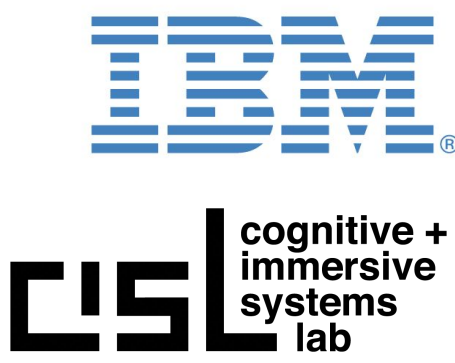




The Rensselaer Mandarin Project

A Cognitive and Immersive Language Learning Environment



Name and affiliation (highlight student author names in bold>)



The Rensselaer Mandarin Project enables students to improve functional understanding, pronunciation and vocabulary in Mandarin Chinese through authentic speaking situations in a virtual visit to China. Students navigate using speech, gestures, and combinations thereof to navigate an immersive, mixed reality, stylized realism game experience through intelligent interaction with AI agents, immersive technologies, and game mechanics. The environment was developed in a black box theater equipped with a human-scale 360 Panoramic Display (14'h, 20'r), arrays of markerless skeletal tracking sensors, and speakers for spatialized audio.

Project Overview

- **Speech based dialogue**
- **Multimodal interaction with speech and gestures ("what is that?")**
- **Cognitive agent to tell culture story**
- **Language switch (between English and Mandarin)**
- **Help functions in dialog (e.g. "what did you say?")**
- **Assessment of students' achievements and suggestions for practices**
- **Pitch tone contour analysis**

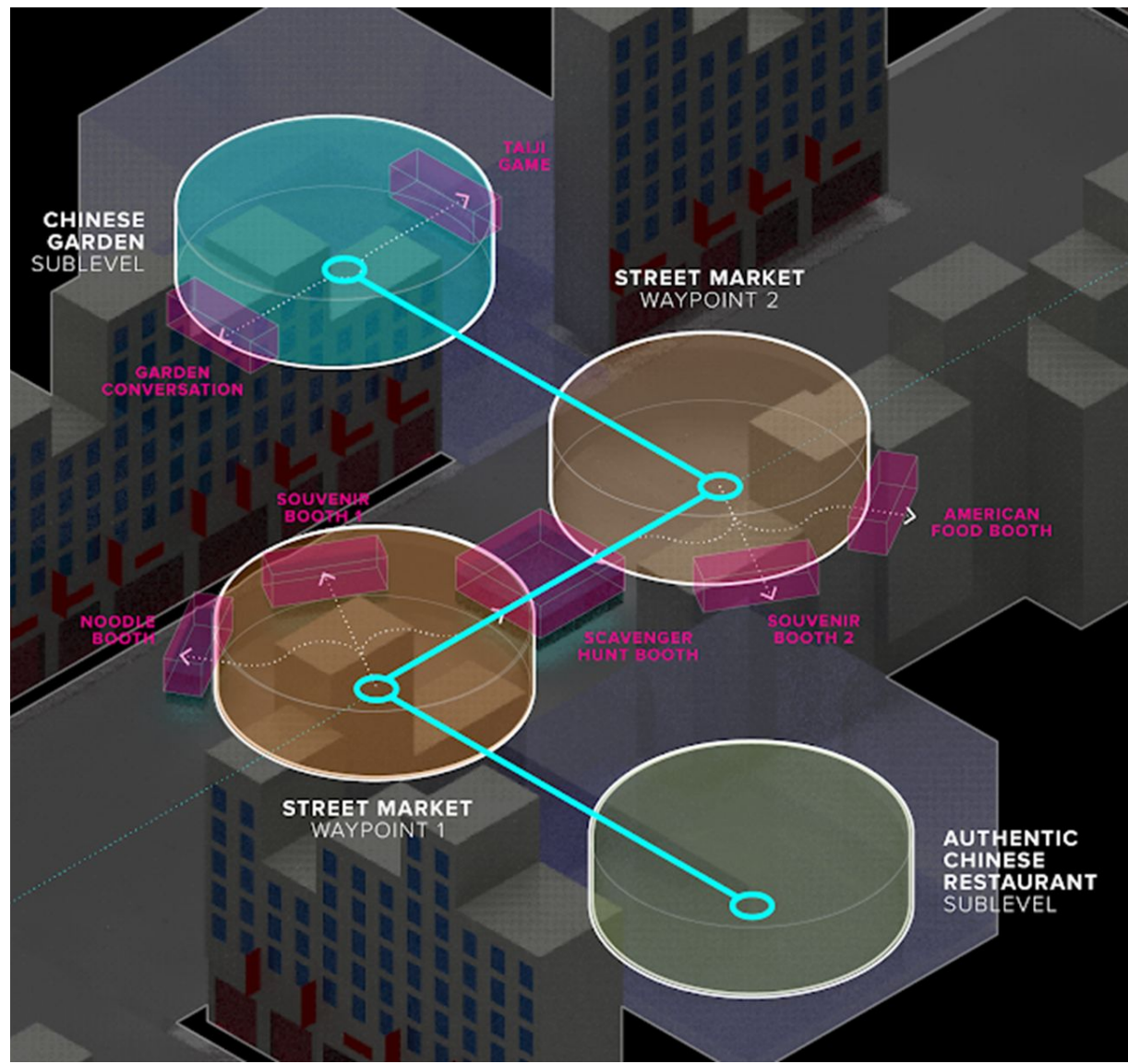
Existing work in the field suggests that Interactive environments for language learning provide significant benefits to learning a second language when compared to traditional teaching methods. They both improve learning outcomes, and facilitate positive learning attitudes in the classroom. They enable improved understanding and retention of formulaic expressions, persuasive talk, awareness of audience, and collaborative communication as a result of digital immersion in authentic speaking situations. At the same time, many of existing technologies utilize small displays, and seldom leverage Artificial Intelligence (AI)³

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Current progress



An initial usability study conducted with an earlier RMP prototype in November 2017 collected data from 16 students: 8 male, 8 female, Ages 18-22. First languages: 1 Tais-hanese, 1 Cantonese, 2 Spanish, and 12 English. A question-naire conducted during the study yielded the following key qualitative findings: 16/16 (all) students liked being able to use gestures (pointing) to disambiguate food menu items and found it helpful; 14/16 liked that the system was able to re-peat itself on command and found it helpful¹.

8 AI Agents:

- 4 Vendors—souvenir, food, drink, clothing
- Friend (Lisa)
- Taiji master

3 Environments:

- Garden pedestrian
- Waiter
- restaurant, garden, and street market.



Chinese Street Market (above)—Students search the street market and converse with different vendor agents to find a list of items for a party.

Chinese Garden (below)—Students visit the garden and approach different agents or use gestures⁴ to acquire items that have been lost.



Chinese Restaurant (left)—Students interact with an AI waiter and can order drinks and food and pay the bill. They can speak in Chinese or English and can use multimodal gestures⁴, such as pointing to menu item to order². Through pitch-contour analysis students can also practice their pronunciation of Chinese characters. They select a word to practice by pointing to the options on the left. They will then listen to a native speaker pronounce the character and see a graph of the speaker's tone on the right. The student then speaks the Chinese characters and can compare the shape of their tone graph to that of the native speaker.

Open questions and future vision

