



INDIA-UK ISCC

INNOVATION & SUSTAINABILITY CHEMISTRY CONSORTIUM



*A new virtual approach
to collaboration, training
and education between
industry and academia*

*Accessible via PC or meta
Quest2*

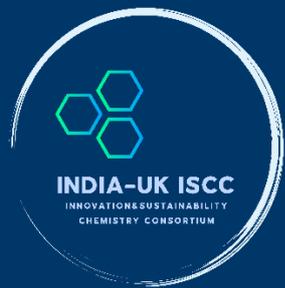
ISCC Virtual Centre

The ISCC Virtual Reality centre is a unique online digital space designed to stimulate research collaborations and enhance training between scientists of the United Kingdom and India to rapidly create solutions for a fast-changing world.

Using the centre, scientists from anywhere in the world can come together and interact with each other using digitised equipment, the same way they would in real life despite being thousands of miles apart. Simply placing a set of virtual reality goggles allows them to meet and work together on novel solutions in real time.



Within its virtual walls, across four floors, scientists can view real-time experimental data allowing them to perform collaborative experiments and to develop new approaches to chemical transformations using state of the art scientific equipment.



ISCC Virtual Centre: *Building Environments*

The ISCC VR centre is arranged across four floors with a variety of different spaces designed to allow for enhanced research and state of the art training as well as relaxed collaborative spaces designed for scientific meetings.



Figure 1: Entrance Lobby

ISCC Virtual Centre: *First Floor*

On the first floor, users can view details of the VR centre and the aims of the ISCC as well as recent publications. The main body of the floor revolves around a conference facility where users can present their latest scientific findings.



Figure 2: Display Lobby



Figure 3: Conference Room

ISCC Virtual Centre: *Second Floor – lab-builder room*

The second floor is designed to facilitate training of scientists and industrial partners, where users can meet in the lab-builder room and discuss their respective equipment set-ups. In this space, users configure reaction set-ups and arrangements via the use of an equipment spawner allowing them to seamlessly design and develop optimum arrangements of laboratories and experiment workflows. Digitised versions of both current and new equipment can be seamlessly integrated into any training workflow, by simply walking up to the wall and selecting from a plethora of commonly used modern laboratory equipment as well as 3D printed variants developed by members of the consortium.



Figure 4: Configuration Room

ISCC Virtual Centre: *Second Floor – Equipment Spawner*



Figure 5: Equipment Spawner



Figure 6: Equipment Selection and Realisation

ISCC Virtual Centre: *Second Floor – 3D Printing*

Members of the ISCC are trained in leading technologies and develop their own innovative equipment solutions via the use of 3D printing, which has become a mainstay of advanced scientific techniques.

On the second floor, users receive training on modern 3D printers and techniques enabling them to rapidly design cutting edge scientific equipment that can then be realised immediately wherever they are in the world. Having printers on site in the VR environment enables rapid discussion about the optimum means of production and design. Scientists from the ISCC and partners are thus able to discuss their designs in real-time before sending to print.

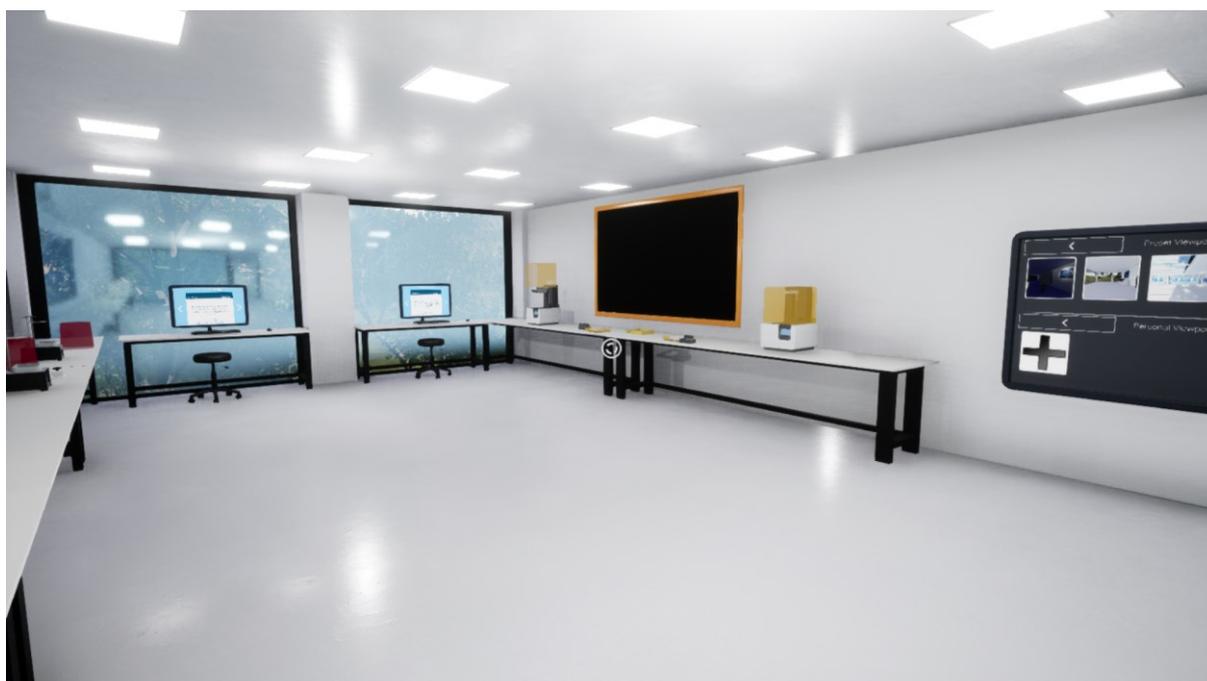


Figure 7: 3D Printing Training

ISCC Virtual Centre: *Second Floor – Undergraduate Training*

Whilst the centre is designed to be used primarily by advanced scientists, the use of a VR based centre, means that space is unlimited as multiple servers can be run at any one time. In this manner the ISCC is also able to train undergraduate students in modern techniques in parallel to simultaneous international collaboration meetings.

Our orbital training room resides in the heart of the building, where simple concepts of bonding and orbitals can be quickly and simply conveyed to students. Using this space flexibly, the 3D models can be easily swapped out for alternative objects and concepts as desired.



Figure 8: Undergraduate Training

ISCC Virtual Centre: *Third Floor – Training*

Whilst modern scientific techniques are a core part of the ISCC, users still need to be trained in the setup and use of current analytical techniques. In this room, users can interact with analytical systems such as HPLC and mass spec systems and discuss optimum use of the machines for analysis and maintenance. In this manner, users can meet with engineers or experts in their use and rapidly fix or resolve key issues, obviating delays which can impede scientific progress.



Figure 9: Analytical Training

ISCC Virtual Centre: *Third Floor – Flow Chemistry*

Continuous flow synthesis is an area of growing importance to synthetic chemistry, but despite its clear advantages over batch synthesis, its adoption by industry and academia remains limited due to the high costs of the equipment, meaning that in-person training is not accessible to most users. To address this training deficit, in the flow chemistry laboratories, high-end equipment has been digitised and is available in a stress-free environment to users who can quickly become familiar with its use and applications.

Flow chemistry is a growing area of importance to ISCC members and in this space, real-time display of laboratory experiments enables users to see exact reaction conditions from various locations across the globe, allowing ISCC members to rapidly enhance and improve chemical processes in collaboration with industrial partners.



Figure 9: Continuous Flow Chemistry

ISCC Virtual Centre: *Conference Posters and Meeting Rooms*

Within the ISCC VR institute, we are able to hold virtual poster sessions and meetings, allowing scientists to disclose their most recent advances whilst minimising their global carbon travel emissions. This space is flexible and can accommodate a large number of sessions across multiple servers, enabling several conferences to be held in parallel.



Figure 10: Meeting Room



Figure 11: Poster Room

User Controls: PC Connection

The PC version of the software is controlled by the keyboard and mouse as shown below. Users can navigate around the virtual building via the **W,S,A,D** keys on the keyboard and the mouse controls the users viewpoint and allows for interaction with objects.

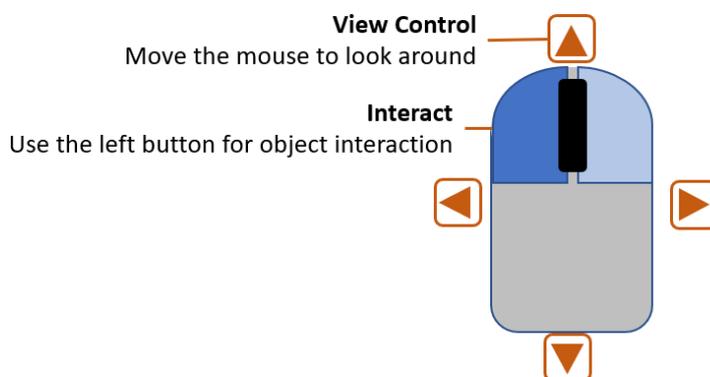
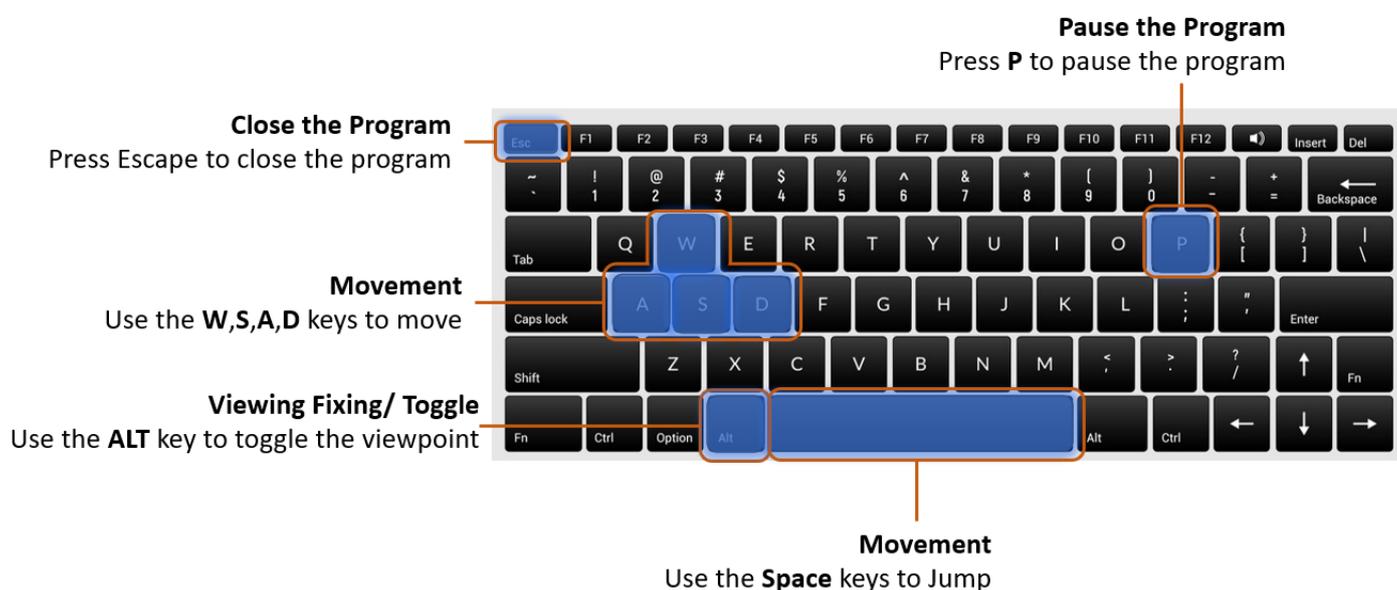
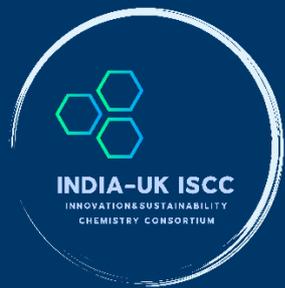


Figure 12: PC Controls



User Controls: Software Access

The ISCC VR software is hosted on [Sidequest](#) allowing for updates to the software and easy user access. In this manner, both the PC and Quest versions of the software are readily accessible. Clicking on the red button enables users to download either the PC version of the software or sideload the Android/ Quest2 version (as long as the headset is set for developer mode).



Figure 13: Software Access

Once downloaded, the PC version needs to be unzipped and then the application can be accessed by double clicking on the LAB427_ISCC icon.

Software: Email Registration

To register an email address on the LAB427 server to access the software, the user needs to click on the sign-up box as shown below (Figure 14). By pressing the **ALT** button on the user's keyboard, the viewing location is fixed on the login screen. To unfix the view, simply press the ALT button to release the current viewpoint enabling the mouse to re-control the viewpoint of the user.



Figure 14: Email Registration

On the registration screen, enter an email, password, and username (no spaces) by clicking on the keys on the keyboard on the screen with the mouse. Click on each box for entry with the mouse and then click on the keyboard letters to add the data. Once each line is finished, simply click on the next line to enter the data for that line.



Figure 15: User Registration

Once you have entered your user data, click on the sign-up button and the screen will then change to the confirmation window and a confirmation email will be sent to the address you sent (may go to junk mail, so please check). Please click on the registration link to confirm your email address and then click on the confirm button to ensure your email is verified in the software.

NOTE: You cannot leave this window until you have confirmed your email.



Figure 16: Email Confirmation

Software: Log in

Once the software has loaded, the user is directed to the loading screen. By pressing the **ALT** button on the user's keyboard, the viewing location is fixed on the login screen. To unfix the view, simply press the ALT button to release the current viewpoint enabling the mouse to re-control the viewpoint of the user.

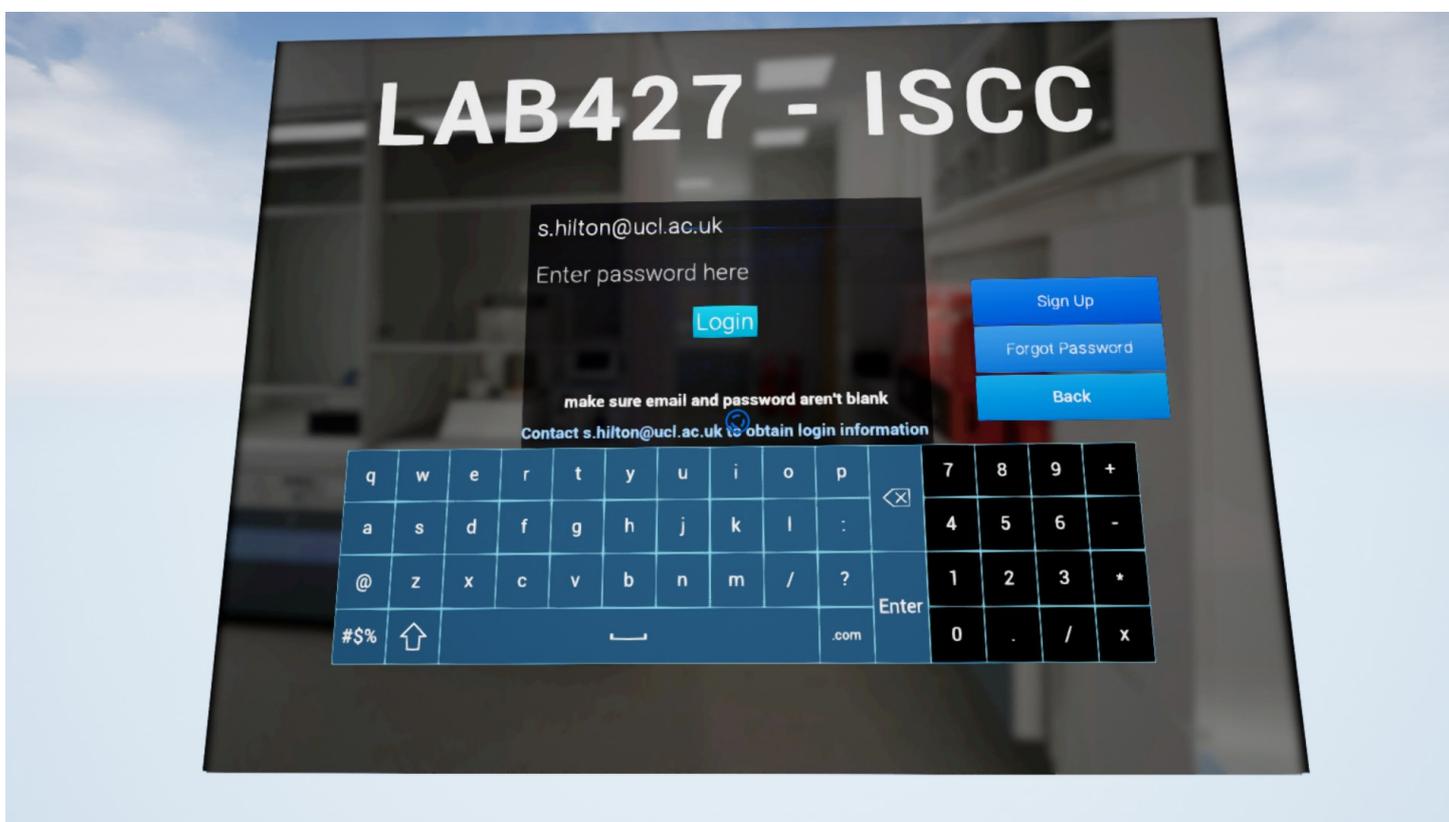


Figure 17: Software Access

To enter user details, users need to simply click on the email box and using the mouse in fixed view mode, type in their email by right clicking the letters of their login details. This is then repeated for the password box

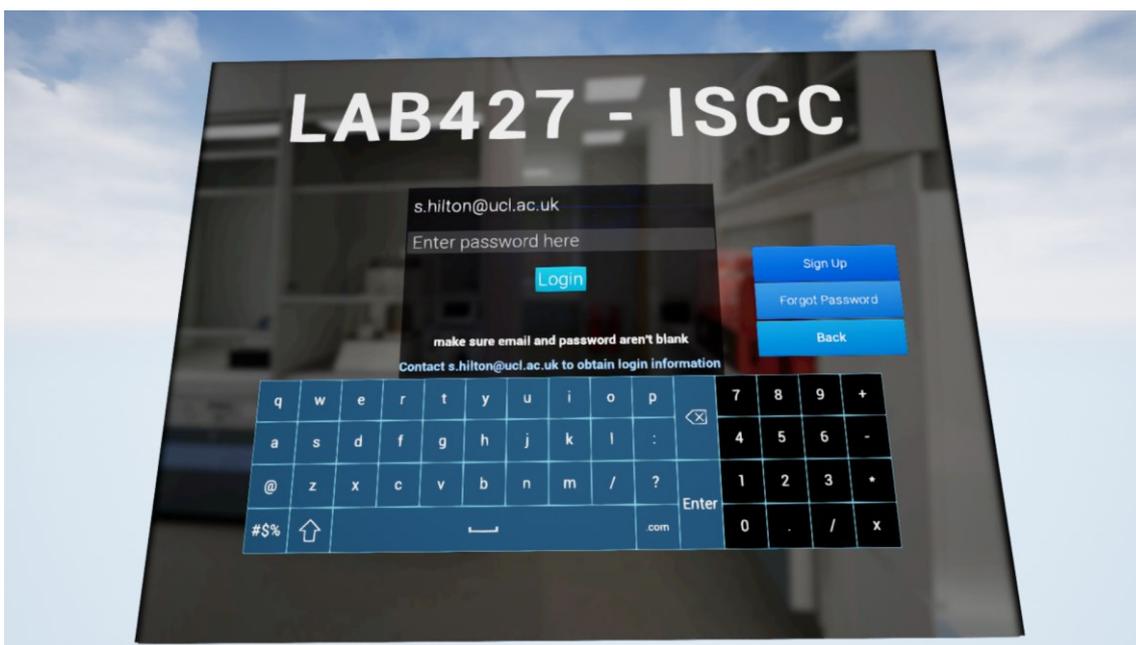


Figure 18: Software Access

User Controls: Accessing the Server for Multi-user access

Once the user has passed the loading screen, they enter in front of the multi-user connection. Simply clicking on start followed by host (if hosting) or the server (top left of the screen) will enable easy access to meetings with other users.



Figure 19: Software Hosting/ Connection



Figure 20: Software Hosting/ Connection

User Controls: Navigation

Once loaded, the user can navigate around the environment by using the WSAD keys on the keyboard and moving the mouse for the viewpoint. To open and close doors, simply click on the handle when it glows, allowing easy movement into the next rooms.



Figure 21: Room Entry

User Controls: Object Interaction

To interact with objects on the PC, simply click and hold with the mouse for pickup and release to let go. In the ISCC VR centre, some objects have gravity enabled, so will behave in the same way as in real life and drop to the floor.

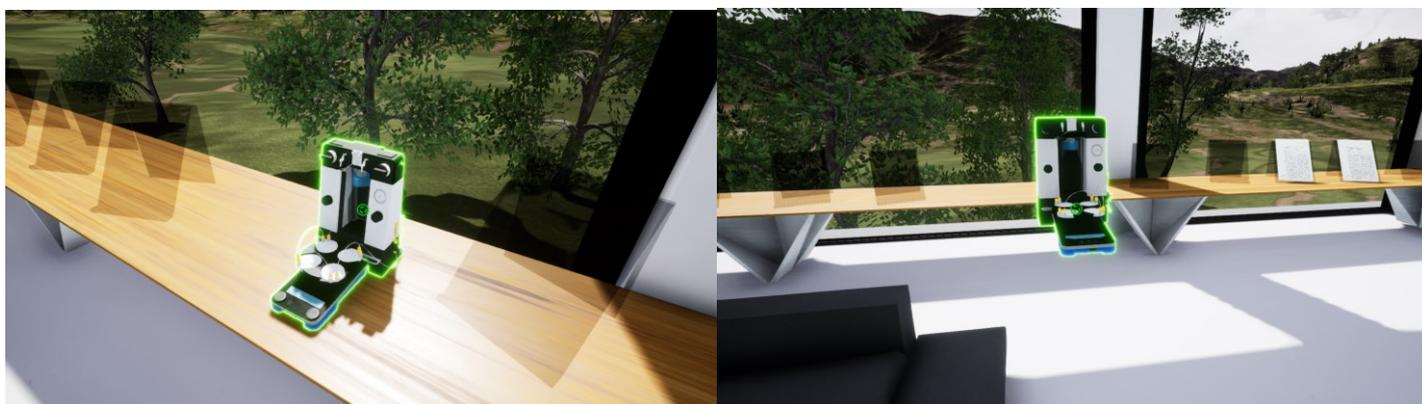


Figure 22: Object Interaction

User Controls: Navigation around the Building

Whilst the user can easily navigate around the building, it is often quicker to use the jump pads for rapid navigation. To move rooms, simply click on the one you want to go to, and you will be seamlessly transported to that environment.



Figure 23: Room Navigation

User Controls: Use of the lift

Whilst users can move between floors using the teleportation system or the stairs, in VR it is sensible to move via the lift to avoid motion sickness. To access the lift, simply click on the button shown and then select the floor that you wish to go to.

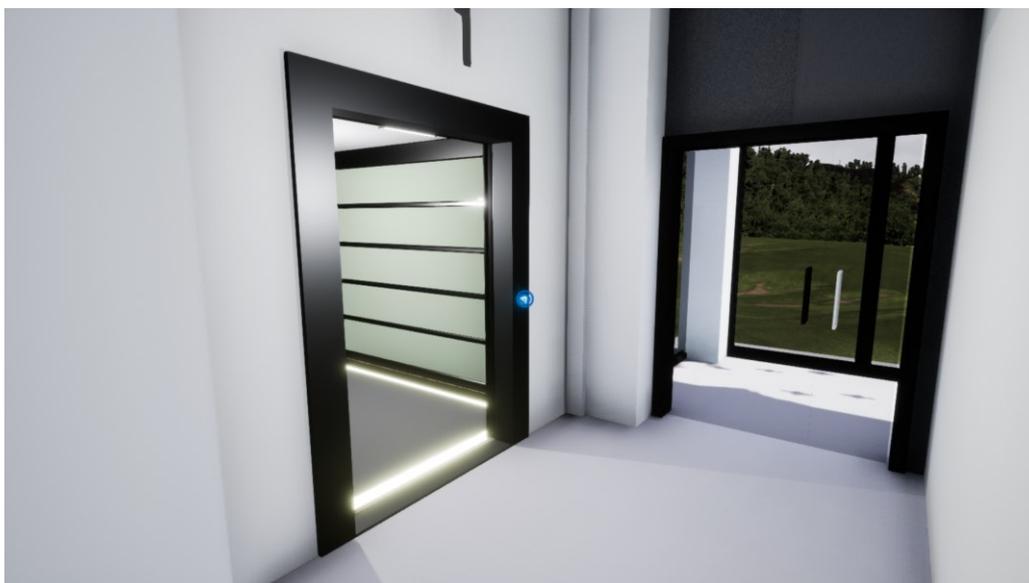


Figure 24: Use of the lift

Launching the LAB427_ISCC VR Training app on the Quest

Once you have powered ON the Oculus Quest headset and put on the device, you should see the Quest Home room (Fig. 25, A). To open the LAB427_ISCC VR application:

1. Raise your right hand holding the controller and Click on Oculus circle button shown (B)
2. This will bring up the main menu bar (C).
3. Using your first finger (Fig 25, D) select the button with 9 dots (Fig. 25, C) on the main menu.
4. Once the Apps screen is opened, click on the menu in the upper right corner (Fig. 25, E).
5. Scroll to the end of the list and select Unknown Sources (Fig. 25, F).
6. Click on LAB427_ISCC to open the app (Fig 25, G).

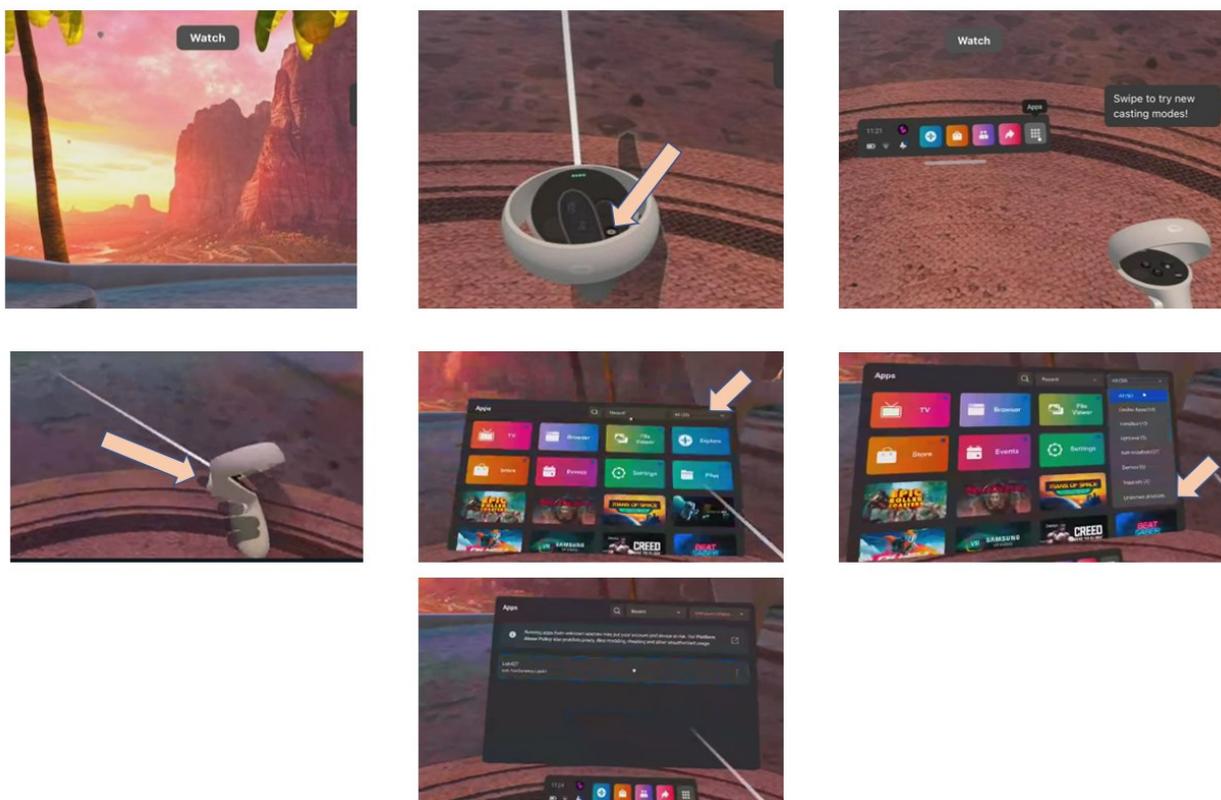


Figure 25: A) Entry screen. B) Oculus Button. C) Menu Bar. D) Select Button. E) Location of 427 app. F) Scroll to the unknown sources. G) LAB427_ISCC App.

Initial Logging in to LAB427 software

After a few second of loading, a logging-in screen will appear.

1. Using your first finger on the right hand (Fig. 25, D), click the “enter email here” bar (Fig 26). Then enter your email – XXX@XXX by selecting characters from the keyboard with the laser and clicking on each one – this then transfers the letters to the entry bar.
2. Next click the password bar and type **YOUR PASSWORD** as the password by using the laser from the right hand and selecting as above.
3. Next click on the Login button to access the main VR environment (Fig. 26).

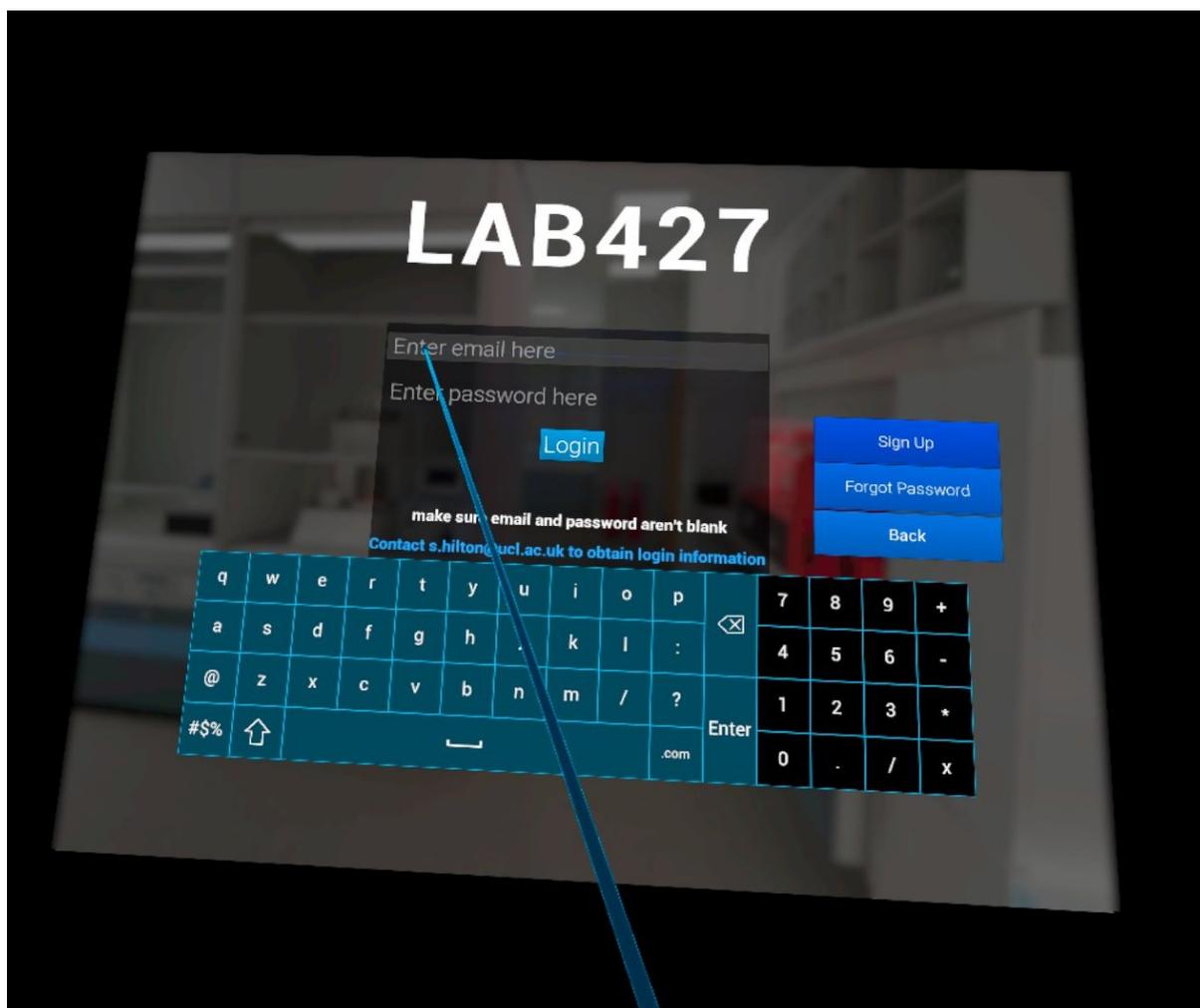


Figure 26: Navigation Within the App

Navigation within the App

You can use the LAB427 VR app in either a standing or seated position. To navigate around the room, you can physically walk and turn around, but it is preferable and much easier to use the teleportation feature, especially if you prefer to sit down. To teleport around the rooms, simply press the left-hand thumb-stick down, whereupon a blue circle will



Figure 27: Teleportation

appear on the floor. Point where you want to go, “Click” and hold the Left-hand thumb-stick button forward then release it.

You can keep holding the thumb-stick button and point in different directions until you find a desirable spot you want to go to. Please note that:

- **Teal-coloured** teleportation indicates a valid teleportation location.
- **Red-coloured** teleportation indicates an invalid teleportation location.

Alternatively, you have free movement by pressing the joystick on the Right-hand controller.

Object interaction within the App

To interact with objects within the software:

Simply point towards the object with your right hand, which will then glow blue if its interactable and click the select button to activate the object/ initiate movement of the object – doors etc (Fig. 28).

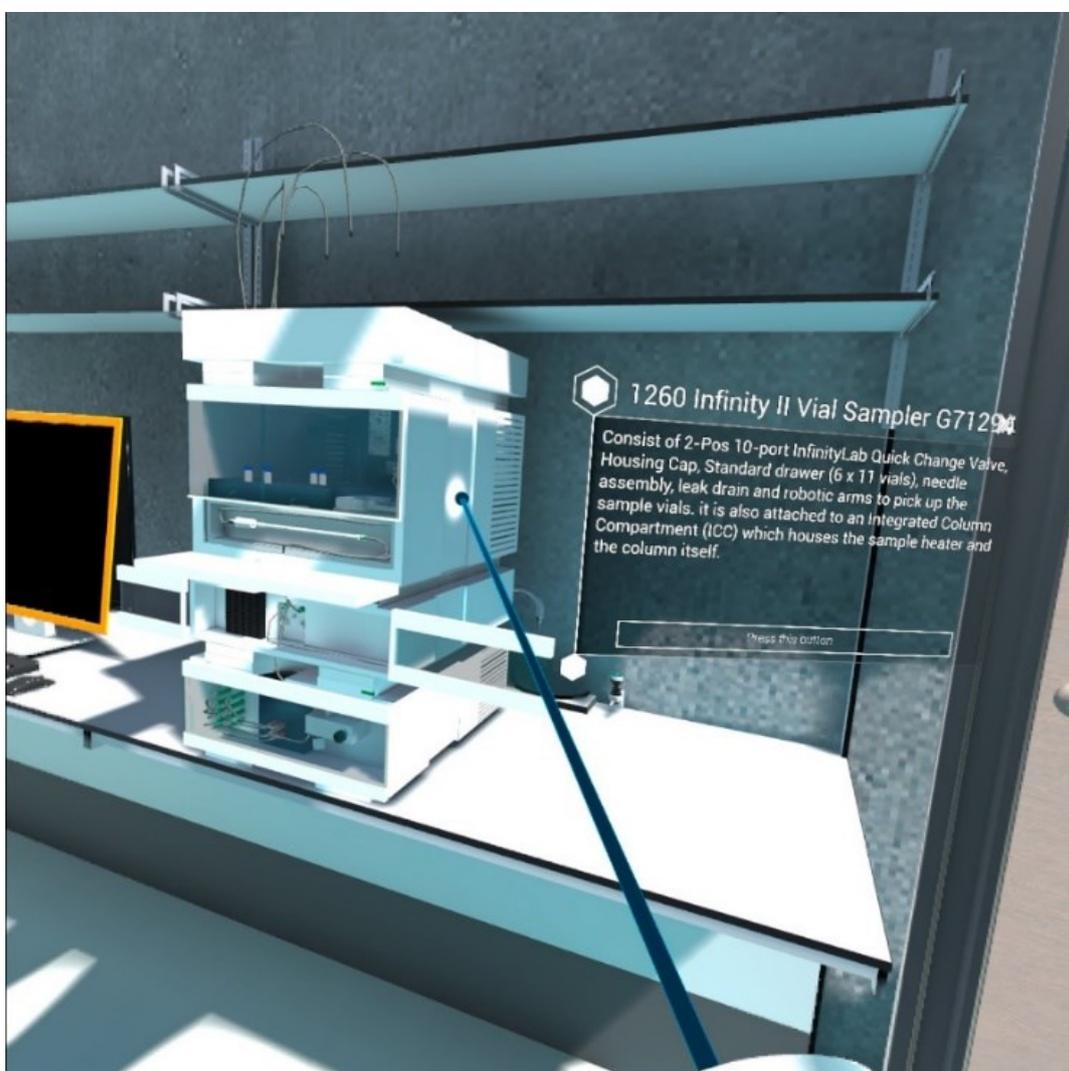


Figure 28: Object Interaction

Object interaction within the App -Gripping/ Selecting

To pick up objects, simply squeeze and hold the Grip button and rotate your hand to turn it around and move it further or closer to you using the Right-hand joystick (Fig. 29).

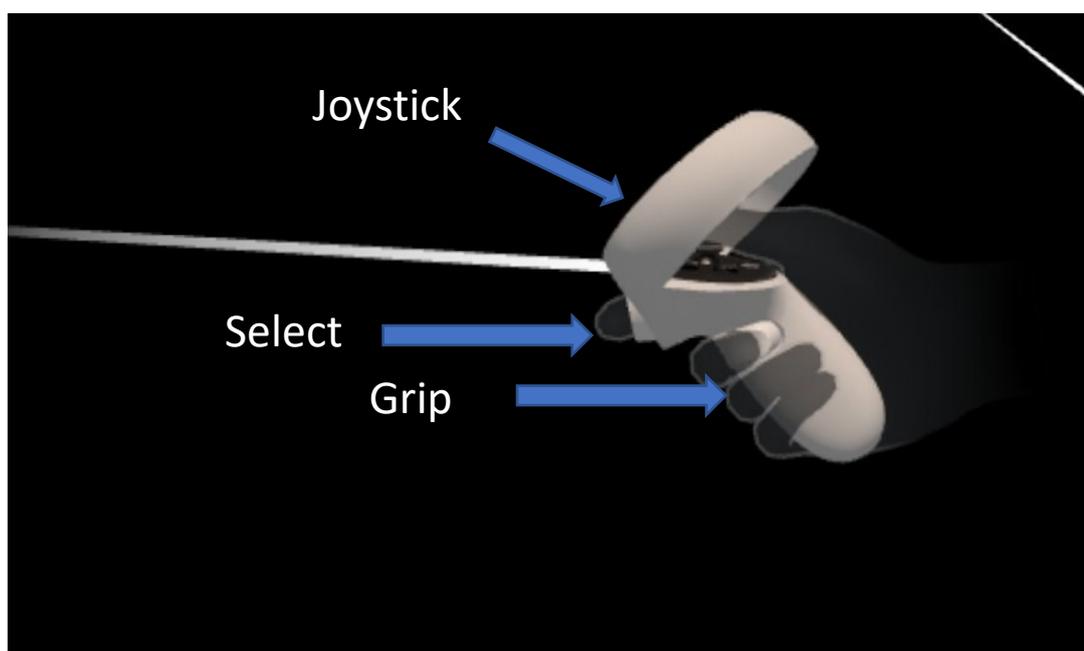


Figure 29: Object Interaction