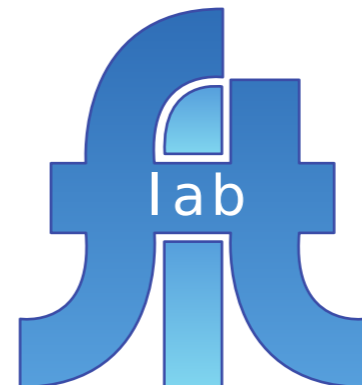


A Billion Signposts: Repurposing Barcodes for Indoor Navigation

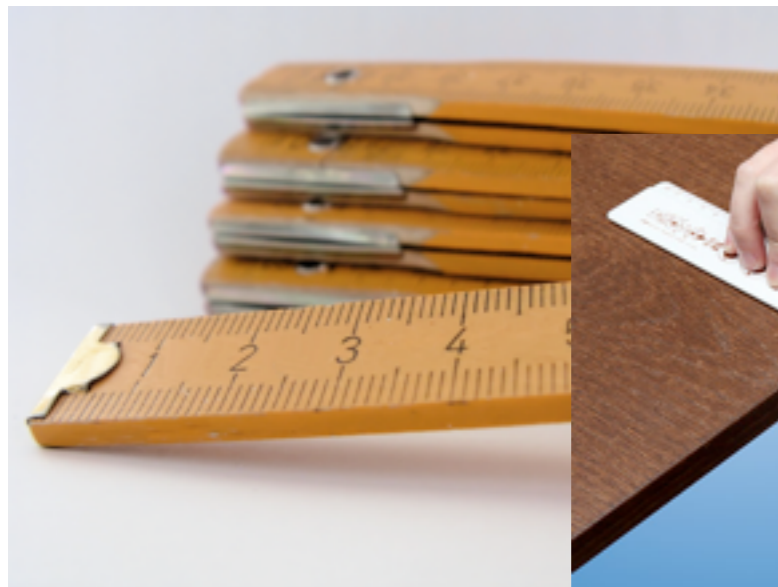
Simon Robinson, Jennifer Pearson, Matt Jones



Prifysgol Abertawe
Swansea University



Physical appropriation



Digital appropriation

- Internet of Things – uniquely identifying everyday objects
- Everything connected: physical embodiment of the internet
- ...lots of work to do
- What about the tagged objects that already surround us?

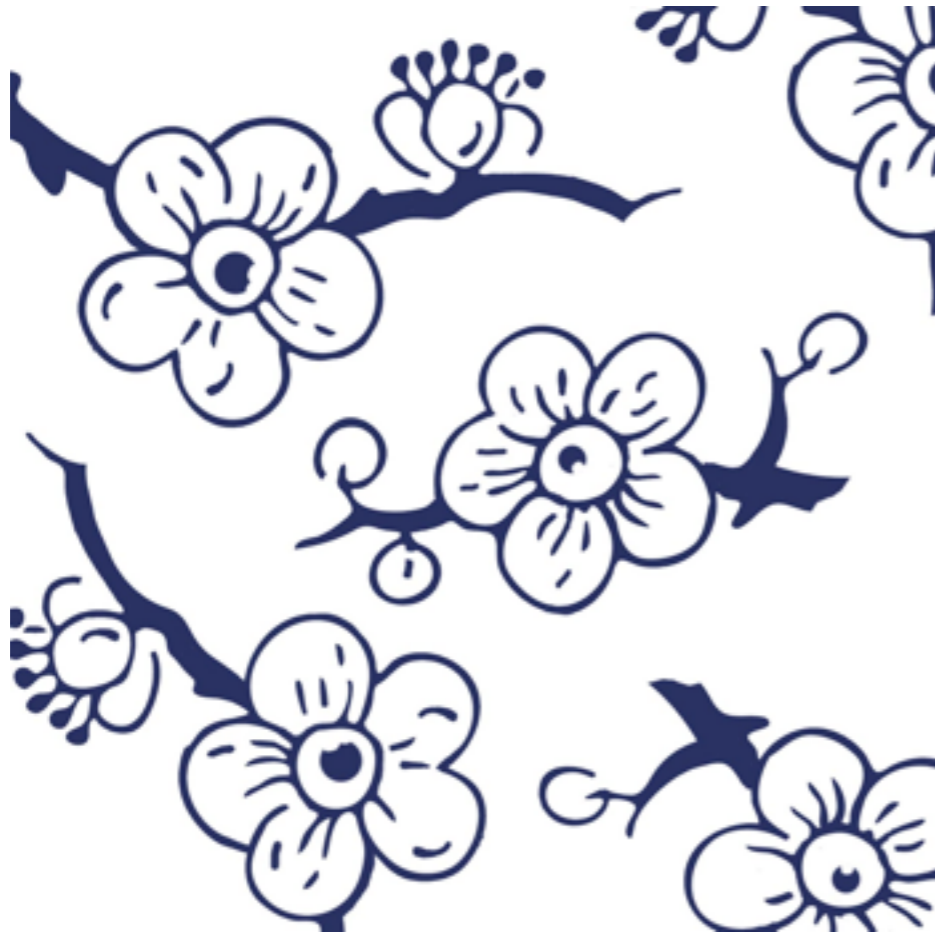
Everyday codes



- Advantages: ubiquitous, visible, open
- Disadvantages: limited usage, old-fashioned?

Everyday codes

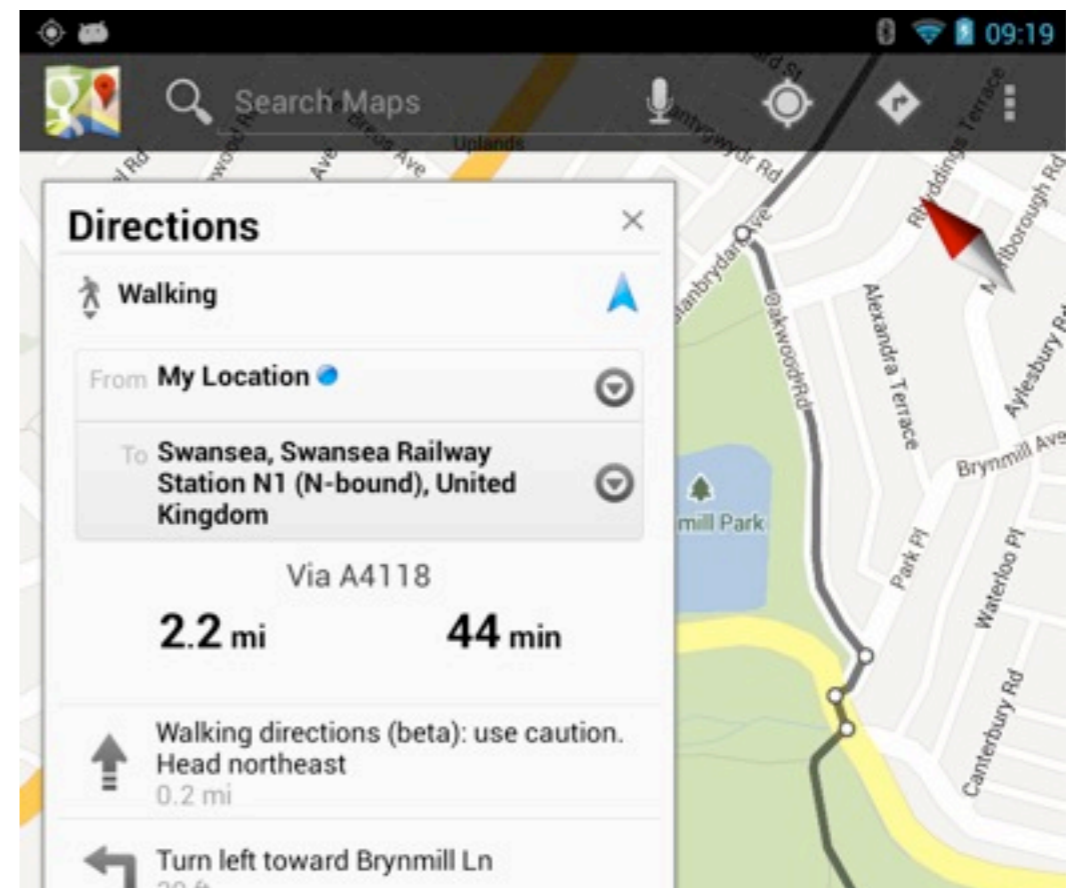
- Some previous work focused on aesthetics



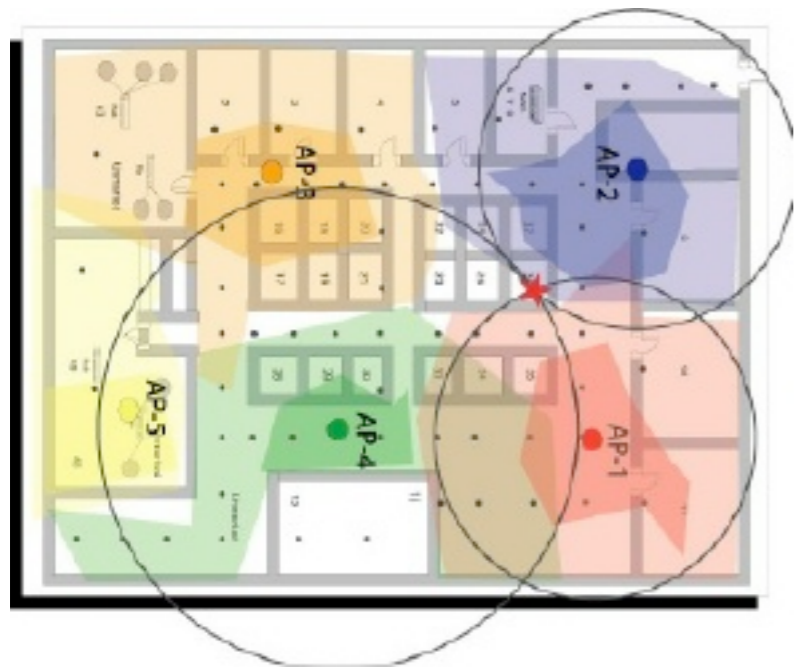
[Meese et al: Aesthetic codes]

Appropriation for navigation

- Outdoor navigation has largely been “solved” by GPS
- Indoor navigation is far more difficult.



Previous work



WiFi triangulation
[Bahl et al]



ShopTalk
[Nicholson et al]



Augment environment
with codes [e.g., Serra et al]

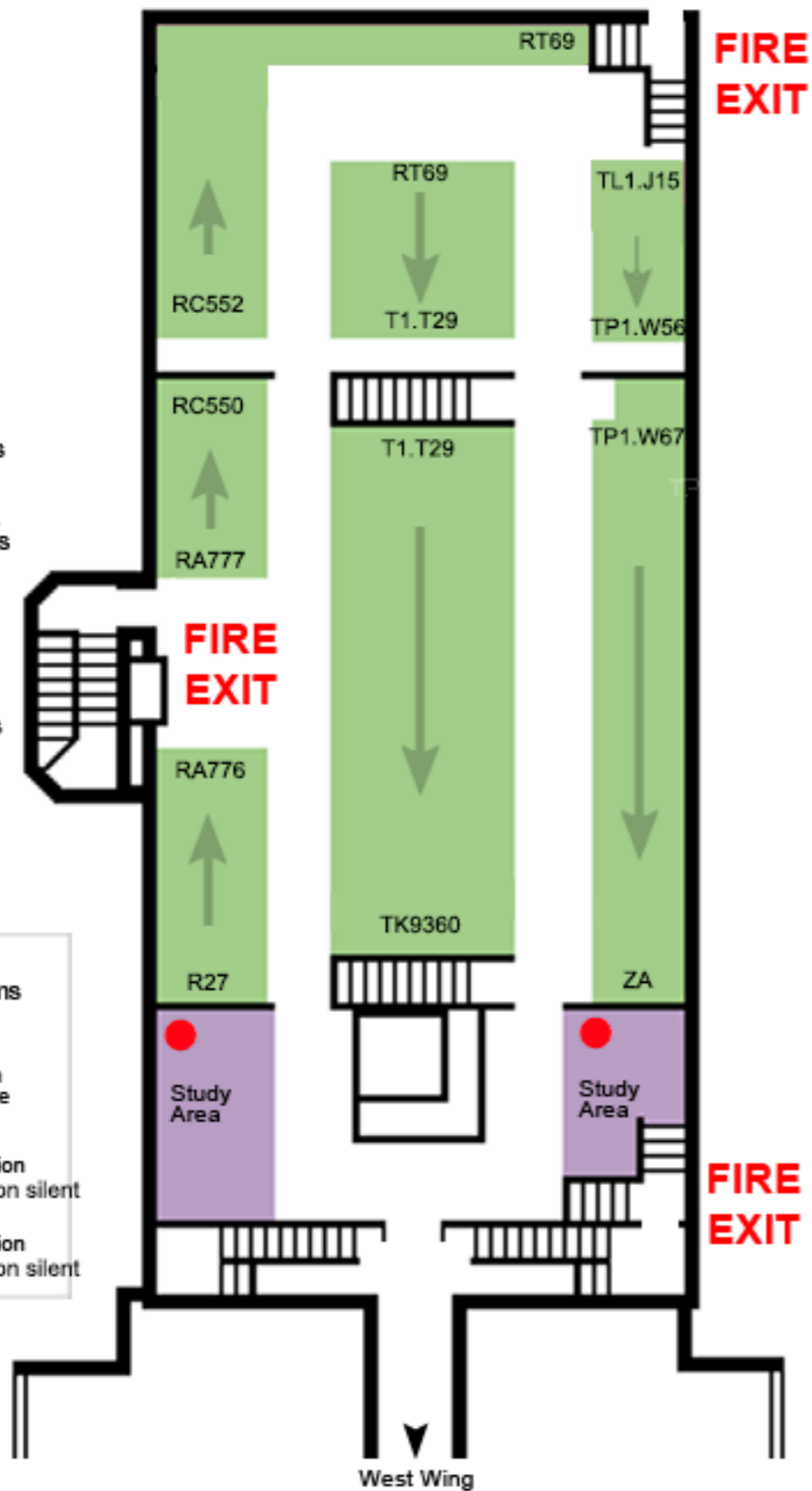


Our approach

- Helps users find books in a (physical) library
- Takes advantage of the ordering of items

Level 1 East

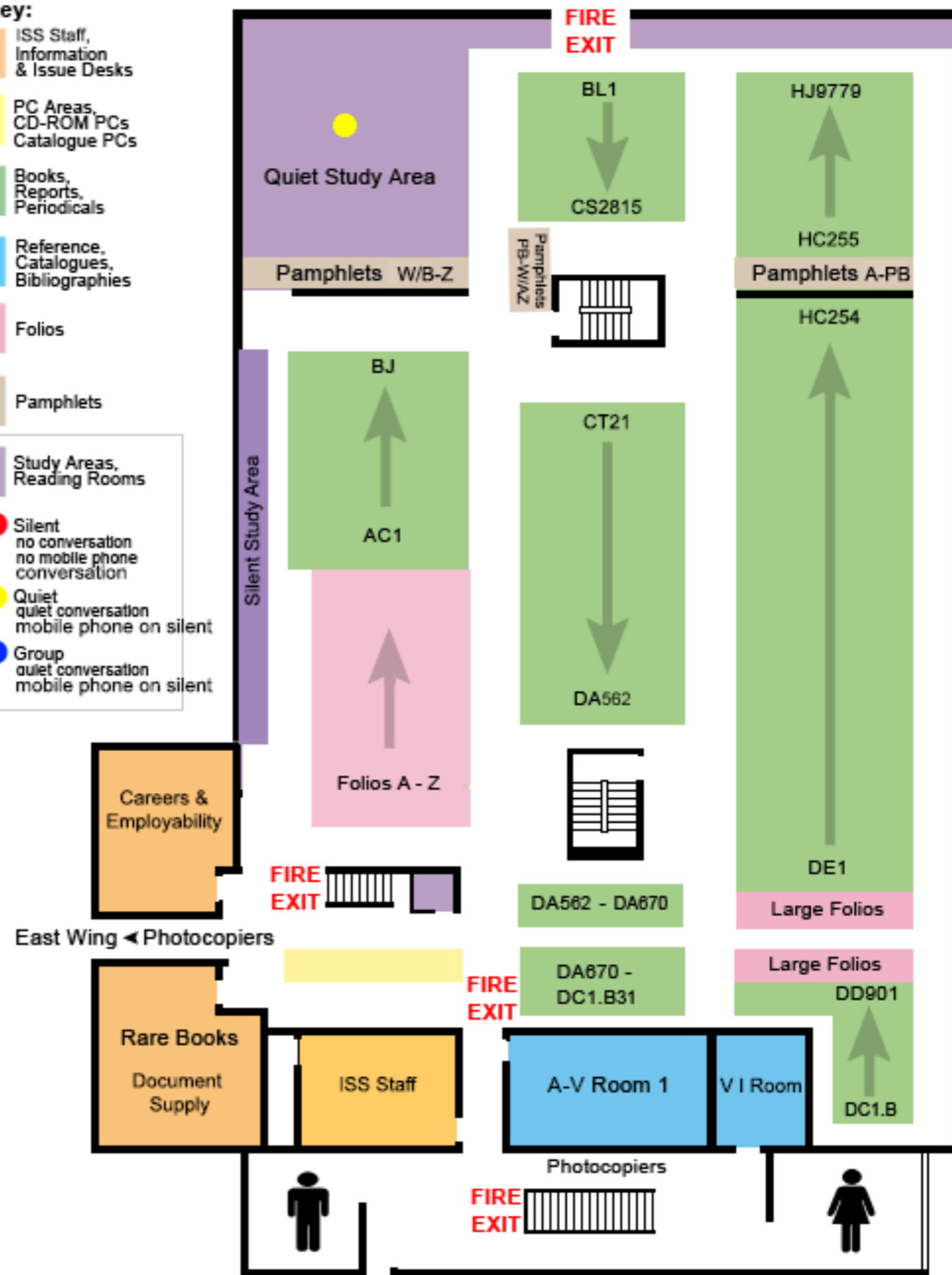
- Key:**
- LIS Staff, Information & Issue Desks
 - PC Areas, CD-ROM PCs, Catalogue PCs
 - Books, Reports, Periodicals
 - Reference, Catalogues, Bibliographies
 - Folios
 - Pamphlets
 - Study Areas, Reading Rooms
 - Silent
no conversation
no mobile phone conversation
 - Quiet
quiet conversation
mobile phone on silent
 - Group
quiet conversation
mobile phone on silent



Level 2 West

Key:

- ISS Staff, Information & Issue Desks
- PC Areas, CD-ROM PCs, Catalogue PCs
- Books, Reports, Periodicals
- Reference, Catalogues, Bibliographies
- Folios
- Pamphlets
- Study Areas, Reading Rooms
- Silent
no conversation
no mobile phone conversation
- Quiet
quiet conversation
mobile phone on silent
- Group
quiet conversation
mobile phone on silent



GA304.R3 HAR

GB55.F85 2002

GB401.5E26 1999





BookMark

- Scan the barcode of *any* nearby book
- Get a map to the desired item's shelf

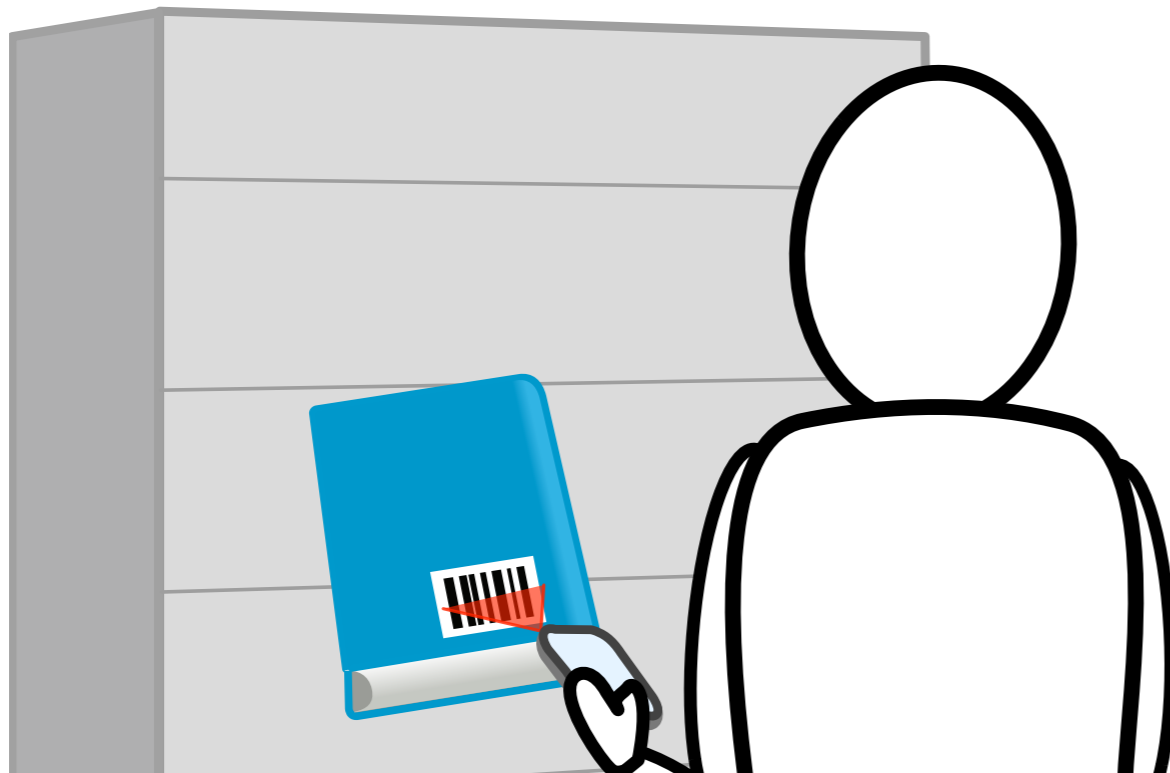
① Finding books can be difficult in large libraries



② Solution: using BookMark, search for the book required



③ Scan any nearby book





④ Follow the generated map




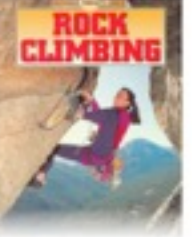
13:16

Items to find

 Mobile interaction design
Matthew Jones
John Wiley (2005)


 You are not a gadget : a manifesto
Jaron Lanier
Penguin (2011)

 Groundwater science
Charles R. Fitts
Academic Press (2002)

 Rock climbing
Phil Watts
Human Kinetics (1996)

9:24 PM

Scan an item

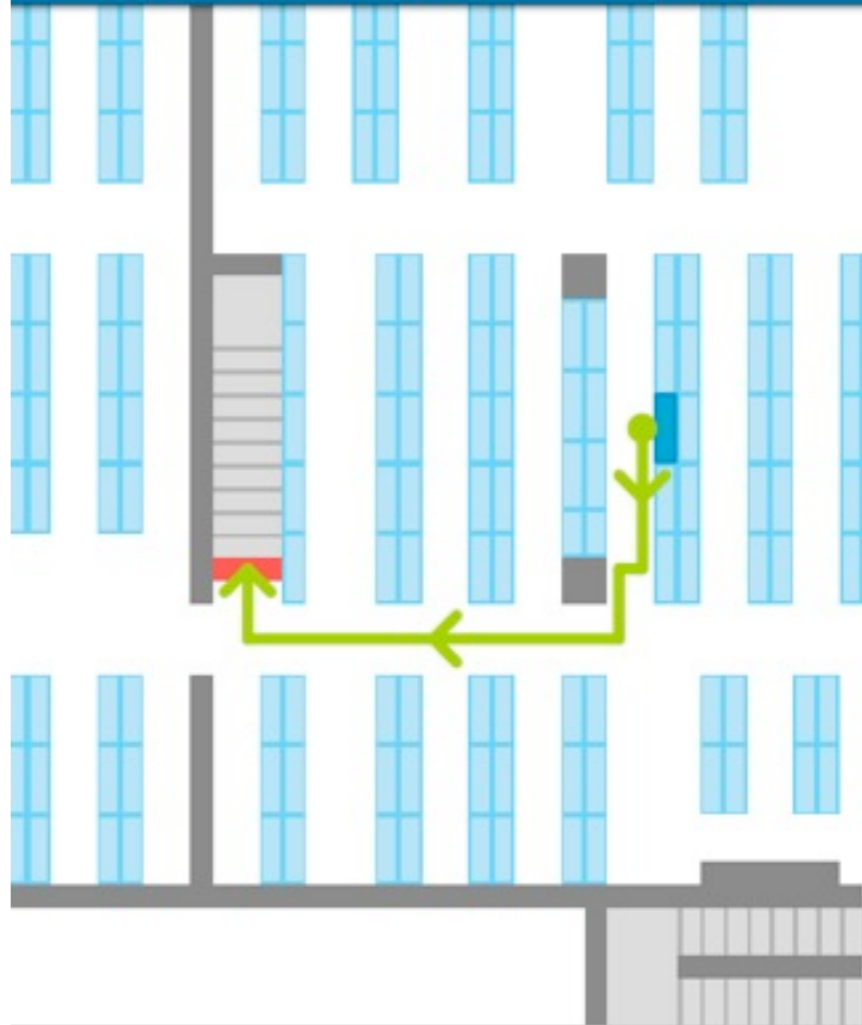


Scan the barcode on the **back** of any nearby book to locate yourself.

Touch here to start from the library entrance.

13:55

Level 2



Follow the route, then go down one floor to Level 1. Touch here when you arrive

Try it – search for *BookMark Swansea* on Google Play

User study

- Between-groups comparison study:
 - **Part 1:** 16 participants using BookMark to find 10 books.
 - **Part 2:** 16 participants using actual library paper maps to find the *same* 10 books in the *same order*

Results

- All 32 participants found all 10 books.
- BookMark was faster to find books (73 vs 117 seconds)
- BookMark rated far higher for library user experience than existing approaches

Benefits

- Cheap and easy to implement
- No need to build new infrastructure
- Add value to existing spaces



Conclusions

- What makes these markers appropriable?
 - Visibility
 - Openness
- Future digital markers should aim to follow the same path?
 - e.g., NFC, RFID

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