Assignment P2
CS6750 Human Computer Interaction

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1 QUESTION#1

1.1 List of tasks

Table 1 — Task, Goal, Interface used and Object of tasks

Task	Goal	Interface	Object
Adjust Thermostat	Regulate Temperature	Touchscreen Thermostat Panel	AC
Play Piano on a digital screen	Create music for recreation	iOS Garageband app	Music
Operate Robot Vacuum cleaner	Clean the living spaces	SharkClean App and buttons on the robot	Cleanliness
Operate treadmill to run indoors	Exercise for the body	Physical buttons on the treadmill	Treadmill
Video chat with family	Communicate with loved ones	iOS Facetime	Video communication

1.2 Task 1 – Video chat with family - iOS FaceTime app

Directness:

My interaction here, being able to *select a contact* I wish to video call is very near to the object of interaction, to be able to *communicate with the contact via video*. The interface is designed to be self-explanatory & a novice user can easily figure how to look for contacts and call at the press of a button displayed next to the contact listing. When a conversation needs to end, I simply press Hang Up icon to disconnect, a good example of *small semantic & articulatory distances*. I can also maximize/minimize the other person's video feed by directly clicking on the frame insert or move the frame around as desired by holding it pressed with a finger &

moving around with maximum physical precision that touchscreen offers. This is a good example of Indirect Manipulation made Direct with little learning. Overall, the interface hands a great feel of direct manipulation making the user feel in control of all the features built in.

Invisibility:

The interface makes real-time 2-way video communication seamless and packs in one the best invisible interface attributes I've used. With an almost zero learning curve, it is designed to be consistent with how GSM calls are placed. I don't spend more than 5 seconds to get talking to my contacts from the time of opening the interface. It is designed to fade its controls away giving a real-world face-2-face communication feel. It augments animation to give users a preface of what this app is about by activating and blurring the camera upon opening even before any call is placed. The interface has become invisible with good design and very little learning.

1.3 Task 2 – Play Piano on a digital screen - iOS GarageBand app

Directness:

My interaction, to be able to *press displayed keys*, just like an actual physical piano, on screen is very near to the object of my interaction, to *generate musical notes* at the press of those keys to create harmonics. The extent of direct manipulation is high given that the key press is almost precise with touchscreen (with the limited real estate available on screen) and it immediately sounds a programmed designated musical note.

Invisibility:

Having set a default instrument of choice (Piano in my case), simply opening the app brings up the piano face and I can start operating right away – This is invisibility through good design. The app requires minor manipulation & learning to select an instrument of choice to display upon opening and provides some options to adjust the octaves on the same screen. A novice user becomes habituated to, and the interface becomes invisible, with just one or two times of operation.

1.4 Task 3 – Adjust Thermostat – Touchscreen Thermostat Panel

Directness:

My interaction, to *operate on the digital thermostat touchscreen* to manipulate temperature displayed is not distant from the object of interaction, to *regulate the indoor temperature through the AC* that the thermostat controls. The level of directness here is apparently direct; while I feel I can control the AC to regulate temperature with my interaction on the thermostat touchscreen, the actual AC control is done by the electric thermostat that the touchscreen interface is coupled with.

Invisibility:

It being a simple digital thermostat (unlike Google Nest), it required considerable learning for me to start using it. I had to learn how to switch on/off the AC, how to increase/decrease temperature, how to set to heat/cool and adjust schedules. The interface does not use employ key HCI Direct Manipulation tips like *using affordances* effectively and is not *self-explanatory*. After significant repetitive usage, I now can operate the interface but still not with great confidence. It is almost invisible through considerable learning.

1.5 Task 4 – Operate treadmill to run indoors – Physical buttons

Directness:

The distance between my interaction, to *operate physical soft buttons* on the treadmill and the object of my interaction, to *control the treadmill motor,* is small. There are designated physical buttons to Start/Stop, Increase/Decrease Speed that regulate the treadmill conveyor movement coupled to the embedded motor, which give me a feel of directly controlling the motor via the buttons.

Invisibility:

I spend very little time thinking of the interface to perform my task of running on the treadmill. The interface is rather straightforward, and a novice user can get the motor running with press of designated buttons. This is an interface that has become invisible through minimal learning and good design. I may have spent a little more time initially being new to using digital treadmills but since they are ubiquitous now, the interface needs not much learning effort to operate.

2 QUESTION#2

2.1 Task Selection and Naming

Task: To weigh myself/bags on a Domestic Weigh Scale | **Interface**: Digital Weigh Scale Platform, LCD display & Buttons

2.2 Components of the Interface

The interface has an LCD screen that displays weight in lbs/kgs and has a platform on which the subject is to be placed for weighing. It has buttons on the backside, to switch between lbs. & Kgs. Usually, I weigh myself frequently and with my work travel routine, I use the same weigh scale to weigh baggage that's usually limited when I fly. Since the platform has limited space, I lift the luggage in front of me and determine its weight by subtracting my weight from the total displayed. This activity blocks my direct vision into the LCD screen and there is no easy way to comprehend the output displayed. The interface would also post false calibrated weight if the platform it is set on is not leveled (for ex, placed on a mat/carpet or uneven tiles).

2.3 Current thought process & Specific Change

Having learnt of the interface's incapacities, I employ 2 methods to de-emphasize the interface. If my vision into the LCD is limited, I wait for a minute with me (& the bag) on the scale, quickly hop off and record the number before it disappears. To overcome the calibration issue, I weigh it at least 3 times moving it to adjacent areas. These ideas of specific change help blur the interface's shortcomings.

2.4 Redesign

I would add a simple auditory read-out feature to just read the numbers out aloud once the weight of the object is determined. This overcomes LCD visibility challenges. I would also add a simple level check fault mechanism, which would display or alert the user of any calibration fault which would overcome platform placement calibration issues and I'd be sure of my bag's weight to avoid any surprises at airports. One step further, perhaps a more intuitive touch screen display could alert real-time leveling alert, enable LBS/KGS toggle, indicate battery level all in one place so I wouldn't need to flip it over every time to adjust.

2.5 Invisible Interfaces

"Knowing and differentiating users" and "let the interface teach", these 2 invisibility principles are in line with the redesign ideas above to enable novice & expert users alike and to overcome design/calibration issues respectively.

2.6 Quicker Invisibility

Adding the redesign features above, would just let me focus on the task of weighing without bothering about the interface inconsistencies. I could just listen to weight being read-out when I cannot see the digital display with a bag in front of me or be alerted about any leveling errors before it displays inaccurate results.

3 QUESTION#3

3.1 Task Domain

Pumping gas into a gas-powered car

3.2 Visual Perception (Current)

The gas pump interface has an input unit, consisting of larger press buttons for fuel selection (Gasoline/Diesel and Octane), a small keypad-card slider for payments; an output unit with an LCD screen that displays volume of gas being pumped & price as it fills up and some basic instructions to replace nozzle after use etc. Once the user makes the payment, the user can *VISUALLY* perceive the task of fueling up successfully in these ways; 1) The backlit fuel selection button affirms the user's fuel selection 2) The LCD display starts clocking numbers on screen once the trigger is pressed indicating fueling in-progress 3) Once the desired volume is reached, the LCD stops clocking the figures and displays a visual instruction to replace nozzle back into the hub for receipt printing, indicating completion of the task.

3.3 Auditory Perception (Current)

Most fuel pumps make a beep sound with every user action like payment, keypad zip code entry for each digit, fuel selection, receipt printing - that is usually localized to be heard only by the user in close vicinity, to not distract other users at the next pump. Apart from designed sounds, there are other physical auditory sounds that aid the user in acknowledgment of task completion like sound of the

fluid flow and auto-stop click that occurs when the designated volume or money is met (full tank gas fill in most stations when nozzle detects overflow).

3.4 Haptic Perception (Current)

The buttons on the number pad and fuel selection units on the pump, provide simple press feedback to the user as they make selection with their fingers. The fuel nozzle incorporates a slightly tougher spring action feedback that needs a little more strength from the user to avoid inadvertent fuel sprays or usage by kids.

3.5 Visual Perception (Potential)

The interface could display Fuel and Octane selection on the LCD as well to avoid inadvertent selection (like Diesel for Gas cars or vice versa). It could also change LCD backlight colors to indicate different stages of fueling (an idea for eg White before transaction, Green to indicate successful payment, Red to indicate fueling in progress and back to white to indicate completion). This could also help users stay abreast with the progress of their task & not forget replacing nozzles which is a biohazard otherwise. It could use animation as well to provide instructions like replace nozzle etc.

3.6 Auditory Perception (Potential)

The interface could voice-out user selection and fueling progress. For example, “Payment Receive, Now Select Fuel”, “Gasoline selected”, “91 Octane selected”, “Replace Nozzle” etc. This could really help users confirm their selection and avoid fuel mix-up, acknowledge completion, and replace nozzle effectively.

3.7 Haptic Perception (Potential)

The interface does not over-employ haptic feedback, rightly so, to avoid fire hazards. However, the interface could allow the nozzle to vibrate right after the pump stops and nozzle auto-releases. This haptic vibration could add to the auditory perception as well to alert a forgetful user to replace nozzle.

3.8 Other Perception (Potential)

Smell can be used to detect potential leakages/spills. It depends on the user’s olfactive abilities and needs more research in the area of biochemistry however,

but the interface can employ electronic leak detection and intensify the smell where spill is detected to alert users and avoid fire/bio hazard.

4 QUESTION#4

4.1 First Tip

Emphasizing essential content while minimizing clutter

4.2 Describing First Tip

Microsoft Teams, a communication engine I use every day for work allows me to schedule, chat and meet virtually with colleagues. It provides options to mute user's audio, activate camera for Video calls, raise hand to interject any discussion etc. (*Figure-1 in appendix 4.2*). The placement of the Video button here, in both the desktop & mobile app, highly interferes with the user's motor system. With the pandemic enforcing work from home these days, users certainly may not be always camera ready. There have been many cases when I try to reach the mute button when I'm required to speak up or mute any background noise, I end up clicking on the video that instantly activates the camera. The real estate on the menu ribbon is not effectively used. "The emphasis on essential content to minimize clutter" principle is at fault here.

4.3 Redesign First Tip

Teams could 1) minimize clutter by provide customizability to let users move feature icons as accessible to them 2) Avoid motor system interference by providing added checks to avoid inadvertent camera selection.

4.4 First Tip Usage

Teams could emphasize essential content and declutter its menu ribbon. For ex, I do not use Raise Hand feature often and I could customize to have it embedded in additional options tab to minimize clutter.

Adding additional checks to activate camera, like a pop up to lets users confirm camera activation on the desktop app and swipe camera icon up on the mobile app could integrate tip1 of reducing cognitive load effectively.

4.5 Second Tip

Offloading Task

4.6 Describing Second Tip

iOS dial screen has this shortcoming – a phone number copied from text message or another source (website, email, WhatsApp etc) cannot be edited before placing the call from the dial pad. Editing is needed to add a country code or even area code in some cases. So, the only way to edit is delete the number entirely, key-in the country/area code and enter the number manually. Note that iOS does not allow copy here lest should it wipe out the entered country/area code as well. This needs the user to memorize the number and recover from perceptual memory. The iOS interface does not provide for this basic task offloading. (*Figure-2 in appendix 4.6*)

4.7 Redesign Second Tip

iOS could integrate an existing feature it already employs in other apps like iMessage, notes etc. – i.e. to provide cursor visibility and placement functionality for the user on the Dialpad.

4.8 Second Tip Usage

iOS could bring up a blinking cursor in the blank space above Dialpad. This will solve another problem right off the bat which is of visibility of the blank space where numbers could be edited. This is a challenge right now with user having to guess where to paste a copied number.

Then allow the user to copy numbers that may have come via text or on websites etc. and have the blinking cursor traverse to user-desired position through a finger drag to add/delete numbers or symbols for country code as needed at that position. This would offload users' task of memorizing random phone numbers and free up their cognitive space. This feature already exists in iOS's iMessage, Notes and other text apps and I see no reason why this cannot be added here to resolve an issue a lot of people have acknowledged

5 APPENDICES

Appendix 4.2: Reference Images

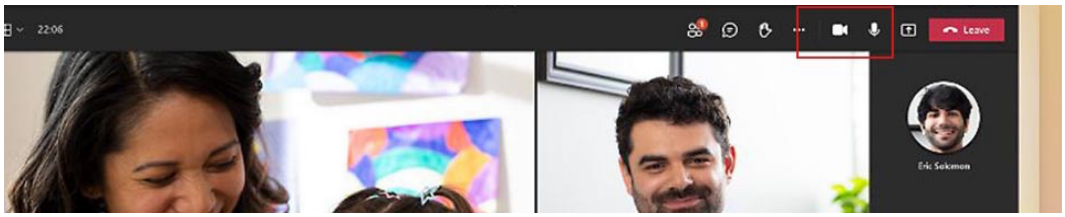

Figure 1 — Teams Desktop, notice how the mute button and video option are right next to each other. Source: Microsoft

Appendix 4.6: Reference Images

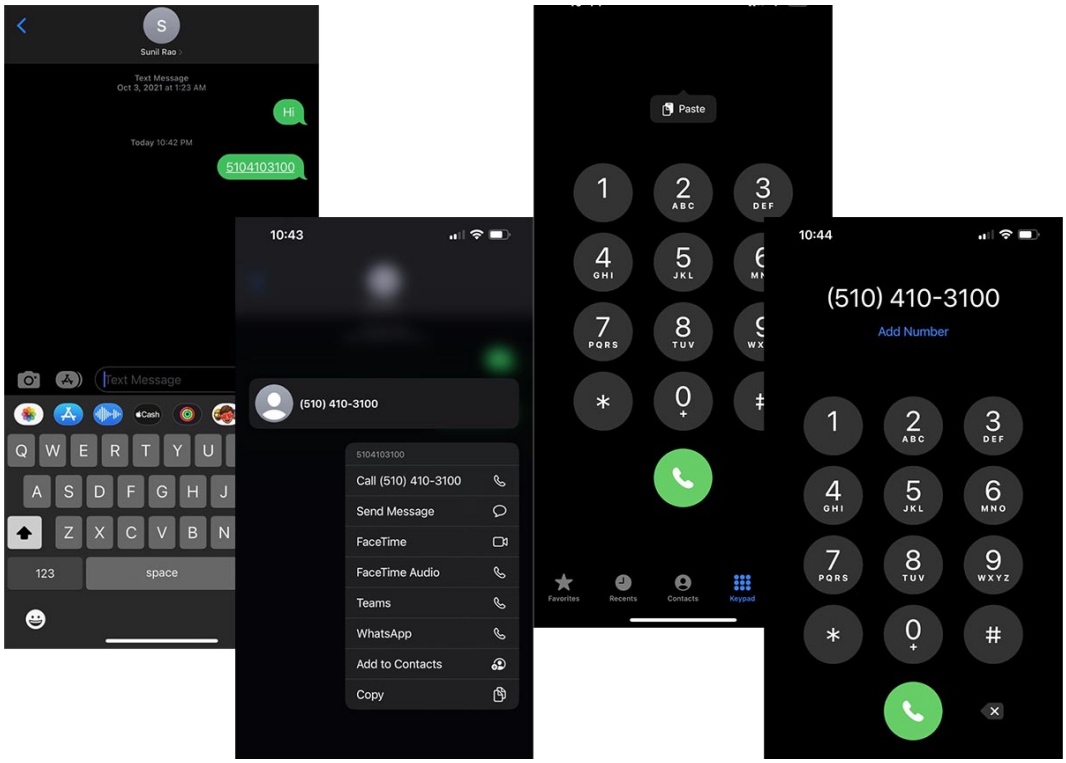

Figure 2 — iOS Copy from text and edit incapacities in Dialpad illustration