Bonus: 6/6

25.5/26 Well done !

Human-Computer Interaction
Exercise sheet 4

Team members:

1. Ankit Agrawal (2581532)
2. Janaki Viswanathan (2581499)
3. Rameen Ghafoor (7000933)

Exercise 1 - Eye Tracking

1. **Advantages and disadvantages of eye-input:**

- *Advantages:* Eye-inputs are of high precision and it could be used from a longer distance and for a longer period of time. 1
- *Disadvantages:* It will be difficult to distinguish whether the user is looking at a UI object to understand and process the information or to interact with it. This famous problem is named as the Midas problem. 1 Additionally, it is very expensive to write or type using an eye-input when compared to a traditional keyboard input. 1

2. **Solving the Midas problem:**
Eye gestures like blinking n times could be used to overcome the Midas problem. Dwell time could also be used but it will take a little longer than other interaction methods. 1.5

3. **Scenario – For quadriplegic users:**
A gesture set for eye-input could be helpful for quadriplegic users.
Eg: To open, read and reply to an email

- Blink twice to open the email in focus
- Wink the right eye first and then immediately the left eye to switch off eye-input to avoid the Midas problem – so that he/she could read the email. It could be switched on again when needed by using the same gesture.
- Focus on the scroll bar and gaze a bit high to drag it up and gaze a bit down to drag it down. 1.5
- Blink twice while looking at the ‘Reply’ button to compose an email.
- Swift eye movements to draft the email. If the keyboard is also part of the interface, the user could just look at the necessary keys to type the letter.
- Blink twice at a word to select it. Right wink while looking at it to get the right-click options to select Cut, Copy or Paste.
- Blink twice while looking at the ‘Send’ button. And the email is sent successfully.

4. **Alternative way of using eyes for input not relying on eye-position:**
Winking right/left (metaphorical to left and right click in a mouse input), blinking n times (twice to open), enlarging or contracting the eyes (to zoom in or out), winking left and right one after the other (to enable or disable eye-input)

2

Exercise 2: Interface Types

good work with pros and cons, but you are asked to consider them for explanation of the interface and not really write it down.
It is a good exercise now, but for exam writing down pros and cons not required until asked

Speech-based interface:

Voice commands can control the movement of the PacMan, i.e. the user can use a list of voice commands such as Left, Right, Up, Down to move the PacMan through the maze.

2

Pros:

- Supports hand-free interaction.
- Users with impairments can play the PacMan game using speech recognition.

Cons:

- A frustrating experience can occur if the system is not able to understand the commands of the user properly. (Eg: noisy background or misinterpretation of the voice command.
- It might have a slightly slower response with noticeable lag.

Touch-based interface:

Using a touch-based interface, PacMan can be controlled via a Swipe on the screen, where the player can swipe through the screen in any direction (Left, Right, Up, Down) to change the direction of the movement of the PacMan.

2

Pros:

- No need for conventional devices like a keyboard or mouse to control the PacMan movement.
- Can be easily played on devices like Tablets, iPad, etc.

Cons:

- Systems compatible with touch screens are required.
- There is a kind of nanosecond delay while changing the direction of the PacMan.

Tangible interface

In a tangible interface, we can use a physical board and a PacMan is represented by a token to play the game, by moving the token, the user inputs the command to move the PacMan. A projector can be placed above which would project the maze, path, and the ghosts.

2
nice

Pros:

- Exciting gaming experience
- No need for conventional devices like a keyboard or mouse to control the PacMan movement.

Cons:

- Requires advanced devices and technologies.
- Not very feasible for people having disabilities.
- Not very intuitive.

Virtual reality interface

you need to have an alarm/alert to get to know about the ghosts a bit in advance, so that you could change the direction accordingly, unlike in 2D pacman

1.5 In the Virtual reality interface, a three-dimensional (3-D) artificial environment of the PacMan game is created where the physical movement or hand gestures can be used for the movement of the PacMan through the maze.
Or the user itself can act as the PacMan here and they need to physically move in order to move along the maze. They can be handed with virtual swords to kill the ghosts, or jump over them, to make it more interactive and interesting.

umm, actual pacman does'nt really kill, intends to escape in the remaining directions, else gets killed

Pros:

- It provides an amazing gaming experience to the user.
- Additional features like multiplayer gaming, additional obstacles, a better design can be implemented.
- It is an ultra-immersive gaming experience.

Cons:

- The setup is costly including a VR headset, sensor-equipped gloves, hand controllers, etc.
- Not very feasible for people having disabilities.
- Headsets can be uncomfortable to wear.
- Motion sickness.

Augmented Reality:

2 An augmented-reality version of Pac-Man that you play by navigating a virtual maze in a real-life space. It projects a large Pac-Man maze into the world around you. The user needs to open the game on their phone and the maze is projected to the environment as seen on the phone. As a Pac-Man, you move through the maze by walking and collecting all of the dots to get points and advance to the next level, while doing your best to avoid the ghosts.

Pros:

- Very immersive and interactive.
- Involves physical movement.

Cons:

- Need a device to augmented reality (Eg phone.)

- Need an outdoor space so that the projection can be visualized on the phone.
- Motion sickness

Mixed Reality (Human PacMan):

Integration of real and virtual elements as the users(humans) are both PacMan and the ghosts and they need to physically move in the arena. The users need to wear semi transparent head-up displays where virtual objects like cookies will be laid over. PacMan" can catch "Ghosts" for a limited time using cookies. "PacMan" must try to catch all "cookies" without being touched by a "Ghost´s" hand on a sensor mounted on their shoulders. Meanwhile, the "Ghosts" try to catch the "PacMan" before they could catch all "cookies".

Pros:

- Multiple players option.
- High level of fidelity and exciting gaming experience.
- A mix of both real and virtual essence in the game.

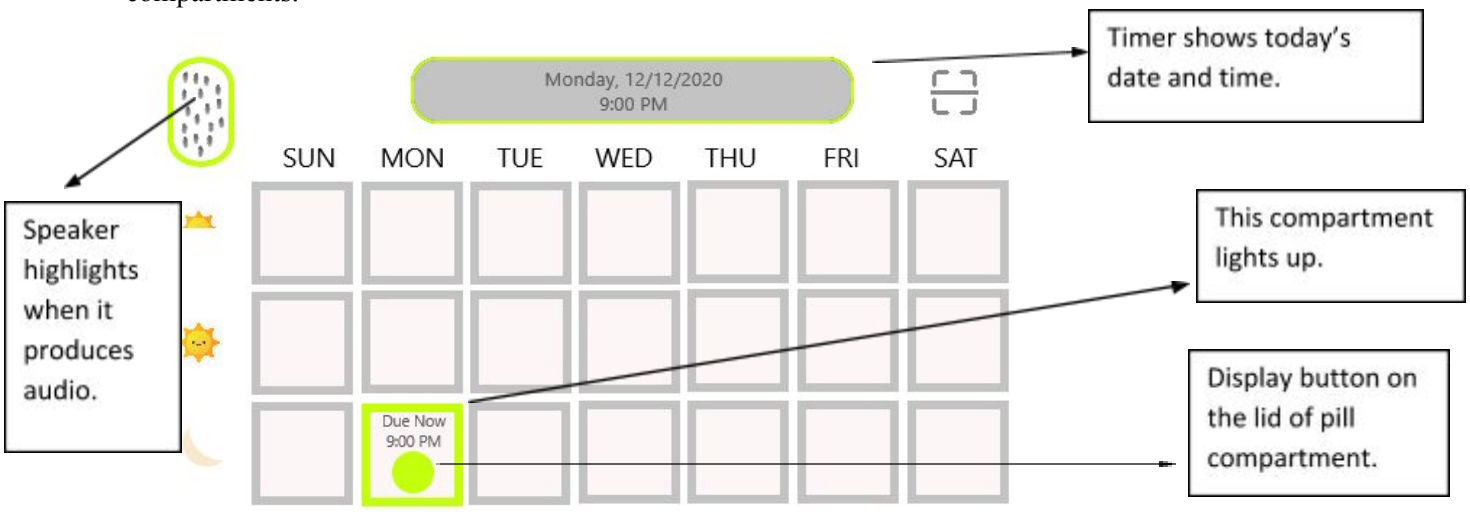
Cons:

- Need to be outdoors as good enough space is required.
- The gears can be costly and require maintenance.
- Head-up displays can be uncomfortable to wear.
- Motion sickness.

Exercise 3 1225.5

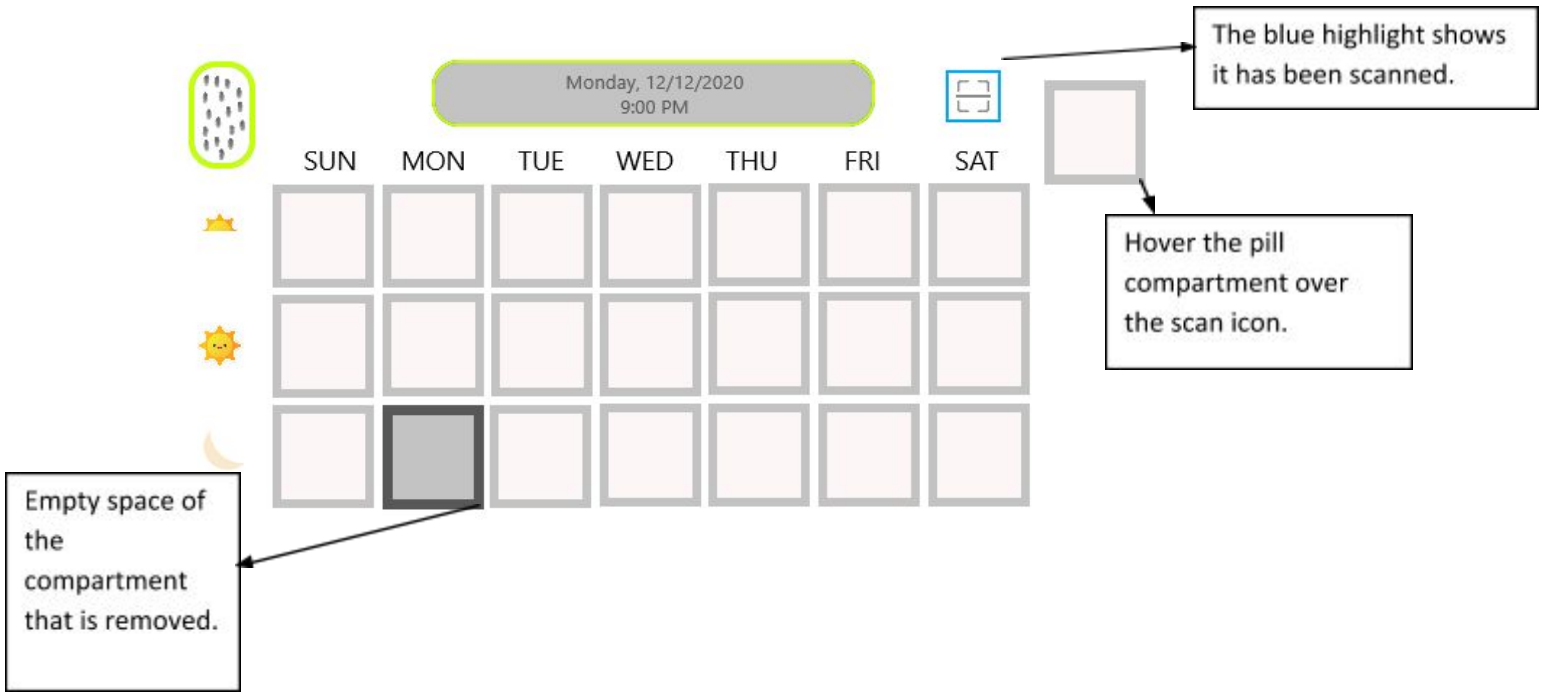
Pill Reminder: When it is time to take the pill, the alarm goes off and the pill compartment lights up with pills which are "Due Now" and also shows the time. This also comes with the audio reminder that could be set to ON/OFF according to the user's preference. If the user still does not take the pill, this device will call him/her as a reminder and will also send an automatic email notification to the caretaker of the patient. The top of the compartment's lid displays a touch button. User touches this to open the compartment. The user can only open a compartment with pills that are due right now. The rest of the compartments will display no buttons and therefore cannot be opened. This prevents the user from taking the wrong pill. This behavior of course can be changed when one has to place the pills inside the pill compartments.

4



Log Pills: When the reminder/alarm goes off and the compartment lights up. The user opens and takes the pill. The cell can detect that it is empty now (from let's say 2 pills to 0 pills) but it still does not mean the user has taken the pill. To assure that, the user scans the compartment with the help of a scan icon on top right side of the device by hovering the cell over the scan icon before placing it back. Doing this will highlight the icon to blue. Now the backend system also knows the day and time of the pill that has been taken.

4



Tracking: Users can track his pills by touching the display of Monday on the top. It gets highlighted in blue by touching and would display today's track of pills taken, missed and the pills that are due next. And if one wants to track his pills from the previous day, one can do so by touching on Sunday in the example below. Note that the cells from Monday and Sunday both display their respective statuses. Touching the Mon display will activate pill tracking mode. Touching on Monday again will bring it back to its normal state (not highlighted).