Human-Computer Interaction
Exercise sheet 3

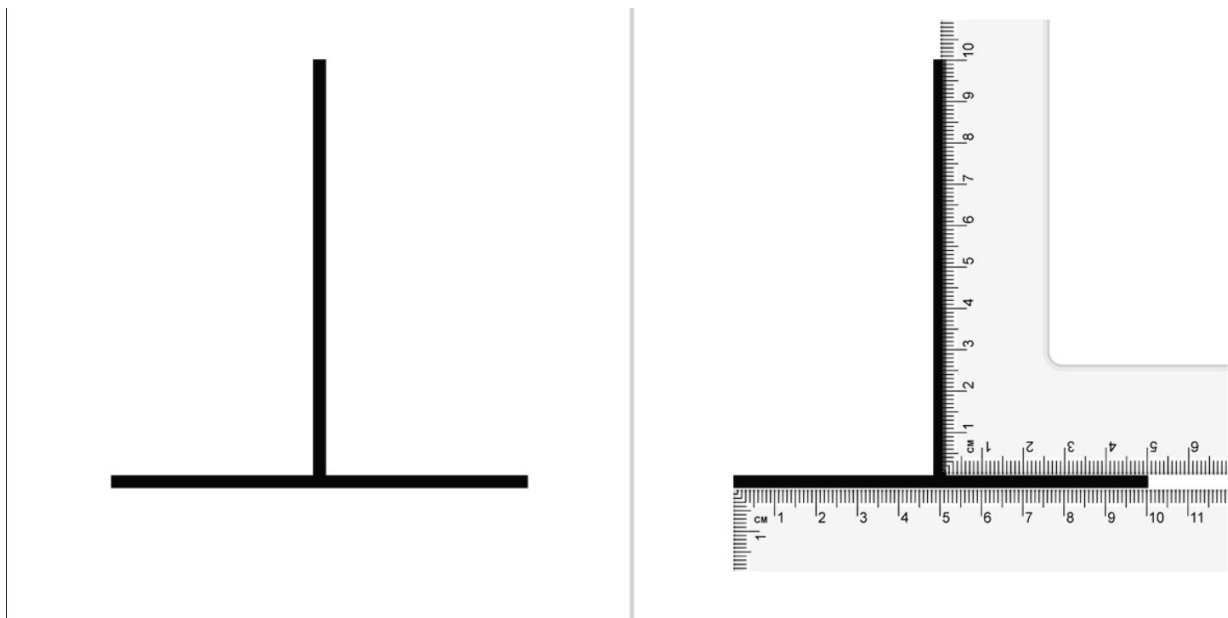***Team members:***

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Task 1:

1a)

1. **Visual Perception:**

The vertical-horizontal illusion is the illusion where the viewer always overestimates the length of the vertical line than a horizontal line, but in reality, both the lines are of the same length.

Source: https://en.wikipedia.org/wiki/Vertical%E2%80%93horizontal_illusion

2. **Auditory perception:**

Speech-to-Song Illusion is an illusion where the speech is heard as a song, this can be accomplished basically by repeating an expression a few times over and by without changing the sounds in any capacity, or by adding any melody to it. When we listen to a sentence for the first time it appears to be spoken normally, but when the sentence is being replayed several times it appears to be sung rather than to be spoken.

However, when you play the phrase that is embedded in it: 'sometimes behave so strangely' repeatedly, a curious thing happens. At some point, instead of appearing to be spoken, the words appear to be sung, rather

Audio link: http://philomel.com/asa156th/mp3/Sound_Demo_1.mp3

Source: http://deutsch.ucsd.edu/psychology/pages.php?i=212

3. **Tactile perception:**

The cutaneous rabbit illusion also known as cutaneous saltation is an illusion observed when more than two regions of the skin are being tapped continuously in quick progression. It can be felt more on the regions of the body surface that have relatively poor spatial acuity, e.g. forearm. A fast grouping of tapping, first close the wrist and then close the elbow creates the feeling of successive taps from the arm to the wrist towards the elbow, even though, we didn't apply any physical stimulus in between the two.

Source: https://en.wikipedia.org/wiki/Cutaneous_rabbit_illusion

4. **Size-weight illusion:**

Charpentier illusion - In this illusion, people usually perceive that if the object is larger in size, it is expected to be heavier to lift and hence try to lift it with greater impulse. This causes the larger object to lift easier than the smaller object that the viewer thinks might be lighter. This illusion has been tested where strings were tied to the bottom of small and large cans and it is observed that the viewer used greater impulse to lift the larger can.

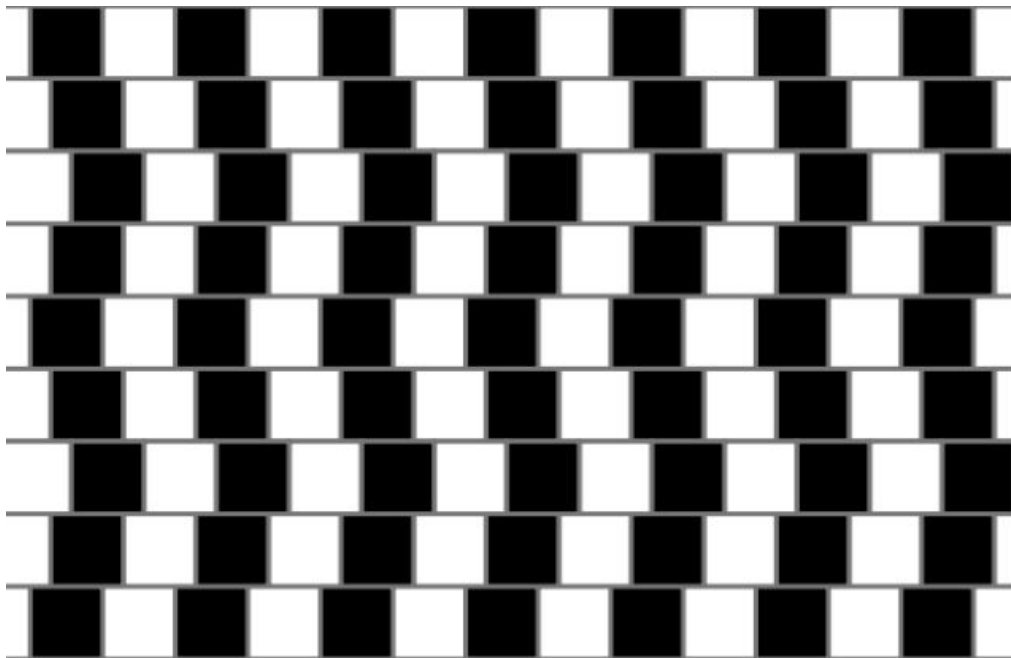Source: https://en.wikipedia.org/wiki/Size%E2%80%93weight_illusion

5. **Taste perception**: A classic experiment of the **taste perception illusion** (Effect of color on taste) was conducted by a French scientist, where, to understand the taste perception he colored a white wine to the red with an odorless flavor. He conducted this over a panel of wine experts and asked to describe its taste of the wine. They all described the wine as if it were a red wine

descriptor instead of a white wine. The colors we see play a significant role in how we perceive taste.

Source: https://perception28.wordpress.com/category/taste/

 6. **Distorting Illusion:**

Café Wall illusion - Doctor Richard Gregory was surprised to notice the effect on the tiles of the wall of the cafe he visited. The wall design effect appeared to be bent whereas the lines were straight and parallel. The distorting illusion effect can be seen in the pictures below.

Source: https://en.wikipedia.org/wiki/Caf%C3%A9_wall_illusion

1 (b) How illusions can be used for HCI purposes.

In HCI it is critical to try not to add any confusing effects. In Café Wall illusion, we can see that a straight line can appear distorted if it is seen against a background of radiating lines. This phenomenon is important in the development of systems that involve display that intrude into the periphery of vision. Vision is an important way of describing information and therefore it is a great sensing modality for the Intelligent schemes for HCI.

Source:
http://www.optical-illusion-pictures.com/distort.html#:~:text=Distorting%20illusions%20are%20 0characterized%20by,described%20by%20Doctor%20Richard%20Gregory.

Task 2

Direct manipulation supports objects and the actions that the user has to perform that are close to reality or to what the user has already experienced, making it visually more meaningful for humans to perceive. It does not require the user to type in complex commands, rather just takes in direct input from the user like pressing buttons, touching the screen, and clicking with the mouse. Direct manipulation makes use of icons that can make the user perform his tasks that he does very often in an incremental and rapid manner and those actions are reversible too. And the response to those actions is very immediate and visible.

Iven Sutherland's Sketchpad

Representation of object and actions: The Sketchpad had push buttons which represented specific actions like Draw, Move, Copy buttons, etc. Moreover, it had knobs to rotate and magnify the objects that could be observed on the screen. The use of a light pen on the display screen used the metaphor of paper and pen which was easy to adapt to.

Physical actions: The user could move a pen from a certain point and pressing "Draw" would draw a line stretching like a rubber band from the initial position to the current position. The whole interaction involved physical movement of a hand, pressing buttons, and turning knobs.

Rapid, incremental, and reversible: The user could draw the first line by the positioning of the pen and pressing the draw button. Pressing the button again would draw additional lines. So, we can say that sketchpad supported incremental actions of users and allowed them to perform rapidly and their results could be seen immediately on the display screen. One could also draw a circle. Its center could be specified by placing the light pen where the center is to be and pressing the button 'circle center'. Then positioning the pen on the circle to specify the radius and pressing 'draw' would draw a circle as the pen is moved around. And this action could also be reversed by moving the pen back backwards and that would erase the circle.

Task 3

Yes, my smartphone has WIMP interface which is explained under four elements of WIMP paradigms:

Windows: One example is where I can switch between various opened windows performing different tasks. I can then scroll left and right and select a specific window to open it. Another example is chrome, where I can work on multiple chrome tabs simultaneously and can easily switch between them, open them and close them.
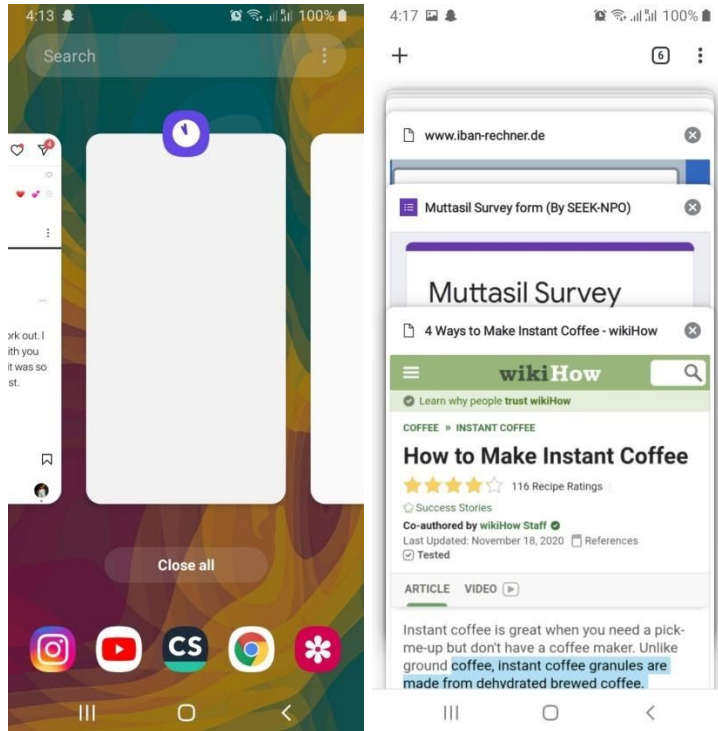
Icons: My smartphone uses a phone icon to represent the phone calls log. And a message icon to represent the messages that were sent and received on my phone. And the notification bubble over the message icon would represent new messages that are unread. Similarly, there is a bin icon that represents the delete action for the home screen page.

Menus: A simple example is when I select some text from a website it gives a pop-up menu from where I can select options like copy, share, select all, and when I click on the 3 dots (context menu) it gives further options like a dictionary, translate and web search. There is also a back arrow to go back to the previous options.
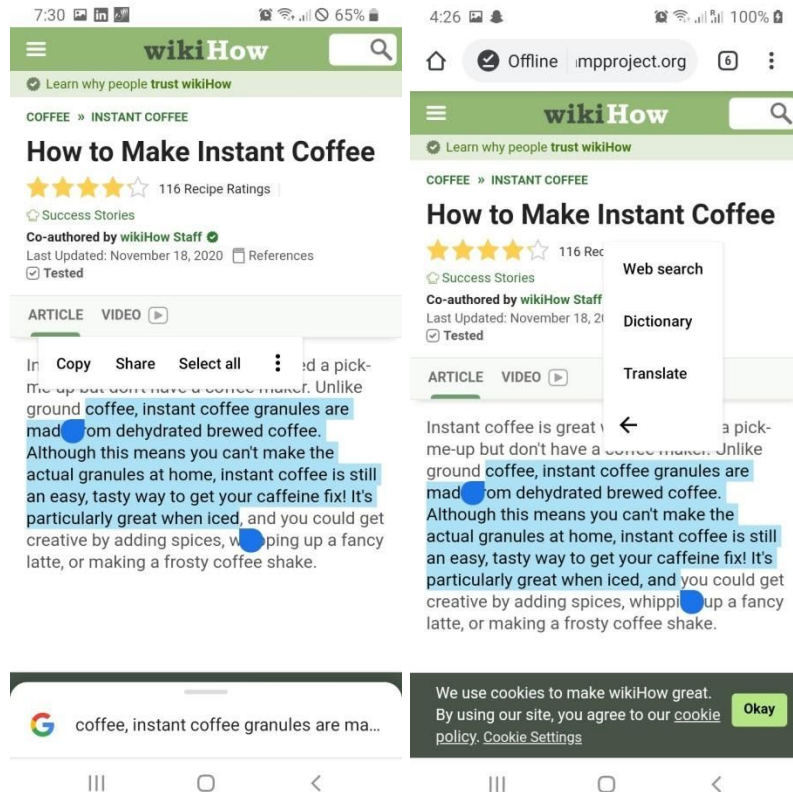
Pointer: The pointer in the case of my smartphone is of course my finger touch. I can also use two fingers to stretch and expand the window screen.

Task 4: Memory & Action

(a.) Recognition and Recall:
- *Recognition* provides more hints to easily fetch information about what needs to be done from one's memory. However, if the UI has many features, it occupies a lot of the screen's real estate to fit all of them which is not ideal.
- For regular or expert users, *recall* is faster when compared to recognition (Ctrl+S rather than File -> Save). However, users tend to forget the commands if they do not use the interface for a long time or when they are in a situation with a high cognitive load.
- *Example of Recall:* One has to recall the password to sign in to the account to use all the features of the Microsoft Word interface. Here, Paul Strohmeier is the user who has signed in to use the interface.
- *Example of Recognition:* All the menus help a user to recognize what it does. One such example is 'Styles'. By just choosing the 'Heading 1' option, the typed text could be made bigger with the blue font to represent a heading. One does not have to remember any commands to achieve that.

- The Microsoft Word interface provides many essential features for users. It will be difficult for a user to recall what needs to be done to make use of the features and hence *many icons* have been used to help a user to recognize their functionality. Icons are easier to learn and remember than commands.

(b.) Motor performance:
- *Fitts' law* is a model that helps in predicting the time it takes for a user to select a target - in UI or in a physical environment. It is defined as a function of the distance and width/size of the target - the time increases if the user has to travel a large distance to reach the target and it decreases if the target is of larger size: $t = a + b\ log_2(D/W)$ where a and b are device-specific constants, D is the distance the user has to move and W is the width of the target.
- By placing the *close button* (X) at the corner of the screen makes it easy and quick for the user to reach it. As per Fitts' model, this gives a minimal time (t) since the width is considered to be infinitely wide (since the user can overshoot) when it is placed at a corner.
- The *File* menu provides many important options like saving, opening a file or a recent file, etc., making it the most important and the most accessed menu. Though it is not exactly at a corner like the X button, the placement at the edge helps to reduce the time to reach it.
- The *context menu* provides many often accessed features like Cut, Copy, Paste, and many other font formats. While the user is using the spreadsheet, it takes effort and time to move the pointer and select one of the menus or icons at the top to format the text. Instead, by using the context menu which appears on a right-click anywhere in the document, it helps with easy and quick access to those features. This helps the user to be more efficient.