LEAP-based Braille Keyboard

Keywords: Interaction; LEAP Motion; Tablet

Background

Co-located meetings play an important role in our professional and educational lives. They heavily relay on visual information by using non verbal communication (for instance pointing gestures) as well as artifacts for information exchange like a mindmap in brainstorming sessions. As a direct consequence of using visual information, an information gap between sighted and blind persons arises. The DACH projects as a joint project between ETH Zurich, TU Darmstadt and JKU Linz aims to reduce the information gap between sighted and blind meeting participants and to make an active participation of the blind user in co-located meetings more easily. A brainstorming session, using the Microsoft PixelSense to hold the mindmap, is picked out as a representative example of co-located meetings and serves as the project investigation basis. Typical tasks to do in the project are:

- tracking of non-verbal communication

- find solutions to present non-verbal communication to blind users

- developing of accessible interfaces, which allow blind users to deal with mindmaps

- find strategies to prevent blind users of information overload during a brainstorming session

http://www.engadget.com/2011/10/10/student-spends-summer-turning-a-tablet-into-a-braille-writer-sa/

For entering information into the mindmap, PixelSense's virtual keyboard could be used by the sighted, while the blind still have to rely on the Braille line.

State of the Art

Today, text input on touch devices is mainly done with a virtual keyboard that is displayed on the interactive screen. Through screen readers for blind users (audio output), virtual keyboards are accessible. However, this results in a decreased working speed in comparison to sighted users. Today several hardware such as Kinect or Leap Motion exists to track gestures. In particular Leap Motion has a sufficiently high precision to track fingers and therefore seems to be an interesting input device for blind users to realize a more adapted virtual Braille keyboard.

Abstract

The PixelSense's virtual keyboard is only accessible for blind people with a decreased working speed. In this Bachelor Thesis, a virtual Braille keyboard should be developed as an alternative input device for the blind user. Using a standard Braille keyboard means that a character is entered by resembling a character in Braille notation with the fingers. The development of the virtual Braille keyboard will be based on the Leap Motion depth sensor, and therefore no real fingertouch has to be detected, but only the positions of the fingers have to be analyzed. The Leap can be mounted on an edge of the surface and therefore the blind user will be able to make inputs to the mind map without additional hardware.

Work Packages

- Short literature study on the state-of-the-art in blind user interfaces for text entry

- Implementation of a Braille Keyboard using the Leap Motion

- Experimentation of a possible mounting on the Microsoft PixelSense

- Comparison between the performance of a virtual keyboard and the Braille keyboard by a blind user

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