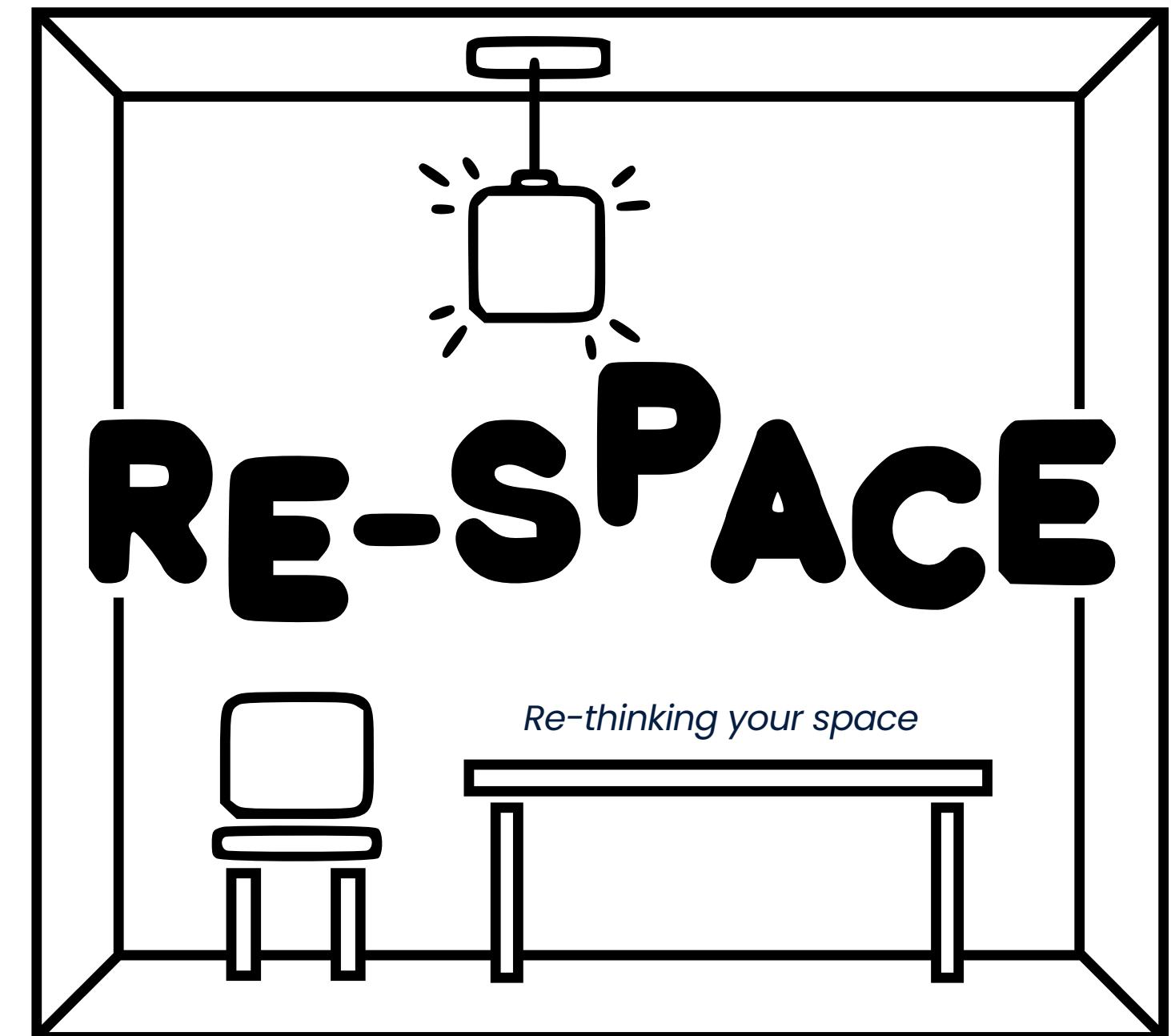


RE-SPACE

Presented by The Re-Space Devs



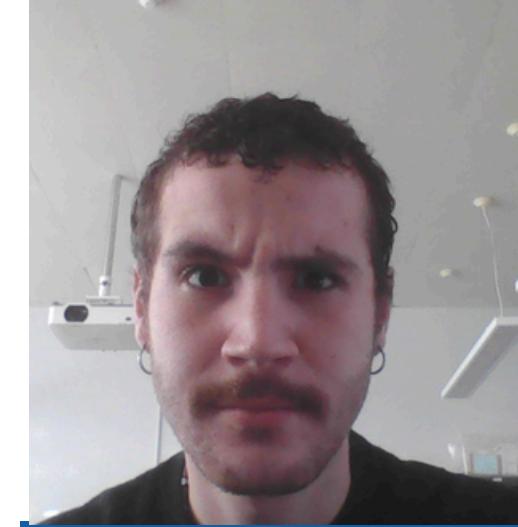
OUR TEAM



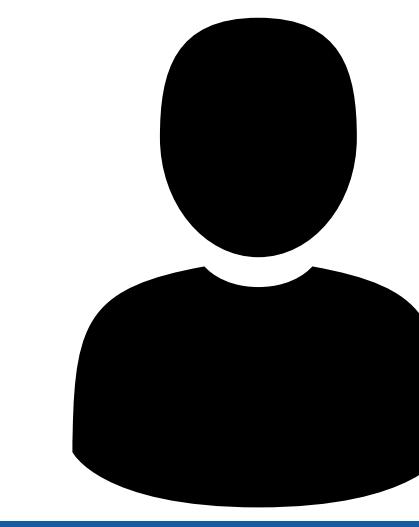
Josh Beckett
Robotics Engineer



Daniel Arruda
Robotics Engineer



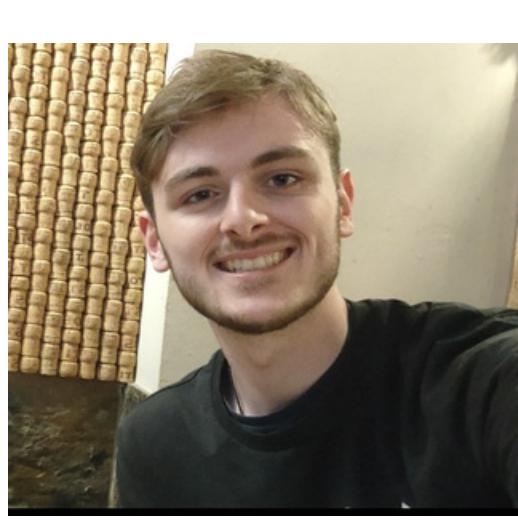
Ronny Ben Yehuda
Robotics Engineer



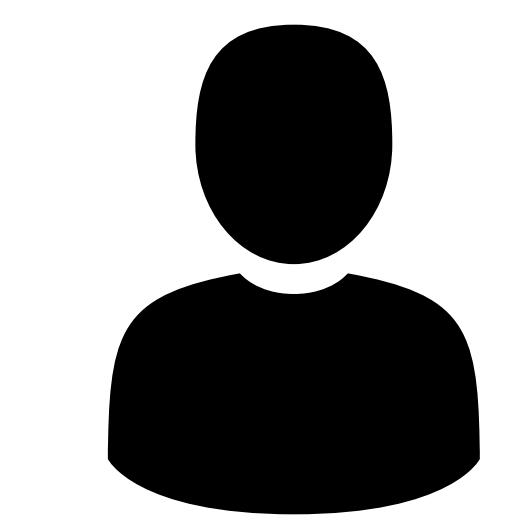
Maya Rogers
Robotics Engineer



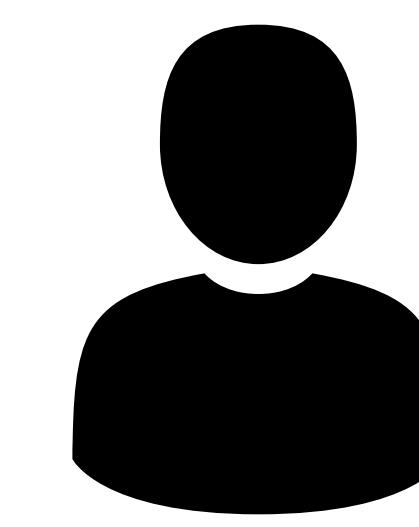
Louis Douglas
Computer Scientist



Alex Purser
Computer Scientist



Victor
Computer Scientist



Cas Penfold
Robotics Engineer

PROBLEM OUTLINE

Setting up large convention halls involves repetitive, manual labour tasks that increase the risk of injuries and human errors.



Time and Labour

Setting up furniture in large venues is time-consuming and labor-heavy, pulling staff away from more critical event prep.



Incorrect layouts

Quickly achieving optimal layouts is difficult, often leading to wasted space and reduced capacity in large event halls.



Safety

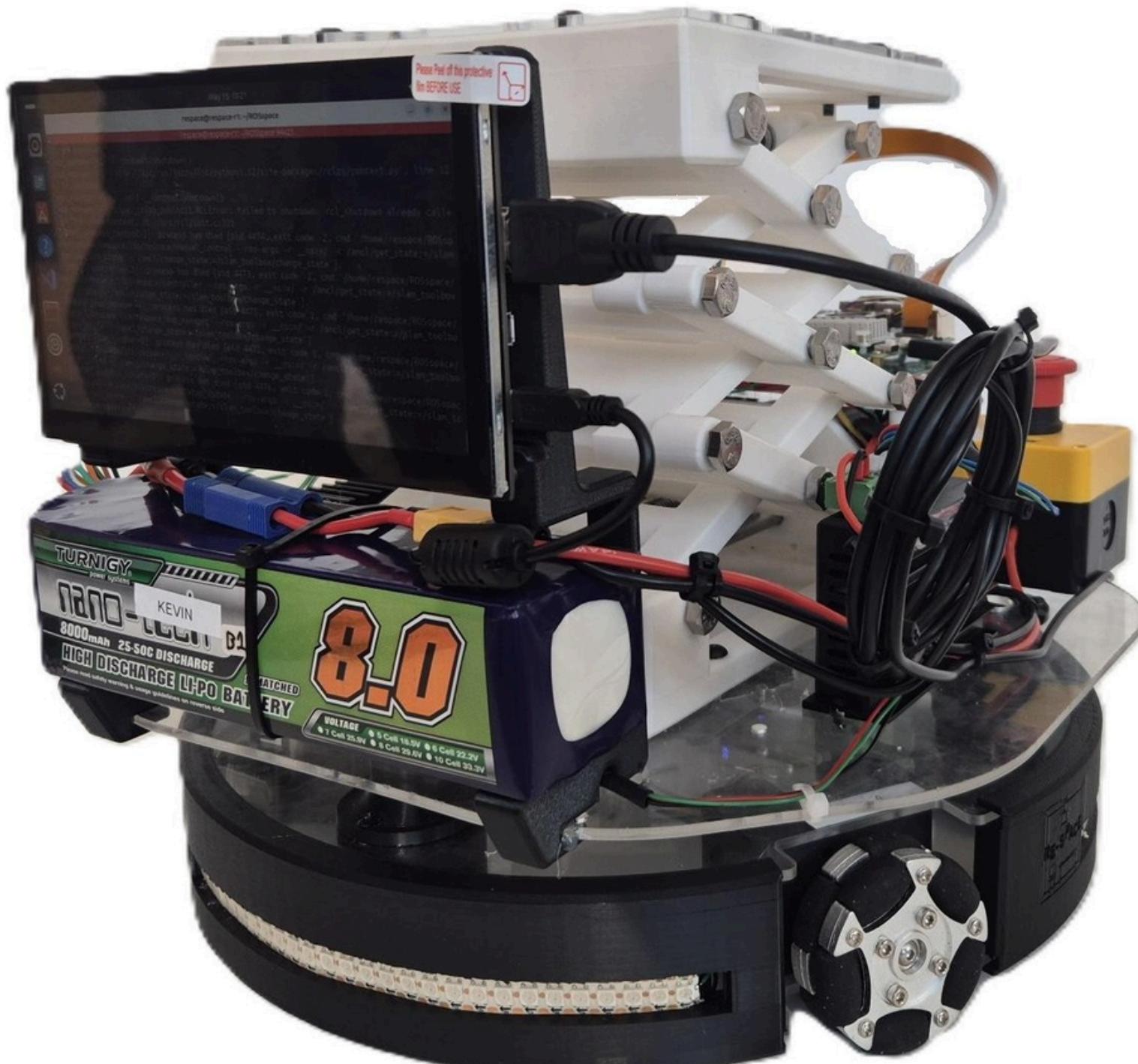
Repeated lifting during event setups increases the risk of injury, especially back strain, leading to downtime and lost productivity.

OUR SOLUTION

- **App-controlled robots** fully automate space setup and reconfiguration
- **Select layouts with a few taps**—robots assess, lift, and move furniture precisely
- **Easily adapt spaces** for conferences, workshops, exhibitions, and more
- **Save time, reduce injury risk**, and maximise space usage
- **Empower staff** by removing the burden of manual setup

OUR PRODUCT

K3VN

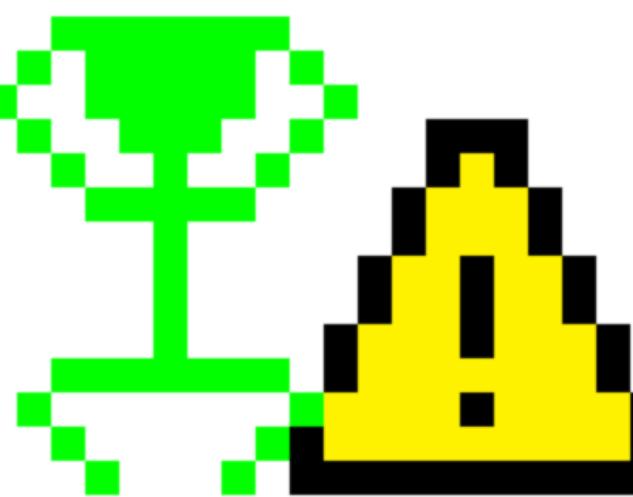


Respace
app

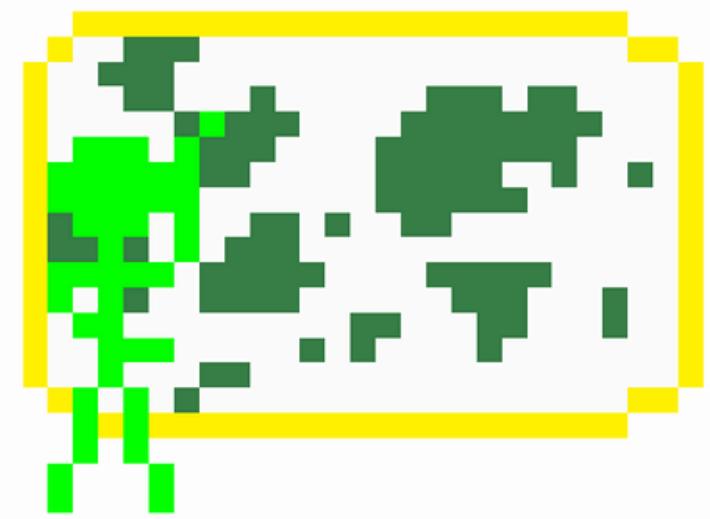
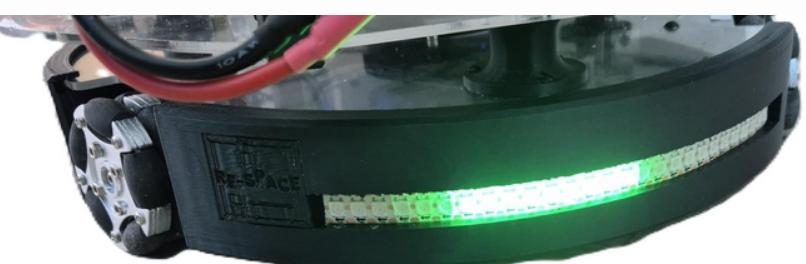
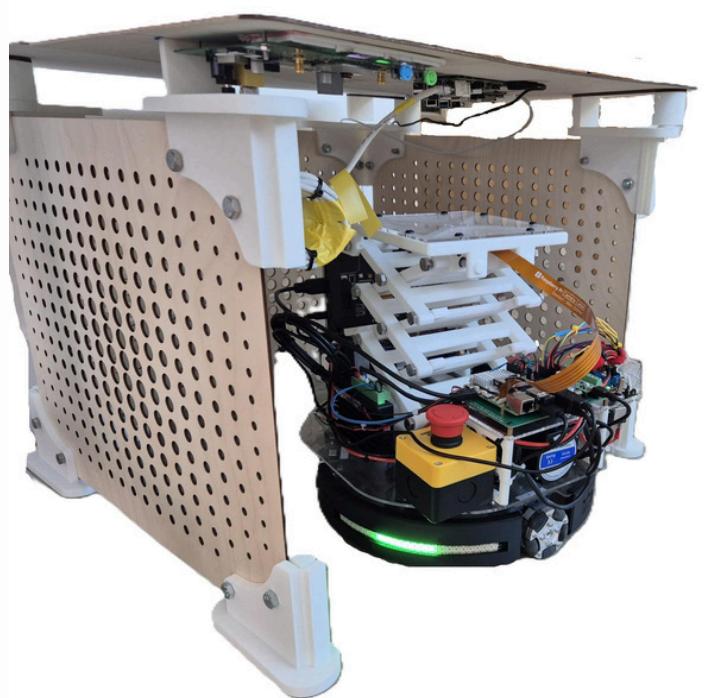




ROBOT - INTERACTION



- An LCD screen communicates the robot's states to the user with animations conveying its current actions. These include states such as lifting and lowering, mapping, navigating and idle.
- Coloured Neopixel LED strips communicate to the user the direction of the robot's traversal depending on where and how the lights are lit at any time.



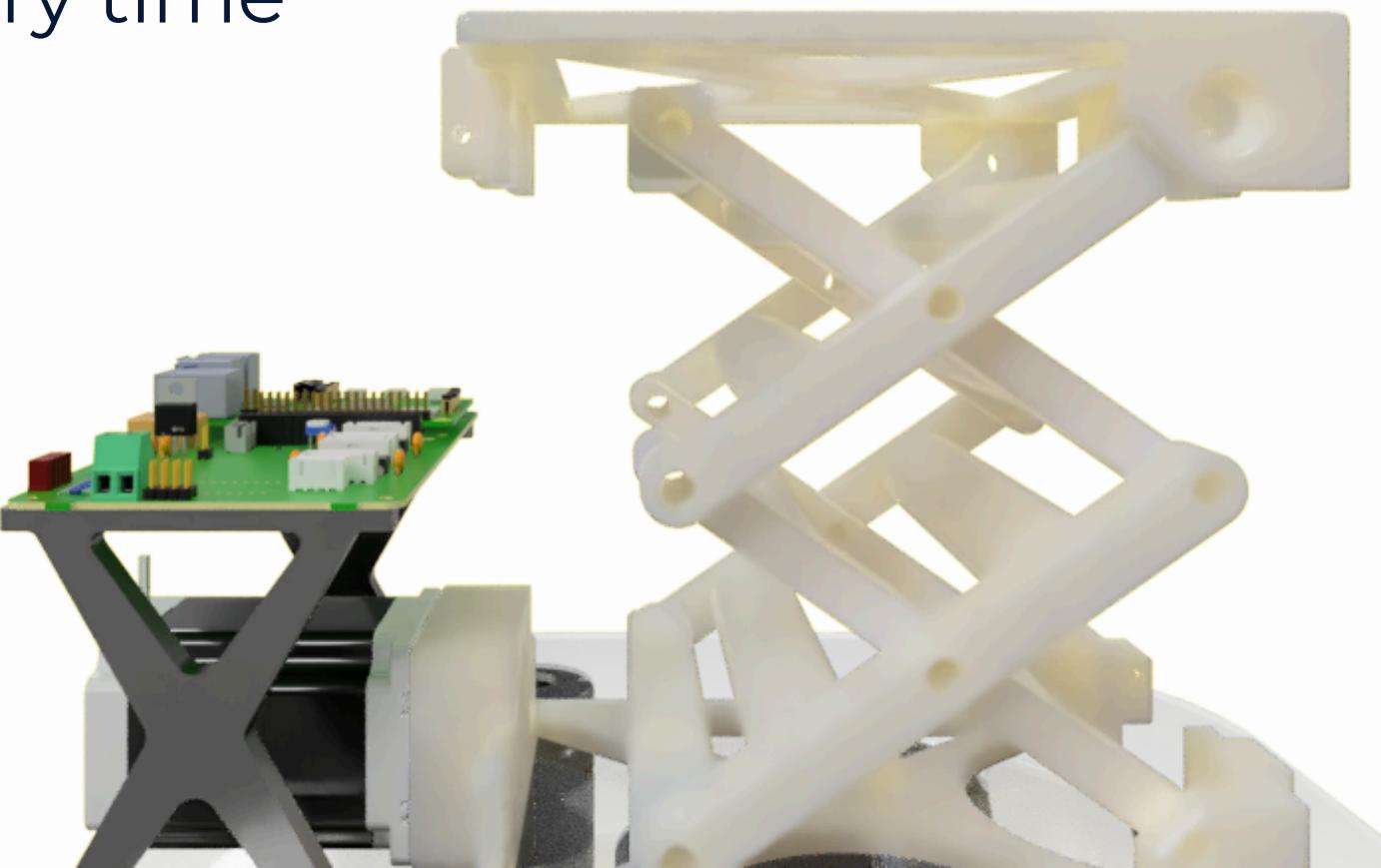
ROBOT - SENSING

- The robot uses **LiDAR to map** and navigate its environment
- LiDAR works by **spinning a laser** and measuring how long it takes to bounce back from nearby objects
- This gives the robot a 360° view of its surroundings with precise distance data, **enabling safe and accurate movement around obstacles**



ROBOT - LIFTING

- Each robot uses a **scissor lift** to raise and lower furniture
- Powered by a NEMA 23 stepper motor, it can **lift up to 13.4 kg**
- A built-in camera helps the robot center itself under furniture before lifting, **ensuring a safe and balanced lift** every time



ROBOT - MOVING

- The robot's base uses three motors, each fitted with **omni-directional wheels**
- Omni wheels are special wheels with small rollers that let the robot move **forwards, backwards, sideways, and diagonally**
- This gives the robot smooth and precise movement, **suited for navigating tight** or crowded spaces
- Neopixel-lit bumpers clearly signal the robot's movement direction to help people nearby stay aware and **avoid confusion**



ROBOT - ROS

Nodes:

- Communication handler **receives messages from hub**
- Controller manages main logic of **mapping & localisation** modes and decision making based on current status, controller also includes **communication with the microcontroller**
- Move task **sets navigation goals** to current and desired furniture locations
- Map manager handles **saving and loading of maps** to and from the app
- Centering enables the robot to **precisely align underneath a chair**

ROBOT - HUB

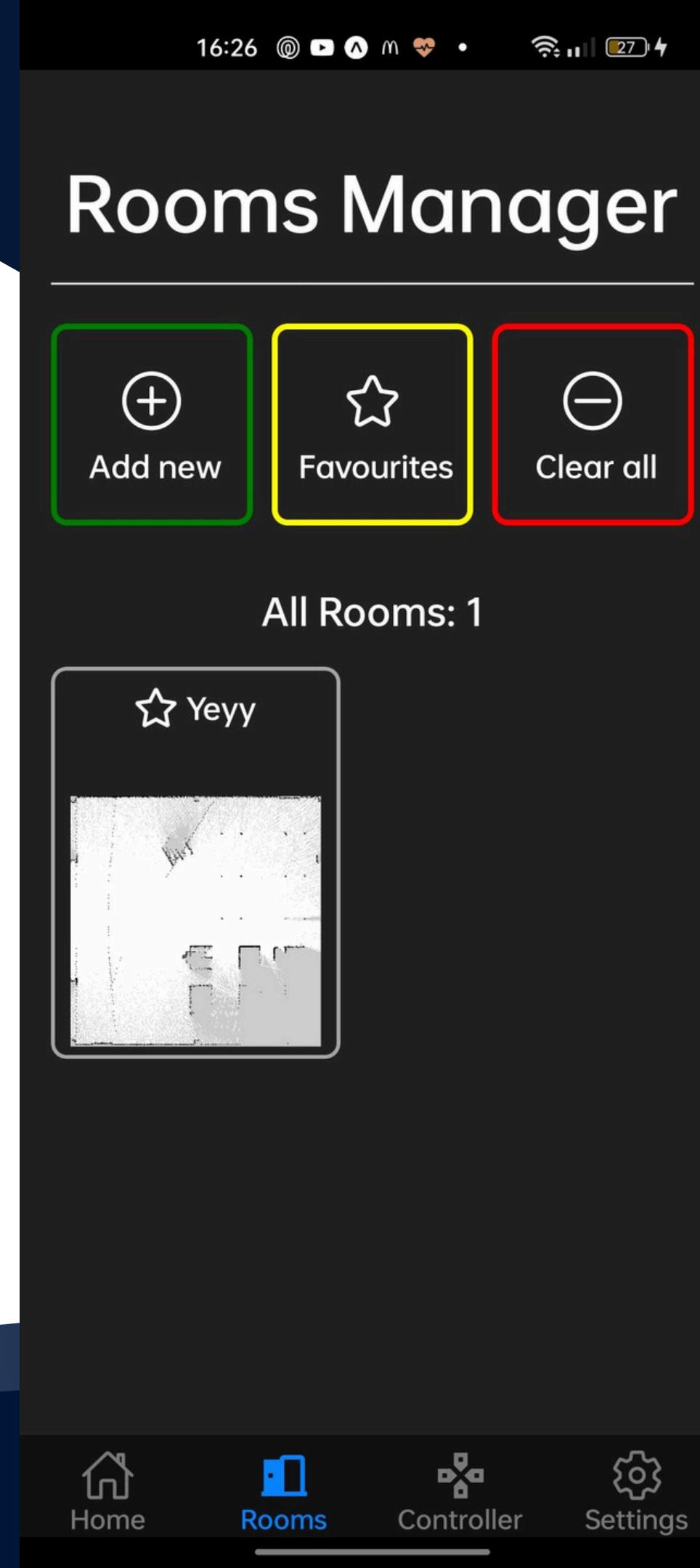
Nodes:

- **Custom Wi-Fi network** on a home router to facilitate the ecosystem connections
- **Hub communication code** to allow the app and the server to talk to each other
- **Swarm logic code** listens to the app for furniture position commands and distributes it to the robots



APPLICATION: FRONT-END

- User friendly.
- Light and dark modes.
- Customisable layouts.
- Favourites.
- Complete account management.
- Easy-to-use saving management.



16:26 @ M 27

16:26 @ M 27

09:42 @ M 27

17:05 @ M 48

Rooms Manager

All Rooms: 1

★ Yeyy

Add new Favourites Clear all

Layouts Furniture

Scanning Delete

Set Current Location

Delete Furniture

Add Furniture

Home Rooms Controller Settings

addPages/roomDetails

New

Yeyy

456.02 m²

Set Current Location

Delete Furniture

Add Furniture

addPages/addLayout

New

5C

Set Current Location

Delete Furniture

Add Furniture

addPages/addFurniture

Add Furniture

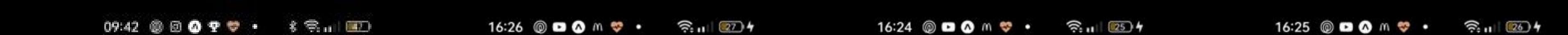
Name: NewFurniture Model: Enter model type...

Height: 5 Width: 300

Length: 400 Quantity: Enter quantity value...

Pick a colour

Furniture Saved!



← extraPages/systemRunni...

← addPages/scanning

New



X = 0 Y = 0 Angle = 0

Progress



Emergency Stop

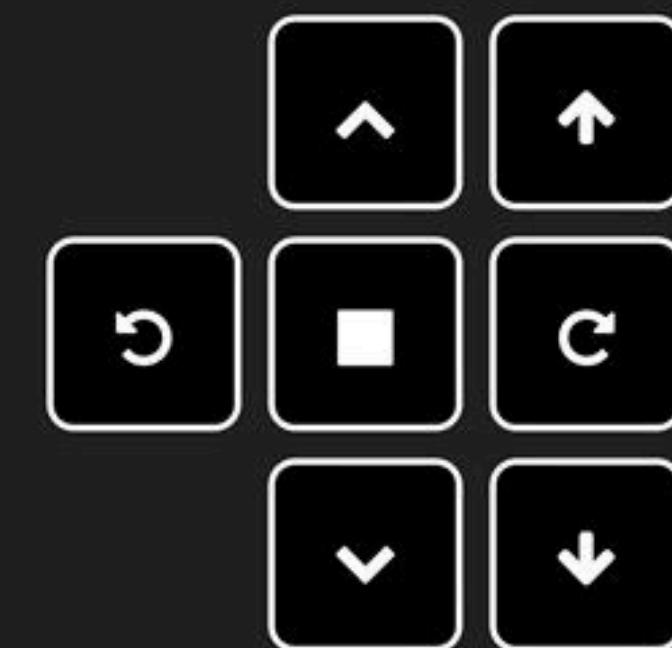
Select Robot:

Select a Robot

Controller

Select Robot:

Select a Robot



Home

Rooms

Controller

Settings

Settings



NewUser

Account settings

Robot Settings

Stop when humans present

Test Connection

App Settings

Battery Levels



Battery Notification Threshold: 15



Theme

Home

Rooms

Controller

Settings

APPLICATION: BACK-END

- JSON management.
- SQLite account management.
- React native Hooks and Providers.
- Cybersecurity aspects:
 - Password encryption,
 - Password visibility settings
 - Encrypted WebSocket Communication

```
// Hash the passwords
var hashedCurrent = await hashPassword(currentPassword);
var hashedNew = await hashPassword(newPassword);
```

```
// Change the password based on the username and current password
let sqlChangePassword =
  UPDATE users SET password = ?
  WHERE username = ?
  AND password = ?`;
```

```
// Run the command with the provided inputs
await db.runAsync(
  sqlChangePassword,
  [hashedNew, user.username, hashedCurrent]
)
```

MARKETING

TRANSFORMING EVENT SPACES



Excel London

UK Robotics Growth & Event Automation Trends

- UK robot installations **grew 51%** in 2023 (3,830 units) [1]
- **53%** of UK hospitality firms use AI/robotics [2]
- ExCeL London predicts **robotics will shape future events** [3]
- Drivers: speed, labour savings, and flexible automation [4]

MARKET GAP & COMPETITORS

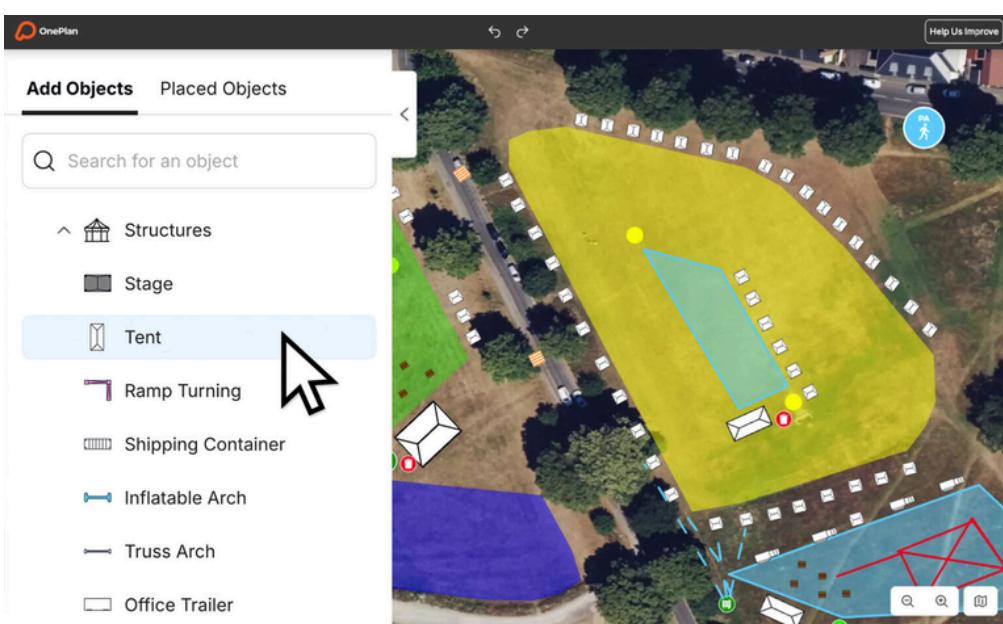
Who's Doing What – and Where We Stand Out

- Wheel.me: attachable robotic wheels (**home scale**) [5]
- Ori: transformable bespoke robotic furniture (**residential**) [6]
- Roombots: modular **research** swarms – [7]
- OnePlan: **software-only** layout tools – [8]
- **No current system** combines lifting, LiDAR, layout app

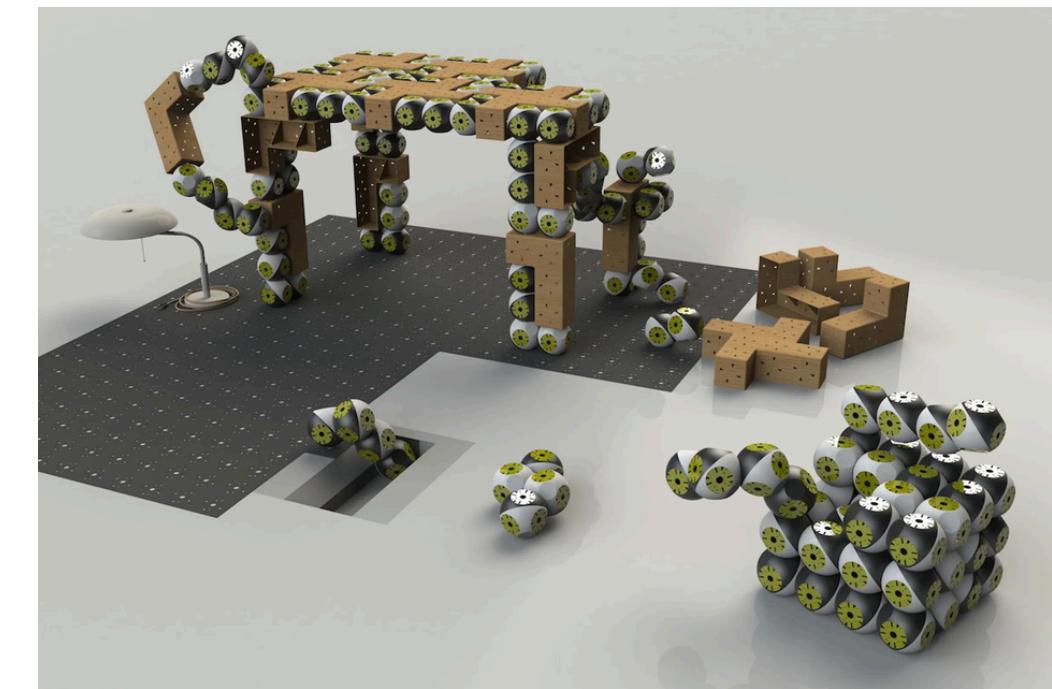
COMPETITORS



Wheel.me, robots that attach to furniture to make them mobile



Oneplan.io, Software to organise event spaces



RoomBots, swarm robots that can come together to move furniture or attach to the bottom and move furniture

USE CASES

Safety, and UK Market Strategy

- Primary market: **UK convention halls** (e.g. ExCeL, ICC) [3]
- Secondary: schools (with **strict safety protocols**) [9]
- Robot includes LiDAR human detection, E-stop, safety zones
- **64%** of UK firms plan **future robot investment** [10]

FUTURE WORKS

Application:

- External account management. (Current system is local due to scope)
- Incorporate professional Graphic Design.
- JSON data transferring between users (rooms, layouts, furniture).
- In-app QR scanning to identify furniture.

FUTURE WORKS

Robot:

- Swarm functions to incorporate multiple robots
- Autonomous chair detection
- improved manufacturing methods (CNC metal parts)

**THANK
YOU**



**DOES ANYONE
HAVE QUESTIONS?**

REFERENCES

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- [2] - <https://www.conference-news.co.uk/news/access-hospitality-tech-guide-leveraging-tech-to-enhance-customer-experience/#:~:text=According%20to%20research%20from%20Access%E2%80%99s,rate%20across%20all%20business%20sectors>
- [3] - <https://media.londonandpartners.com/news/london-wins-bid-to-host-world-leading-robotics-and-ai-conference#:~:text=Andrew%20Swanson%2C%20Head%20of%20Sales,%E2%80%9D>
- [4] - <https://spectrum.ieee.org/the-conference-room-that-rearranges-itself#:~:text=arbitrary%20configuration%20by%20the%20desired>
- [5] - <https://www.bbc.co.uk/news/av/technology-51003445>
- [6] - <https://www.bbc.co.uk/news/av/technology-40644193>
- [7] - <https://spectrum.ieee.org/roombot-swarm-on-demand-mobile-furniture#:~:text=For%20the%20last%20decade,needed%20basis>
- [8] - <https://www.oneplan.io/#:~:text=70%2C000%2B%20events%20planned%20in%2010,countries>
- [9] - <https://www.zurich.co.uk/news-and-insight/robots-what-are-the-risks#:~:text=meet%20minimum%20machine%20safety%20standards>
- [10] - <https://www.robotsandautomationmagazine.co.uk/news/legislation-regulation/uk-keen-on-robotics-adoption-but-stalled-by-safety-and-regulatory-concerns-says-report.html#:~:text=The%20study%2C%20based%20on%20a,introduce%20them%20in%20the%20future>

