



Accessibility Use Cases



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Today's session

- Understanding diverse users
- Different types of disabilities
 - Specific considerations
 - Assistive technologies currently used
- Use case which takes into account the above

Understanding diverse users

Important note

- People should not be defined by their disabilities
- People with disabilities should be able to
 - Perform the same functions
 - Receive the same information
 - Participate as producers & consumers

... **without** having to ask for assistance and **without** the WoT equivalent of the “text-only version” website...

The statistics

- 650 million people worldwide have some form of disability
 - 12.1% in the US have a disability
 - 16% of working-age adults in the UK have a disability
- Over 30% of us will have *some* form of disability ***by the time we retire***
- Sources:
 - "A Web form Everyone" (Horton & Quesenbery, 2013)
 - "Accessibility for Everyone" (Kalbag, 2017)

Different types of disability

- **Permanent:** vision, hearing, physical, cognition, learning...
- **Temporary:** broken arm...
- **Situational:** driving, environmental (glare, noise), new parent...

Our use case

Use case – “The Visitor”

- Residential building with multiple apartments and a secure entry system
- Visitors press the button representing the apartment number to speak with resident and (hopefully) to be let into the building
- Security camera trained on the front door of the building.
- When a visitor presses the button, the camera turns on & residents are provided with a live video stream of the scene next to their entry control device.
 - For security reasons, the camera turns itself off when the visitor enters or leaves.
- Residents can speak with visitors, and vice versa
- (**Note:** For the purposes of this use case, we will concentrate on the needs of the inhabitant)

Use case – components

- **Notification device:** Placed in apartment to inform resident of the visitor
- **Video/audio device:** Displays a video of the visitor and includes audio input/output to allow conversation. Video is displayed when the visitor presses the apartment number; resident must press a button to switch on the audio input/output
- **Confirmation device:** Allows the resident to either let the visitor in, or to send them on their way. Video/audio is automatically switched off when the confirmation device is activated

Vision Impairment: Blind

Specific considerations

- Cannot see text, icons, graphs, maps, color, shapes...
- Cannot follow visual location (e.g. “Press the right-hand button”)
- Cannot see – and/or may have difficulty finding – operable controls and using (exact) touch
- May rely on voice input/output and other (non) speech auditory cues, and haptic feedback to operate and understand controls
- **May or may not be able to read Braille**

Assistive technologies used

- Screen reader
 - Desktop devices: JAWS, NVDA, VoiceOver (Mac)
 - Mobile devices: VoiceOver (iOS), TalkBack (Android)
- Voice input and output (Alexa, eSpeak)

Use case issues

- Notification device: Resident **may** hear the notification if conveyed aurally
- Video/audio device: Resident **may** hear the visitor but **cannot** see them. Resident **may not** be able to locate the control to switch this device on.
- Confirmation device: Resident **may not** be able to locate the controls, or **may not** distinguish between the “Let visitor in” and “Do not let visitor in” controls

Vision Impairment: Low vision

Specific considerations

- May see text, icons, graphs, maps, color, but:
 - Cannot differentiate between colors
 - Can struggle with low contrast text
 - Can miss out on cues conveyed by color alone
 - Can struggle to read small fonts, and/or require text to be magnified

Assistive technologies used

- Screen magnification software
- System font and contrast settings
- Screen reader

Use case issues

- Notification device: Resident **may** hear the notification if conveyed aurally
- Video/audio device: Resident **may** hear the visitor but **may not be able to see them** depending on the quality of the image (and zooming may blur the image even further)
- Confirmation device: Resident **may** be able to locate the controls, but may struggle to use them if they rely on color alone (e.g. green = “Let visitor in”, red = “Do not let visitor in”). **May** need auditory confirmation message to indicate that activating the control has worked.

Deaf / Hard of Hearing

Specific considerations

- Cannot hear audio cues
- Cannot follow along audio in (uncaptioned) video content (live or otherwise)
- Sign language **may or may not be their first language**
 - For people with sign language as their first language, they may not be able to read the written language as fluently
- May not be able to use speech/voice input devices such as Alexa

Assistive technologies used

- No specific assistive technologies *per se*, but they may:
 - Require visible cues where non-speech sound is conveyed
 - Require captions or other visual cues for video content
 - Rely on images, icons, and/or color coding to understand content

Use case issues

- Notification device: Resident **may not** hear the notification if conveyed aurally
- Video/audio device: Resident **may** see the visitor but **may not be able to hear them** (and, for hearing impaired users, the quality of the audio may limit their comprehension of the visitor)
- Confirmation device: Resident **may** be able to locate the controls but **may also** need some visual cue to indicate that activating the control has worked

Physical Impairment

Specific considerations

- May have reduced motor control varying from temporary, to slight, to severe
- May have difficulties using touch; e.g. people with limited dexterity may see a control but may struggle to operate it
- May be concerned about functionality that may cause light-sensitive seizures

Assistive technologies used

- Specialized input devices:
 - Specialized keyboard, mouse
- Dictation software
- Voice recognition
- Sip and puff devices
- Foot switch

Use case issues

- Notification device: Resident **may** hear the notification if conveyed aurally
- Video/audio device: Resident **may** see and hear the visitor, but **may also** struggle to switch on the audio
- Confirmation device: Resident **may** be able to locate the controls but **may also** struggle to operate them

Cognitive and Intellectual Disabilities

Cognitive and intellectual disabilities

- Arguably the most complex; covers many different types:
 - Memory (e.g. dementia)
 - Problem-solving, math comprehension (e.g. dyscalculia)
 - Attention (e.g. Attention Deficit Disorder (e.g. AD/HD))
 - Reading/linguistic/verbal/visual comprehension (e.g. dyslexia)

Specific considerations

- May struggle to understand information or operating controls
- May struggle with abbreviations, acronyms and so on
- May understand icons / voice more than text
- May prefer speech input to typing
- May find flashing/constantly updating content very distracting

Assistive technologies used

- Different combinations of the above, including:
 - Screen reader/text-to-speech tools
 - Voice input devices
 - Magnification

Use case issues

- Notification device: Resident **may not understand** the notification whether conveyed through non-speech audio or vision
- Video/audio device: Resident **may** see the visitor but **may be unable** to switch the audio on
- Confirmation device: Resident **may** be able to locate the controls but **may also** need to be informed how to operate the controls, and **may also** need some visual cue to indicate that activating the control has worked

Solution?

(note: assume configurable by resident)

Notification device

- Audio notification:
 - “Buzzer” sound **and** voice output (e.g. “There is someone at the door...”)
- Visual notification:
 - Walls “light up” in cyan (light blue) (color configurable by resident to suit);’ message above entry system in apartment indicating there is someone at the door

Video/audio device

- Video
 - Image recognition to provide further details (e.g. “Description: person wearing FedEx cap holding a box.”).
 - Voice command (e.g. “describe visitor” or similar)/switch/other input to get this information
- Audio
 - Switching on audio can be achieved by another voice command, a switch/button, or a connector for the user’s own preferred input device.
 - Speech recognition on visitor’s voice so that type of visitor can be indicated in text or via an icon (e.g. “I have a delivery for you” = “delivery service”)

Confirmation device

- Again, can be operated by voice input, switch, or the user's own alternative input device
- Confirmation message provided by auditory icon/earcon, voice (e.g. "Visitor allowed into the building") and text

Implications for WoT

- There are many different moving parts in this use case
- There are lots of different ways of interacting with the various devices in order to support multiple modalities
- **However:**
 - These issues are primarily for the *UI developers* to consider and deal with
 - We can support UI developers by ensuring how data is exposed is UI agnostic and malleable to take into account the various modalities
 - Ultimately, we should be responsible for making sure that whatever is exposed allows for accessible solutions (of course, whether the solution *is* accessible is the responsibility of the UI developer)

Example

`{"visitor" : "true"}`

- **Speech output:** "There is somebody at the door"
- **Non-speech output:** "Bzzzzz"
- **Non-audio output:** Walls change color

To Discuss

- How to map physical events and affordances between different sensory modalities?
- Would some specialized vocabulary help?
- Can we map existing vocabulary (or use inferencing) to determine sensory modality mapping?
- Can the mapping be done automatically or is some developer assistance required?
- Can a user-oriented tool be developed to help with such mappings?
- How to handle connections to existing voice services, such as AVS or Google Voice?
- How does WoT compare with/connect to existing mappers like IFTTT?



Q&A

