

Automated Storage and Retrieval System (ASRS)

Book Vault at Singapore Changi Airport

ASRS has been adopted in warehouse for boxes, but not for individual book in library. This project is **first of the kind in the World.**

The idea was initiated by Singapore National Library Board for the following purposes:

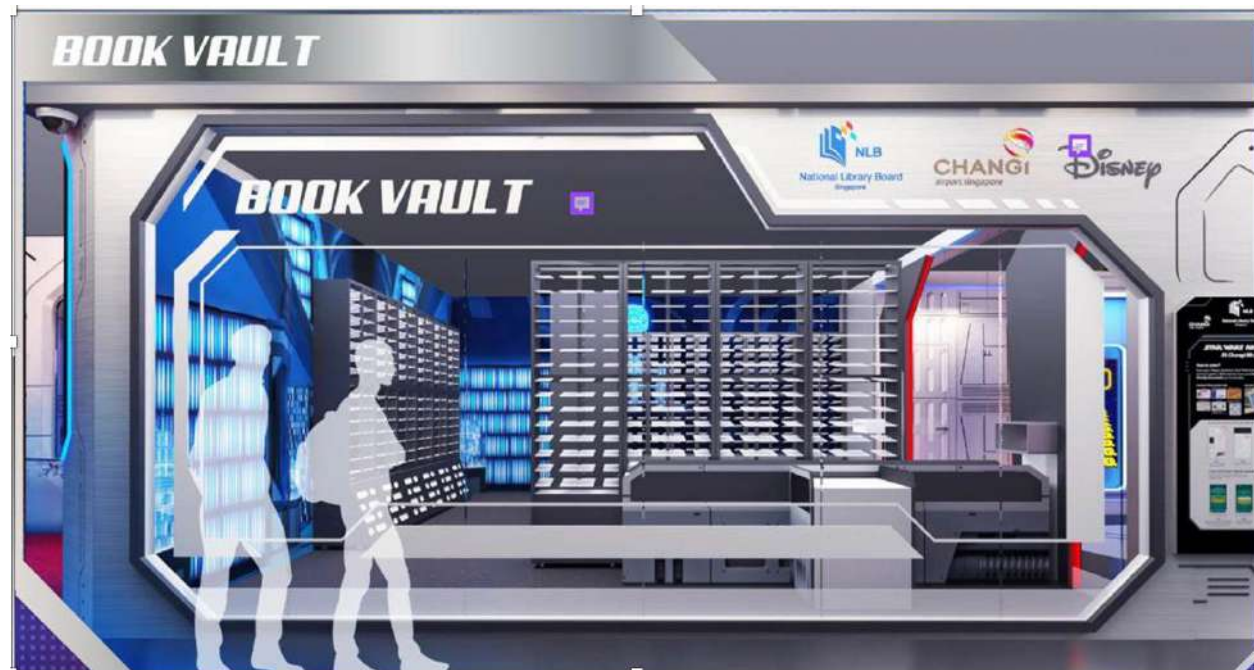
1. Passengers can grab a few books before boarding at the airport & return upon coming back.
2. Inspire the citizen of the futuristic world: AI & Robotic. Besides of reading, it demonstrate via a live example.
3. Apply to some other scenario where physical browsing is limited, such as hospital for handicap patients.

Project Video:

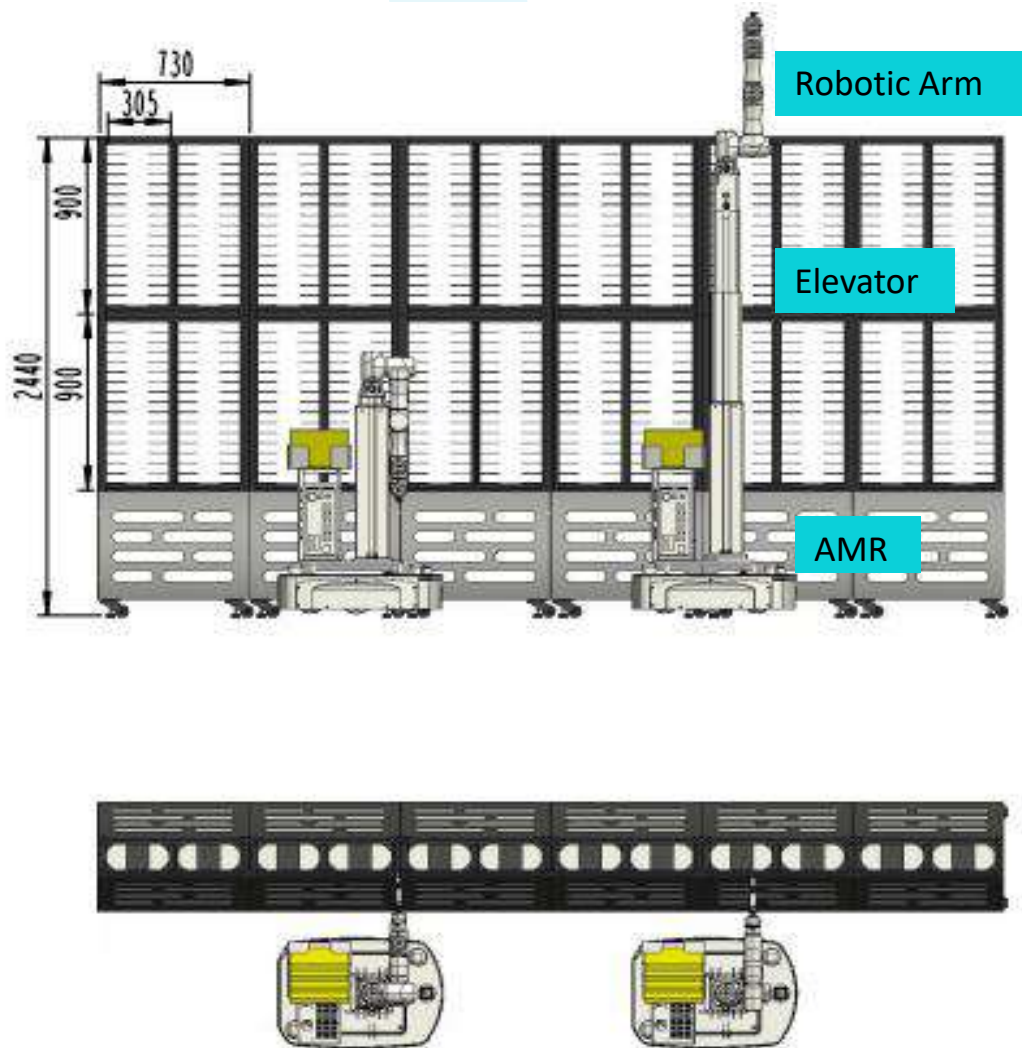
<https://www.youtube.com/watch?v=dcnJRfqvkbw>

Theme: Star Wars

- Book Vault with 1700 books
- Located at Singapore Changi Airport Terminal 3
- Soft launch on 1st Aug, 2025. Official Launch on 6th Aug, 2025.
- Part of the Singapore 60th Anniversary celebration.

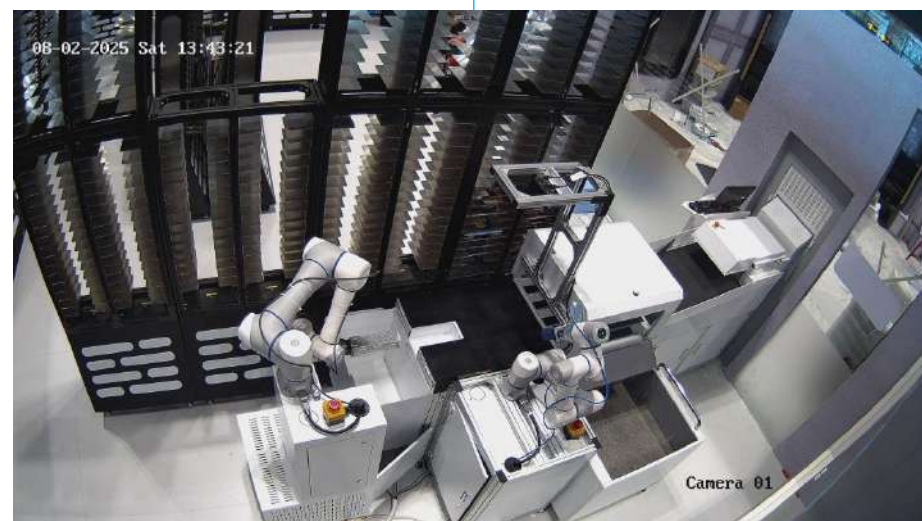
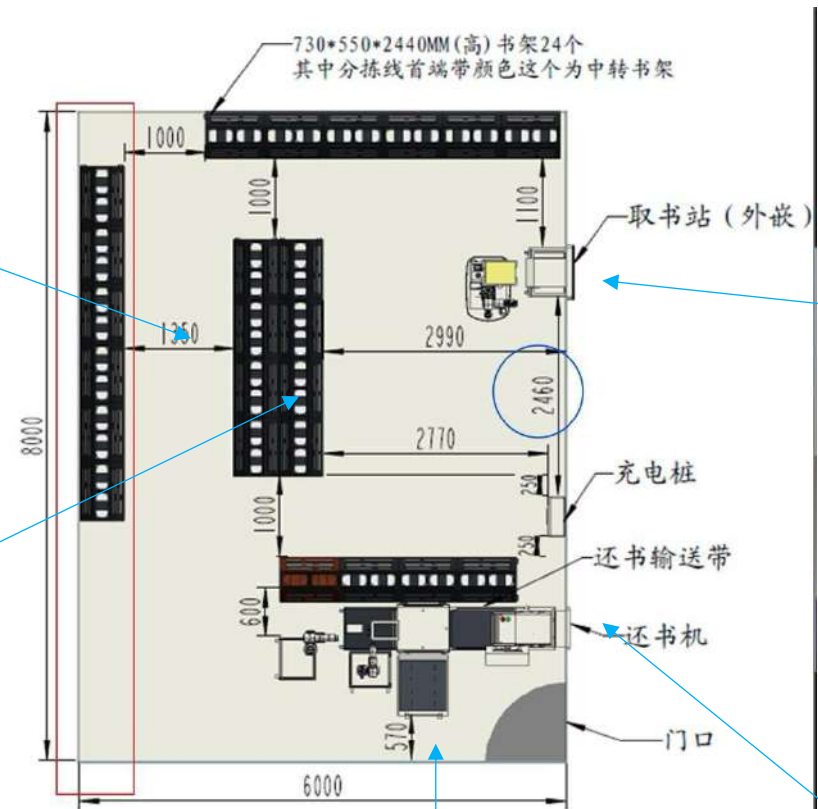


HKC Solution

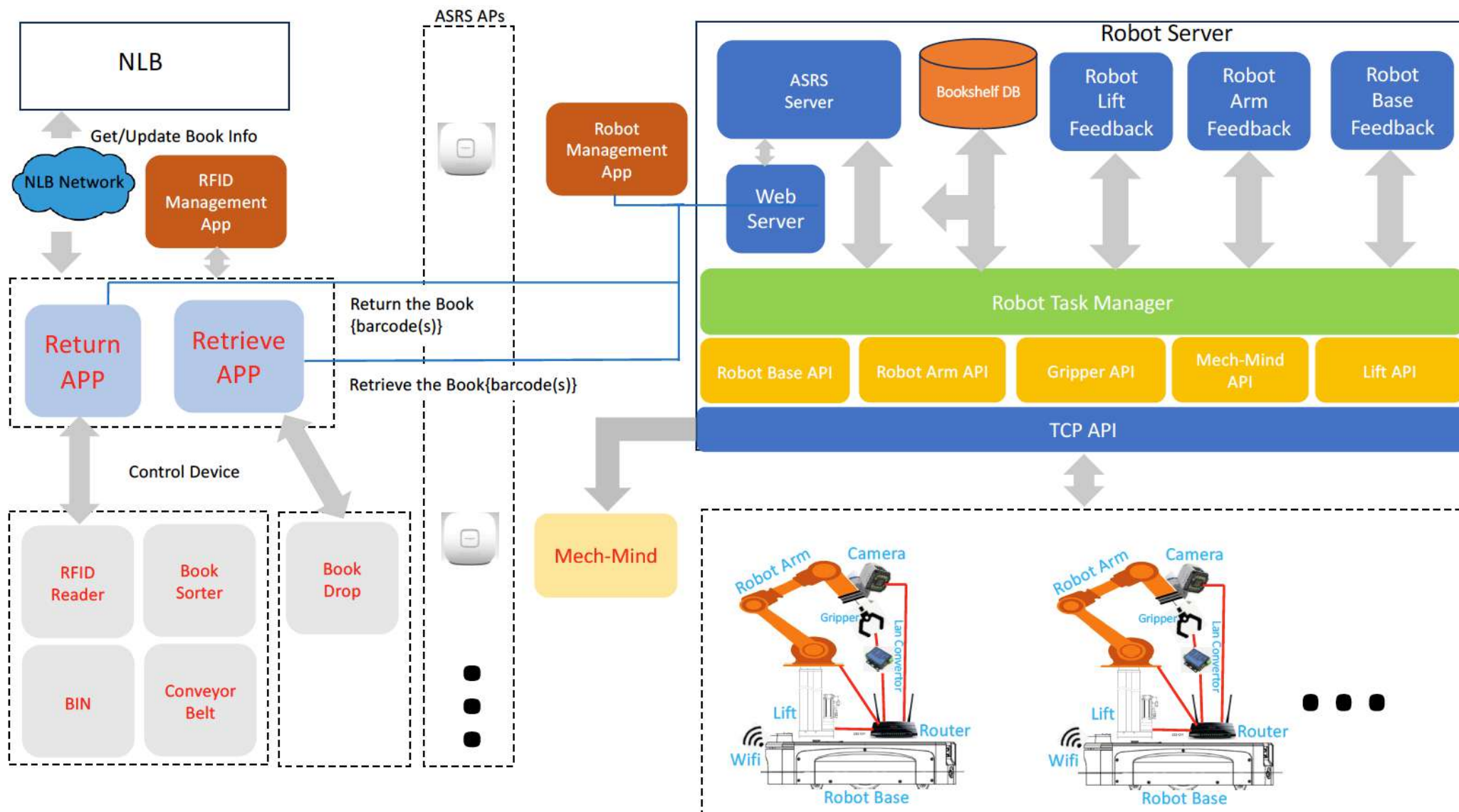


Fully Automated Book Vault :

- Utilizes **Autonomous Mobile Robots (AMR)** equipped with **robotic arms, elevators, and grippers** to retrieve and return books on specially designed shelves.
- Offers **flexibility, easy deployment, and minimal maintenance** through a modular, movable design.
- The **layout** and number of **collection/return counters** can be **easily reconfigured** to suit actual operational needs at minimal cost.
- **Seamlessly integrated** with the Library Management System (LMS) for real-time synchronization.
- Operates within a **compact 8m x 6m footprint**.
- Supports up to **1,700 books**, with **up to 4 books per transaction**.
- **All components are movable and easily dismantled** for relocation or upgrades.



System Architecture

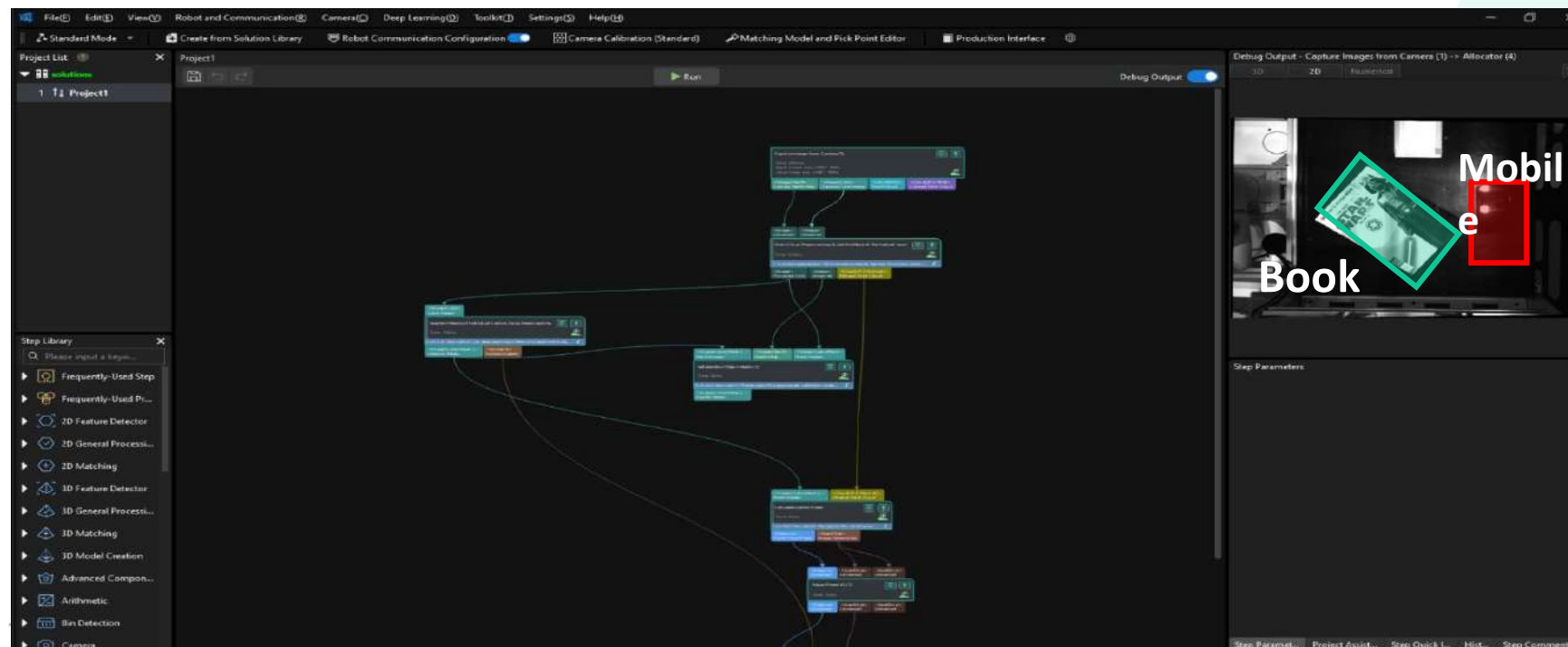


AI and Future Enhancements

- Uses AI to analyze borrowing trends.
- Strategically positions popular books near collection stations.
- Employs visual AI camera for precise book positioning during returns.
- Detects foreign objects (can identify over 100 objects) using deep learning and transfers them to a dedicated bin.



3D Camera at the top of return station



Market Potential

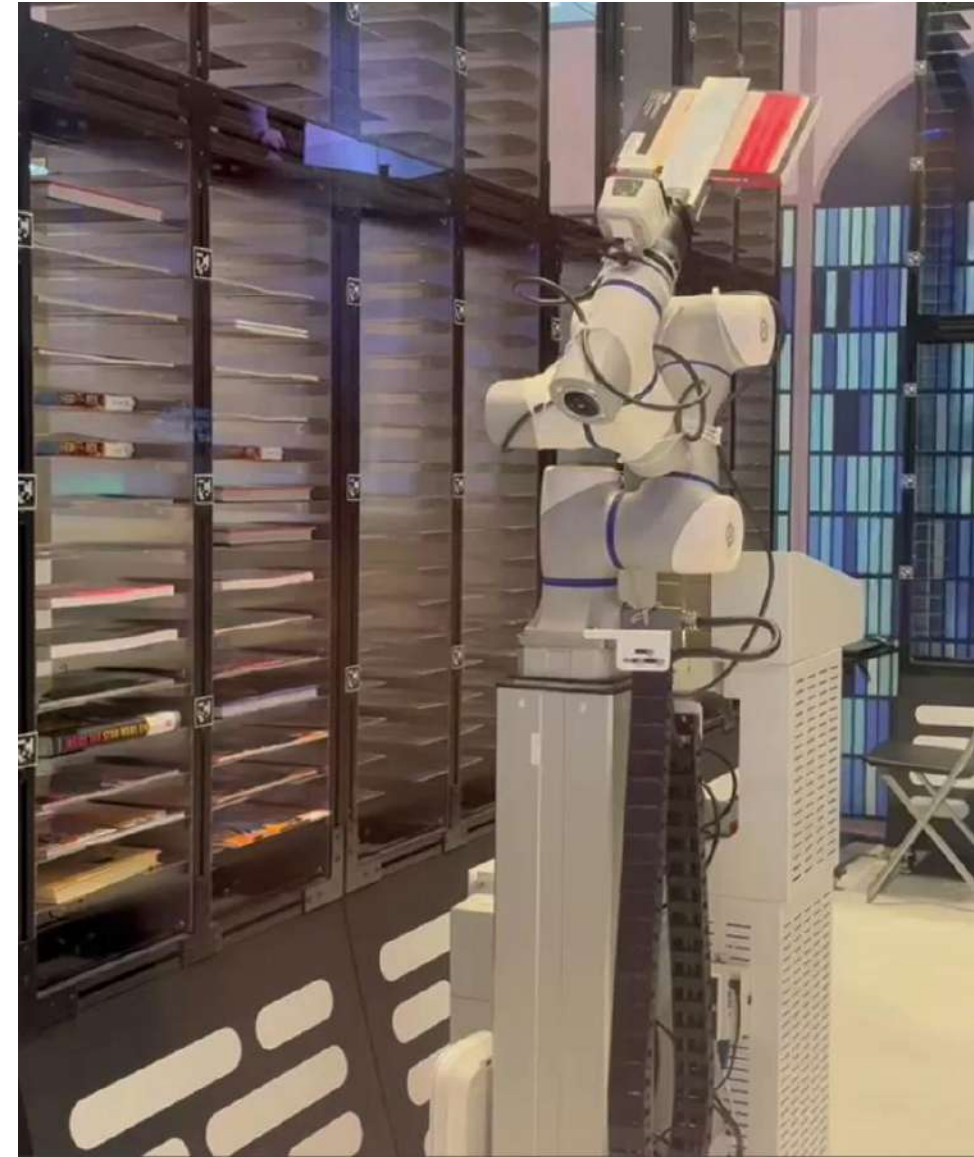
HKC Automated Storage and Retrieval System (ASRS) designed for accuracy, high value, sensitive items and operation in dangerous zone:

1. **Pharmaceutical & Biotech industry:** Handles sensitive material like DNA, RNA or live cultures
2. **Banking & high-security storage,** manages high-value items, like gold, jewelry and documents
3. **Chemical & Hazardous Material Labs** operates in zone with dangerous or toxic substances.
4. **Defense & government Agencies,** handle classified documents, weapons components or forensic evidence.

NLB is going to implement one with 10K capacity at the end of this year.



Project Photos







Online News Sharing:

<https://cnalifestyle.channelnewsasia.com/entertainment/star-wars-library-changi-airport-469156>

<https://www.bykido.com/blogs/events-and-activities/star-wars-pop-up-library-lands-at-changi-airport>

<https://malaysia.news.yahoo.com/read-must-star-wars-pop-082339486.html>

<https://www.tnp.sg/news/star-wars-inspired-pop-library-arrives-changi-airport>

<https://www.nlb.gov.sg/main/about-us/press-room-and-publications/media-releases/2025/StarWars-Popup>