Assignment P2

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1 QUESTION 1

1.1 Dissection of tasks

Task 1: Listening to music on my phone

- *Goals*: Improve mood, concentration
- *Interfaces*: Music app, lock screen widget, headphone controls
- *Object*: Mobile phone

Task 2: Writing this assignment in Overleaf (an online LaTeX editor)

- *Goals*: Finish assignment, learn, get a good grade
- *Interfaces*: Firefox browser, Overleaf web page, keyboard, screen
- *Object*: Laptop

Task 3: Talking to friends on a messaging app

- *Goals*: Communication, sharing ideas and photos
- *Interfaces*: Messaging app, notification on screen, buzzer / lights notifications, soft keyboard
- *Object*: Phone

Task 4: Checking the time on my watch

- *Goals*: Knowing the time, organising my day
- *Interfaces*: Watch screen, side button
- *Object*: Watch

Task 5: Making myself a bowl of cereal

- *Goals*: Nourishment
- *Interfaces*: Cereal box, milk carton, bowl, spoon
- *Object*: Cereal, milk

1.2 Interaction directness and invisibility

Task 1: Listening to music on my phone

- *Directness*: The interaction feel pretty direct, as managing the task (e.g. playing music, pausing music) is done through pressing buttons which are directly related to those concepts (e.g. the "play" button and the "pause" button).
- *Direct manipulation*: There is a level of abstraction in that I am not playing instruments or mixing sounds directly in the app, but pressing a "play" button and a "pause" button is digitally analogous to traditional physical music systems. As such, the manipulation feels pretty direct.
- *Invisibility*: Very little thought is required, beyond choosing a channel to play.
- *Learning vs good design*: As a beginner, the interface became invisible through good design, as channels are obviously named and the ability to select one is very intuitive. For expert usage (e.g. favourites list) it required a little learning, but only very minimally so.
- *Previous thinking*: Before having a favourites list, selecting channels required much more browsing. Playing / pausing music never required much thought.

Task 2: Writing this assignment in Overleaf (an online LaTeX editor)

- *Directness*: Very indirect; changes in editor require special syntax to appear as expected in render, and can look completely different and almost illegible in the editor.
- *Direct manipulation*: Manipulation is almost exclusively in the editor, the final object is slow to react (requires re-rendering) and can change very differently to what is expected.
- *Invisibility*: I spend a lot of time thinking about the interface, putting together multiple build files, searching for syntax, and adjusting display values (e.g. table widths) by hand.
- *Learning vs good design*: Any invisibility is hard earned through learning.
- *Previous thinking*: The first time I used Overleaf, I had to give up and use Google docs instead because of how unintuitive it was.

Task 3: Checking the time on my watch

- *Directness*: Very close, a single button needed to be pressed to see the time.
- *Direct manipulation*: Some watches used to have a button which lit up a dial for a short amount of time. There is arguably a link to that, with the button "lighting up" the time by displaying it.
- *Invisibility*: Almost invisible - the button is easy to find even in the dark and requires only a very simple movement to activate.

- *Learning vs good design*: Mostly good design. There is now muscle memory which helps, but it never required a lot of thought.
- *Previous thinking*: The more advanced interface required more thinking and figuring out, but the time function of the watch could be found as a first guess.

Task 4: Making myself a bowl of cereal

- *Directness*: Very close, as it's a physical system.
- *Direct manipulation*: I manipulate the cereal box rather than the cereal itself (same with the milk carton) but that's the only indirection.
- *Invisibility*: Almost no thought required, it's a physical system I've become very used to manipulating and do so regularly.
- *Learning vs good design*: Good design in that the cereal box is narrow enough to allow easy pouring into most bowls. The milk carton is designed to allow milk to flow out nicely no matter how full the carton is.
- *Previous thinking*: As a child I used to have to think about pouring cereal from a box, but not since then.

2 QUESTION 2

The task that has become invisible to me by learning is playing the video game Overwatch, a first-person shooter (FPS), on the PS4. This activity had two main interfaces: the handheld controller, and the TV screen.

2.1 Cognitively intensive components

The components of the interfaces that I used to think the most about were:

1. *Joysticks and buttons used for movement*. There are two joysticks, one to control the direction of movement and one to control the orientation of the character. There is also a button for jumping.
2. *Abilities available to my character*. Each character has several abilities, which are represented by icons on the screen, with a label for their "trigger button" (the button that triggers the ability).
3. *Cool down timers for those abilities*. Most abilities have cool downs (the time required to elapse between successive uses of the ability), for which there are timers overlaid onto the ability icons described above during a cool down.
4. *The layout of the level*. This is shown on the main screen.

2.2 Current thought process

Here are my current thought processes for each of these components:

1. *Joysticks and buttons used for movement*. The specifics (e.g. "I need to move forward", "I need to look up") are not thought about, and have been replaced with more generic "I need to go over there" or "I need to find someone I know is behind me". The sequence of specific actions is generated and enacted subconsciously.

2. *Abilities available to my character*. No requirement to look at the icons, the abilities available are conceptually tied to each character by their aesthetic and story. Buttons for each ability are muscle memory, and hinted at by character design (e.g. an ability carried out by a left shoulder button is performed by the character's left arm).

3. *Cool down timers for those abilities*. Amount of time between ability uses is now "felt" rather than requiring a check of the count down timer. This is because I have built up an internal timer for each ability, which I can use to approximate the amount left between ability uses.

4. *The layout of the level*. I now have a good mental model of the environment in levels, which allows me to generalise how I think about it. Instead of needing to look at a scene to understand what everything is (e.g. doorways, ledges, passageways) I can generalise them to their likely functions and benefits (e.g. a good sniping spot, a shortcut with lots of cover). This requires less cognition as I no longer need to convert components of scenes to 3D mental models while juggling all of the other things for the game (e.g. movement, tactics, aiming).

2.3 Redesign

The interface is already designed to be very useful for advanced users, with beginners needing to learn abilities and maps with little help. I would add an alternative "beginner" interface layout which would allow user to get to the point of invisibility faster, at the cost of taking up more of the screen space. Likely more advanced users would transition to the current layout for better visibility.

1. *Joysticks and buttons used for movement*. It would be possible to draw a 3D line in-game with the current direction of motion, so that a new player could see how the joysticks interacted to create movement, e.g. moving forward but

looking to the right vs. moving to the right but looking straight on (a.k.a. strafing). It would also let new users understand what sort of arcs would happen when they jumped in a direction. This would likely be very noisy in a real game, but might allow users who are new to video games in general to quickly learn how the movement actions map to the character's movement in the game.

2. *Abilities available to my character*. Flashing the ability used and its trigger button on screen when an ability is used would allow for rapid linking of an ability and its trigger with visual reminders. It would also allow a more complete linking of a physical action (pressing the trigger button) with the ability, especially if the user is not yet familiar enough with the representation of that action on-screen. This is particularly useful in a game like Overwatch where abilities can be cancelled or blocked partway through by other character's abilities.

3. *Cool down timers for those abilities*. Having the ability icon flash on screen with a cross over it (or the time left before reuse) when it was used to soon would help a user to build an accurate internal timer for that cool down more quickly. There could also be a distinctive sound for each ability when it was ready to use, again helping the users internalise ability timers faster.

4. *The layout of the level*. A minimap of the level on screen would allow users to find out about and explore maps more quickly, as well as offering a different perspective for that area of the map. This improved discoverability would increase the user's understanding of the possibilities of areas and familiarise them faster.

3 QUESTION 3

For this section, an exercise bike from my local gym will be looked at. The bike has a front panel with several small digital displays in it, sensors in the handles for recording my heart rate, and the ability to make beeping noises.

3.1 Current feedback

· *Visual*: There are several visual components which give feedback: current speed, elevation, heart rate (if hands are correctly on panels), amount of time elapsed and remaining.

· *Auditory*: Whenever a user changes a setting on the bike, a beep is emitted. There are also a number of beeps when the bike is first started and turned off.

· *Haptic*: When simulated elevation rises, pedals are harder to push.

3.2 Potential feedback

· *Visual*: For pre-programmed routes, it would be possible to show the upcoming simulated steepness of hills. Alternatively, for every minute a bar chart can be shown of expected speed or heart rate, overlaid with actual speed or heart rate for that minute. This would encourage the user to speed up or slow down to match the ideal exertion levels.
· *Auditory*: There could be a series of beeps that increase in tempo when a user goes from a warm up to a main riding phase, and then another set but decreasing in tempo when moving from the main riding phase into a cool down phase. This would mimic a heart beat getting faster or slower, and would be quite a natural signifier for what the user is about to experience.
· *Haptic*: Vibrating the handles when a user's heart rate is recorded as being too high (either for the exercise, or dangerously so) would ensure that the user is encouraged to stay safe while exercising. Having the vibrations happen in the handles which record the heart rate would ensure that the user would be able to feel the feedback, while avoiding being disturbing to other nearby exercisers.

3.3 Additional perception

Equilibrioception (the sense related to keeping your balance) could be leveraged by tipping the bike forward slightly at the end of the ride, simulating putting on the bike's brakes and giving a very natural feeling connected to stopping for people who have experience on real bikes.

4 QUESTION 4

4.1 Tip 1: Emphasising essential content while minimising clutter

· *Interface*: The remote control for my TV (as seen in Fig. 1).
· *Description*: The remote control has 39 buttons, and is used to control a smart TV. There are numeric buttons, volume and channel changing buttons, a directional pad, and several more buttons. It also has an infrared light at the front so it can be used as a pointer with the smart TV.
· *Violation of tip*: There are far too many buttons on display for a user to select from. This is likely in part due to it needing to work under different conditions;

Figure 1—My TV remote. There are many extraneous buttons.

as a "traditional" remote which changes channels directly, and as a "smart" remote which uses the smart TV's interface to access streaming services. Even so, there are many buttons which are badly labelled, with no easily discernible methods for naturally learning their function through normal use of the TV.

· *Redesign*: The remote could be reduced to a much smaller set of buttons:

1. Instead of numbered buttons and channel increment and decrement buttons, the guide button would bring up all terrestrial channels in an interface, which the user can navigate with the direction buttons or the infrared pointer. There could also be a way of accessing these through the smart TV interface.

2. Remove the buttons for specific services (Netflix, Amazon Prime Video) as these are reachable from the smart TV interface already.

3. Remove the play and pause buttons as all streaming services have this functionality with the main "clicker" button.

4. Remove the settings button and make it easily discoverable from the smart TV interface.

4.2 Tip 2: Using multiple modalities

· *Interface*: My oven control panel.
· *Description*: The oven has a set of dials, lights and a display with several function. In particular for this discussion, there is a dial to control the desired temperature of the oven. In tandem with this, there is a small LED light which turns on while the oven is heating up, and turns off when the desired temperature is reached.
· *Violation of tip*: The LED is a directional signifier, so if the user is not looking at the LED they will miss the signal. Since the user is likely no looking in

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the general direction of the oven during food preparation (as they are likely occupied with another aspect of food preparation), this is likely to happen.

· *Redesign*: Adding a second modality by adding an auditory signal, such as a ding or a buzzer sound, when the oven reaches the required temperature would allow for a user to notice it even if their attention was elsewhere at that moment. The tone would ideally be changeable to at least one of a selection, so the user could make sure it was recognisably different to other appliances that might be located near the oven and operating at the same time as it (e.g. a microwave).