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# Indoor Collocation - Exploring the Ultralocal Context

## Alain Shema

School of Information Studies  
Syracuse University, Syracuse,  
USA  
sralain@syr.edu

## Yun Huang

School of Information Studies  
Syracuse University, Syracuse,  
USA  
yhuang@syr.edu

## Abstract

Previous research have investigated collocation using mobile phones at the neighborhood or the city levels. The rise of indoor maps and more accurate indoor location and navigation technologies allow us to take the concept of collocation to indoor settings. In this paper, we introduce indoor collocation, present initial results from users' interviews and a mobile application that let people explore and discover various resources available to them in their indoor environments.

## Author Keywords

mobile collocation; indoor maps

## Introduction

Current technologies enable people to geo-code information and share it with their surrounding communities [1]. This has been empowered by the ubiquity of smartphones equipped with geo-sensing devices (such as GPS) and an almost permanent connection to the Internet, making it easier to share geo-tagged content wherever and whenever, and to push this content to users in specific areas.

For example, many projects focused the concept of *hyperlocality* to the city and neighborhoods levels [3, 4, 6], where location-based mobile applications are developed to increase community engagement and tested it at First Night (a festival) in two subsequent years [4]. Through this application, users could

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search for specific events happening during the festivals based on date and time and also the distance from the users. The application also allowed users to interact with other users through status updates and comments. Other collocation applications investigate sharing among friends. For example, Mobiphos is an application that allows people to take photos and immediately share them with a group of collocated members engaged in social activities [2].

The advent of indoor maps technologies provides us a new opportunity to investigate collocation in indoor environments and the interaction between members of "indoor communities", such as people working in the same buildings, students sharing a classroom, etc. Indoor environments present new opportunities for exploring collocation context and applications. First, compared to *hyperlocality*, indoor collocations with relatively short distances within indoor settings, people's slow movements within the buildings, the face-to-face orientations among indoor occupants might promote serendipitous social interactions [5].

We define indoor collocation as "ultralocal". Similar to the hyperlocal definition provided on Wikipedia, ultralocal content also has two major dimensions: geography and time, and they are measured in indoor space. Ultralocal content might make bridging the divide between the virtual and physical worlds easier; and increase opportunities for different types of social interactions.

For example, if a user reports an event (office presentation, parties, etc.) of interest happening next room, other nearby users may feel that they could attend because of the short distance. The virtual world can also enrich people's knowledge about their surroundings. For example, through virtual tours of buildings, people may discover resources available to the community that they never are aware of in their proximity (e.g., specific lab equipment, musical instruments, etc.). More interactions with

their surroundings and communities may promote their belongings.

### **Indoor Collocation on College Campus**

The rise of indoor maps gives designers new opportunities to explore interaction and collocation in indoor environments, where people spend more than 90% of their time indoor [7]. To investigate the different interactions mediated by mobile phones that can happen in indoor environments, we are currently building an indoor map application for a US-based mid-size university campus. Through the app, we aim at investigating how people could discover their campus in new ways by mapping resources, services, events, pictures and jobs indoor.

To understand users' potential interactions within the ultralocal context, we conducted two rounds of interviews: 1) to understand how people (students and staffs) perceive and explore their indoor environments; and how these perceptions and explorations evolved over time; 2) to get the criteria used by students who are part-time employees on campus the criteria they used when job hunting. In the first round of interviews, we talked with 29 participants, comprising of 11 students and 18 full-time employees of the university. In the second round of interviews, we spoke with 18 students.

During the interviews, we found that most participants had limited knowledge of other indoor spaces on campus. Because of this limitation, they did not explore their indoor areas, instead they restricted themselves to their own offices, classrooms and the library. On average, the participants visited 2 to 4 buildings per week, including classroom buildings (usually where they have their classes, or their workplace), the student center, the library and the gym. However, all of them expressed their eagerness to know more about other indoor surroundings, such that they could interact more with collocated people or events.

The relatively short distances involved in indoor settings could allow people quickly act on call for contributions (for e.g., an inquiry about an event happening in a room) and have a sense of attachment to the place. Indoor spaces also generally promote a greater sense of belongings among people, as they are more likely to be acquaintances.

In addition to the desires of knowing more about their buildings, participants also expressed their interests in receiving more information about event information and part-time job information on campus. For example, current job posts on the campus website did not give students a good sense of the location of the jobs, making job hunting a daunting task. Several participants mentioned that location was a top criteria when they are hunting for part-time jobs. One participant said that “if I need to take a bus, it should not take me more than 5 minutes”. However, most students mentioned that the job should be within 20 minutes walk (or drive, if they have a car) from their classrooms location.

Posting jobs on the map could help solve this problem in two ways. First, maps can give people a quick sense of the location of jobs and their locations vis-à-vis the job seeker current location, which could be where he/she spends most time (e.g., home, classrooms, etc.). Second, the indoor map application can promote serendipitous job search, by alerting a job seeker (who would have switched on “job notification” in the app) when they are in the vicinity of a location with job openings. This concept of serendipitous job hunting could be extended to other objects, events and even people.

To increase the appropriation of the indoor space by its occupants, our indoor map application encourages users to share pictures of the indoor spaces. Viewing pictures of public spaces within indoor environments (such as cafeteria, lounges, etc.) can make people feel more comfortable when they visit new

places for the first time, as they get a feeling of “d  j   vu”. We are still testing this feature with user studies. Figure 1 and 2 show the screenshots of the design of the current application.



Figure 1: App screenshot showing the location of indoor events

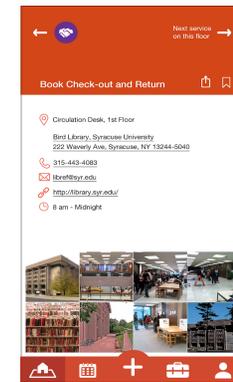


Figure 2: App screenshot showing indoor pictures

## Future Work

To promote collocated interactions, our app allows people to share their own campus experiences by creating events that others can attend (figure 1) and by posting pictures on the map (figure 2). Navigation through the app will rely on geolocation technology based on WiFi that enables indoor location with precision at the meter level. The increasing number of connected devices through IoT will enable connecting these devices to enrich interaction between people and devices. For example, printers connected to the indoor map could report their status (printing/idle, malfunctioning, etc.) and potential users could check these before heading to a room to use a printer.

Because the perspective users may hold different roles, (e.g., students, instructors, visitors, or staff, etc.), when they collocate,

we need to develop a set of policies that can bound certain devices together by applying various context information.

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