 4446, New Zealand. Phn: +64 6 3564120, Website: www.ur.co.nz

[2]Umajin™ is a platform that allows applications to be rapidly developed and provides a wide range of functionality and diversity to be supported via integrated functions within the application programming interface (API). It is a commercially available product, and has a specialised branch called Fingertapps™ which is dedicated to the creation of touch based applications, and has support for multi-touch environments.

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