

# **Augmented Reality (AR) HKUST Navigation App on Android**

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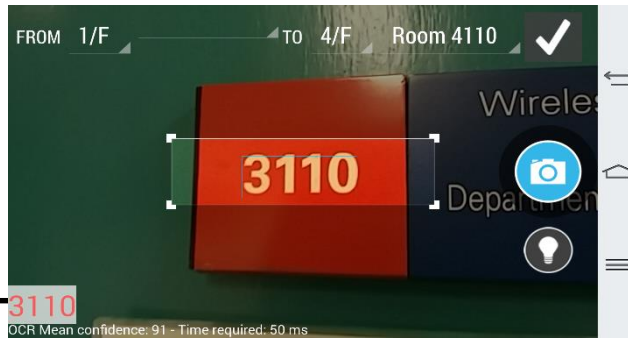
**Advised by Prof. Pan Hui**

# Introduction



The indoor environment in the main academic building at The Hong Kong University of Science and Technologies (HKUST) is complicated. It is still not easy for students to find the classrooms or other venues even though the directory or 2D map are provided. Therefore, an Android app called Ustar is developed for indoor navigation on the first floor of the academic building at HKUST. The main characteristic of Ustar is that, integrates with Augmented Reality (AR) technology which can magnify visible or tangible objects in the physical world by enriching with digital information and communication capabilities.

## Objectives



Our project aims to improve the performance and functionalities of Ustar application, so that users can actually utilize the app in the main academic building of HKUST, regardless of which floor they are on. More precisely, the following objectives were focused on:

- ✚ To modify the shortest path algorithm
- ✚ To enhance the object recognition capabilities by including new objects
- ✚ To provide course usage and vacancy information

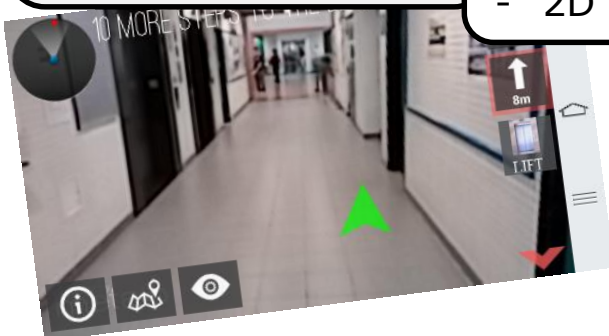
## Design

### Navigation Guide

- Voice guide
- Text message
- Arrows indication

### Output views

- Camera view
- 2D map view



Real time class schedule in each teaching venues

**Show Well-known landmarks**

- Display useful information in an interactive manner by using AR elements

**Display facilities in the surroundings**

- Classrooms, toilets, lifts, restaurants

**Implementation**

**Application implemented by**

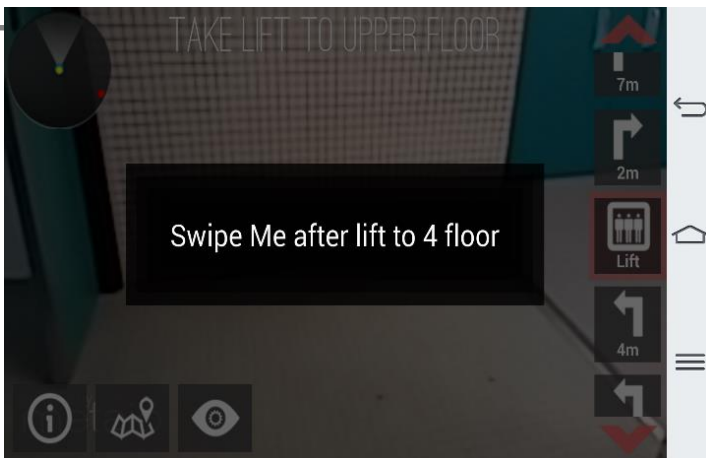
- Android platform
- Metaio SDK is used for AR tracking and rendering
- Tesseract OCR is the scanning engine
- Step counter of mobile device to record the movement



**Modify the database to accommodate multiple floors and additional information**

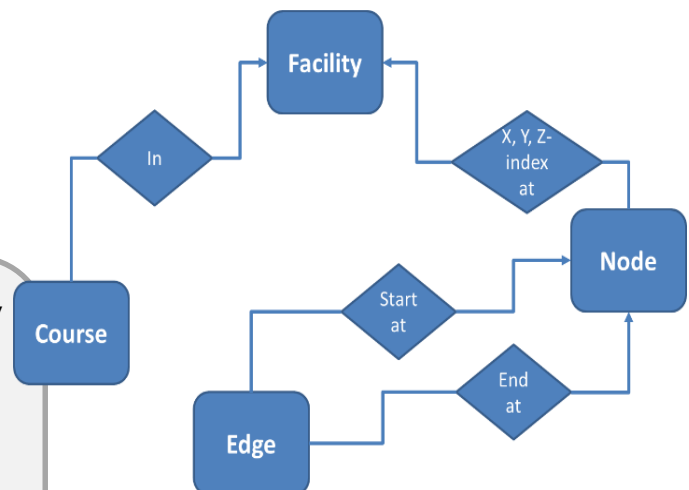
- Z-coordinate is added to each room so that all contain a specific floor location

ID	Room number	x	y	real x	real y	desired format
		50	1120	0	0	(0,0)
		2250	365	440	151	(440,151)
3000	3001	115	1055	13	13	(13,13)
3001	3002	115	1035	13	17	(13,17)
3002	Staircase	115	1020	13	20	(13,20)
3003	LIFT 4	110	1000	12	24	(12,24)
3004	3003	155	990	21	26	(21,26)
3005	3005	175	970	25	30	(25,30)
3006	3006	195	930	29	38	(29,38)
3007	3007	265	865	43	51	(43,51)
3008	3008	325	820	55	60	(55,60)
3009	Staircase	365	760	63	72	(63,72)
3010	LIFT 3	370	745	64	75	(64,75)
3011	Male Toilet	390	790	68	66	(68,66)
3012	3011-3017	395	760	69	72	(69,72)



**Design the course usage and vacancy information**

- C++ program was written to translate the HTML code into required SQL pattern, in order to gather the Class Schedule in each semester. The collected data was stored into SQLite database.



# Testing

## ✓ Testing the Shortest Path Algorithm:

### Algorithm:

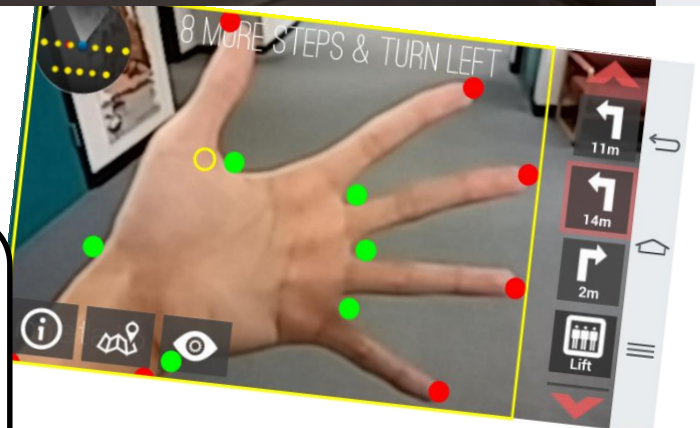
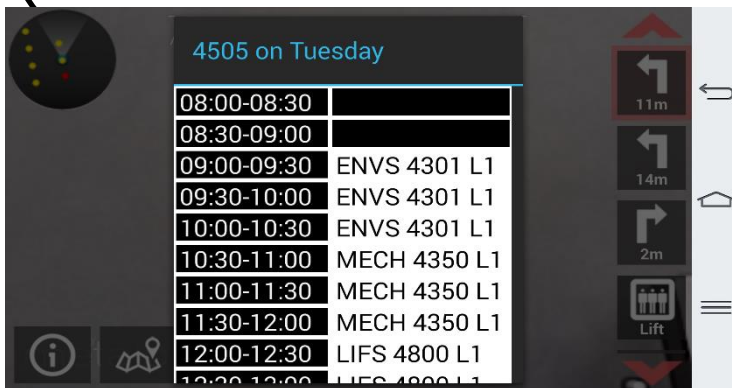
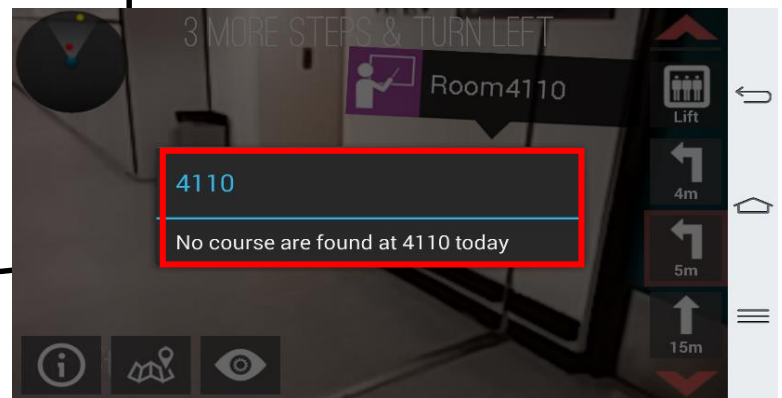
- Test the correctness of multi-floors movement.

## ✓ Testing the Database:

- Check whether it can properly store data entries.
- Check whether the values of the data entries stored are correct and valid.

## ✓ Testing User interface:

- Check unexpected usage of the user interface.



## ✓ Testing the Course Usage and Vacancy Information:

- Test if the displayed timetable was the same week days as showed on that day.

# Conclusion



In our project, we designed and implemented a comprehensively and user-friendly navigation system with an Android system device. The target users of the application are people searching the shortest distance path of indoor spaces inside the whole academic building in HKUST. We have successfully integrated different functionalities into one comprehensive application.