Keypad Design Motivation

Design Motivation for the Proposed CMHR Kiosk Keypad -- or -- Let's Make the Keypad so Fabulous that Everyone Wants to Try it

Background

Our proposed keypad designs are based on research into previous work on accessible keypads and keyboards. Much of this previous work focused specifically on computer keyboards but can be applied to other keypad configurations, such as the CMHR kiosk keypads.

The addition of a keypad to the CMHR kiosks was proposed by the museum exhibit designers (Ralph Appelbaum and Associates, New York, NY) as a way to provide user accessibility to the kiosks and associated exhibits. Our goal is to work within this proposed framework in order to make the keypad (and therefore the kiosk) as accessible as possible.

While the motivation for the use of a keypad may have been to provide touch-screen kiosk accessibility for blind users and users with low vision, we believe that many other aspects of accessibility should be taken into account when designing the kiosks. Not only must we consider users with multiple disabilities (e.g. low vision + reduced co-ordination, or a wheelchair user with reduced strength who uses the keypad because she cannot reach all features on the touchscreen) -- we believe that in order to achieve a successful design, the definition of disability must be reframed as **a mismatch between the user and the user interface.** In this sense a successful design is one that meets the usability needs of as many users as possible, thus providing a fully functional *and* an entirely enjoyable experience for everyone (that is, why not make the keypad so fabulous that everyone wants to try it?). The earlier in the design cycle that accessibility features are considered, the more integrated these features will be, and the more likely we are to achieve a successful design.

Gap Analysis - Keypad and Interactives

At present, we have limited information about the content of the touch-screen interfaces and therefore of the requirements for the keypad-interface interaction. We were provided with a number of images and storyboards on which we have based our keypad designs, but a number of open questions remain.

- do any of the interactives require up and down navigation keys (or are they all limited to left/right, previous/next scrolling)?
- do any of the interactives require the ability to skip forward (for example for video media or other applications)?
- do the kiosk interfaces require zoom keys to be included in the keypad? (and could these be doubled up with the + / - volume controls?)

Other questions/gaps regarding kiosks and associated exhibits:

- wrist support must be incorporated into keypad design (see our proposed Wrist support concepts)
- will it be possible to set preferences on the touch screen (zoom in/out, change contrast, simplify layout)? how?
- include keypads at regular intervals along the group tables (not just at one or both ends)
- debate table and See Change Make Change tablets require an accessible alternative to the touch screen
- gesture diptych requires accessibility features (tactile floor markings to indicate where to stand, audio instructions, alternatives for blind users, alternative for users with limited mobility (mobile touchscreen?))
- on-screen interactables for different levels of navigation are often presented in the same row which can be confusing
- nuanced audio description would enrich user experience e.g. for map/globe visual a whirling sound upon swiping, splashing over water bodies, voice over countries
- use of colour-coding as sole identifier for different classes/levels of information will limit cognition of those who are colour-blind; include also a variety of shapes

Additional Gap Analysis

Though we are moving forward with the keypad as an accessibility solution, we have identified a number of limitations of the keypad concept:

- keypad may be difficult for users with limited mobility to comfortably reach
- keypad requires a level of manual dexterity which some users with disabilities do not have
- keypad as sole alternative to touch-screeen (vs. personal device or other solution) may limit overall enjoyment/experience of exhibit
- fixed, right-handed keypad limits use by left-handed users and those who cannot physically reach the kiosk
- keypad is easy to locate but due to immediate prominence may be confused for sole kiosk interaction
- use of keypad may be tiresome for extended periods; increasing wrist-rest area may provide one solution
- vertically-oriented keypads on wall-kiosks are awkward to use and will be tiresome for extended periods of use

In addition, we have identified some limitations in the existing kiosk design:

- non-adjustable kiosk height will limit access of many users of different heights and in differently-sized wheelchairs
- inability to connect to kiosk with remote, personal device means that individual user's pre-set, personal preferences are unexploited
  - users will need to a) physically access kiosk in order to set preferences and b) repeat preference-setting routine at every kiosk
  - limits ability to adapt to individual's needs (a key component of accessibility)

- headphone requirement for listening to audio describe (vs. local speakers) means that user will have to plug in headset at every kiosk

Keypad Design

Much of the detailed design features for our proposed keypad concepts are based on the information provided in the European Telecommunications Standards Institute document entitled "Characteristics of telephone keypads...requirements of elderly and disabled people". The following list highlights the main points found in that document as well as recommendations taken from various sources listed under Keypad Design References and from our own brainstorming. These points are reflected in our proposed keypad designs .

Overall Keypad Design

- include a wrist rest/support to increase stability and reduce fatigue (see our proposed Wrist support concepts)

- "back" key function needs to be clearer – improve icon?

- keys could be activated only when pressed down for sufficient time, in order to ignore accidental key presses (e.g. caps lock key on mac OS)

- solution for left-handed users or users who cannot reach the keypad (e.g. wheelchair too large to roll under kiosk)?
    - e.g. a detachable, hand-held device like the 3G Off-Table Handtrack wire mouse
    - e.g. place keypad in middle-bottom below touch-screen

Key Design

- concave key surface for non-slip*

- well-defined upper key edges for improved tactile identification

- texture on some keys for tactile identification

- key material (matte surface best for reduced glare but non-slip*)

- shape of key can match function where appropriate (e.g. arrow-shaped keys)

- a keyguard could be included to increase accuracy of key selection

- internal key illumination – could brighten upon engagement

- sufficient distance between the keys (no less than half a key width)*

- sufficient height of keys (>5mm)*

- minimum size of keys (>12mm in any dimension)*

- larger keys better (but not too large as to be unidentifiable as a key)*

- embossed/(engraved?) symbols on keys for tactile feedback
    - e.g. volume slider with embossed audio icon along with +/- embossed symbols indicating volume limits at each end

- contrasting colour/shade between keys and kiosk base (illumination will help) as well as contrast between key icon/text and key material*

- size of characters on keys >7.5mm with 1mm between character and edge of key*

- sans serif font for key text; lowercase letter height should be > ½ upper case height*

- function keys should be labelled with the full function names in the national or preferred language, or by well-known symbols*

Keypad Layout

- physical separation of keypad groups*:
    - navigation keys (forward, back, select)
    - home
    - help
    - skip back
    - audio keys (volume, headphone jack, audio description on/off)

- put headphone jack in centre of headphone icon?

- arrange keys to line up with resting finger positions where appropriate

Audio

- vertical (volume) slider easier to use than horizontal, and up/down direction more obviously reflects logic of increase/decrease in volume

- audio feedback upon key selection or "snap" key for user-confirmation*

- audio description/screen reader icon improvement (could use a speech bubble?)

- have audio description turn on when the headphones are plugged in? (eliminates need for AD on/off switch, but implies that AD will be through headphones only)

*Source: Characteristics of telephone keypads...requirements of elderly and disabled people (European Telecommunications Standards Institute)

Usability Testing

Useability Testing will be carried out on the selected keypad designs in order to determine which keypad designs and which features within each design are successful. Evaluation will be based not only on the useability of the keypad itself but also on how well it serves the useability of the touch-screen interface The final keypad design will be determined based on the results of the useability testing.

Framework

Useability testing will be both directed and undirected.

Directed Testing

In directed testing, users will be given specific tasks to complete based on a given kiosk/exhibit scenario. Specific features of the keypad can be tested in this way.

The following is one example of a directed useability test scenario. The complete testing protocol (in progress) can be found here.

Format: individual kiosk (Insight Station)

Interactive: Human Rights Defenders

What is being tested: keypad functionality in allowing user to: engage audio description, get information, reset the interactive, navigate

> You walk up to the Human Rights Defenders kiosk
> and notice that the kiosk has been left running in
> the middle of a session by the last user. You wish
> to know more about the information available at
> this kiosk and you want to start from the beginning
> of the session.

Task	Description
1	Turn on audio description
2	Get information about this kiosk/installation
3	Navigate to first screen of this session
4	Start the session
5	Navigate through one of the screens in the series
6	Close the session and choose another

Undirected Testing

In undirected testing, users will be presented with a kiosk screen mock-up and will be asked to use the keypad to control their interaction with the kiosk, but will not be given any specific task to complete.

See Also:

Keypad Design References

Considerations for Keypad Design

Keypad Concepts (Final 3)

Wrist support concepts

User Testing Protocol - CMHR Keypad

CMHR Kiosk and Keypad Gap Analysis