

The Practice of WeChat Shake in Library Proximity-Based Services: A Case Study of Lectures at the Beijing Municipal Party School Library (Postprint)

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Abstract

Abstract

Objective: To establish a closed loop between WeChat online users and the physical library, optimize the user experience within the offline library environment, and enhance library service efficiency.

Background: Library near-field services have traditionally relied on physical service modalities such as electronic display boards and human-guided tours, with minimal online-based guidance resources.

Methods: This study designs and develops near-field services for the Beijing Municipal Party School Library using WeChat as the platform, integrated with Bluetooth iBeacon hardware devices and HTML5 pages.

Results: The implementation provides differentiated near-field services across various service scenarios, yielding high user participation and satisfaction while substantially increasing the library's WeChat official account followership.

Conclusion: Near-field services deliver a novel user experience, fostering greater user initiative in exploring library resources and engaging with library services.

Full Text

Preamble

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Using WeChat Shake & Find for Library Near-field Services: A Case Study of Beijing Administrative College Library Lectures

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Abstract

[Objective] This study aims to establish a closed-loop connection between online readers and the physical library, thereby optimizing user experience and improving library service efficiency.

[Context] Traditional library near-field services primarily rely on physical resources such as electronic display panels and in-person explanations, with virtually no online guidance resources.

[Methods] Using WeChat as the platform, combined with iBeacon Bluetooth hardware devices and HTML5 pages, we designed and implemented near-field services for Beijing Administrative College Library.

[Results] The system successfully provided different near-field services for various scenarios, achieving high reader participation and satisfaction while significantly increasing subscriptions to the library's WeChat Official Account.

[Conclusions] Near-field services deliver a novel user experience, making readers more willing to actively explore library resources and interact with them.

Keywords: WeChat shake & find; Bluetooth devices; Near-field services

Classification: G25

Shake & Find (hereinafter referred to as Shake & Find) is a new location-based connection method provided by WeChat for users. Through the “Nearby” tab in WeChat’s “Shake” feature, users can interact with offline entities and obtain personalized services. As of June 30, 2015, the combined monthly active users of WeChat and WeChat had reached 600 million, representing a year-over-year increase of 37% [?]. This massive user base urgently requires libraries to accelerate their information service transformation. While there are numerous library official accounts on WeChat, and the platform continues to introduce new functional plugins, library WeChat Official Accounts urgently need functional transformation to better serve readers. Shake & Find’s near-field services enable readers to experience “receiving information out of thin air” in real-life scenarios.

Shake & Find transmits data based on the Bluetooth hardware device iBeacon. Compared with other near-field devices such as RFID and NFC, iBeacon offers longer sensing distances and lower maintenance costs. Meanwhile, smartphones already supported Bluetooth Low Energy (BLE) technology with the release of Apple’s iPhone 5s and Samsung Galaxy Note 3, indicating that iBeacon applications are becoming widespread. However, existing solutions for library implementation still have significant drawbacks: most domestic research remains at the theoretical level, such as the entrance welcome messages, identity

recognition, location-based information services, questionnaires, reader analysis [?], service check-ins, and indoor guides [?] proposed by Shanghai University Library and Hunan Agricultural University Library. While these applications provide many reference solutions, none have reached the practical implementation stage. Existing foreign solutions require readers to install third-party apps to receive push notifications. For example, the Orange County Library System in California deployed 25 Beacon devices across three branches to push library event announcements to readers. This approach struggles to establish a stable user base and significantly increases development costs for libraries. Therefore, using WeChat as a third-party app can effectively bridge readers and libraries while serving as a promotional tool for library WeChat Official Accounts.

2.1 Preliminary Research and Design

(1) Content Requirements

Near-field services can provide different content for different service scenarios. Therefore, preliminary research is required for near-field services, including thematic content, surrounding environment, and related materials, to construct HTML5 interactive pages around these aspects. Research can be conducted through online polls sent via WeChat group messages and random offline questions. The research content focuses on peripheral aspects of the theme, particularly content that cannot be conveniently provided on-site but can be easily delivered via mobile phones, such as videos and PPT downloads. The surrounding environment is also a research point—for example, whether wireless network connectivity is supported and whether the environment is quiet or noisy. Related materials constitute another important component, as the scenarios are primarily library-based; thus, relevant books, electronic resources, and borrowing assistance content can be integrated into near-field services.

(2) Bluetooth Hardware Device Requirements

iBeacon Bluetooth devices have relatively strict configuration requirements for mobile phones: iOS devices require iPhone 4s or above, iPad 3 or above, or iPod 5 with iOS 7 or above; Android devices require system version 4.3 or above plus Bluetooth 4.0 (both conditions must be met simultaneously). WeChat version requirements are 5.4 or above for iOS (Mainland China version) and 6.0 or above for Android. WeChat Traditional Chinese version 6.1 also supports Shake & Find. By decomposing requirements, devices can be deployed across all involved scenarios. User attention and focus vary across different usage environments. Factors such as phone shaking, lighting changes, and network instability may occur during mobile phone usage, requiring specific design considerations. In open spaces, a single iBeacon device can cover a radius of approximately 30-50 meters; in indoor spaces with obstructions, coverage is reduced to about 10-20 meters. Typically, WeChat randomly displays pages bound to a single device when shaken, so each device can only bind to one page. Meanwhile, to ensure users can shake to access designated pages, signal interference between devices should be minimized.

(3) Platform Tool Requirements

WeChat Official Accounts are categorized as Subscription Accounts, Service Accounts, and Enterprise Accounts. Shake & Find is one of the functional plugins provided by the WeChat Official Accounts Platform for verified accounts. Therefore, near-field services must use verified WeChat Official Accounts, which also have maximum secondary development permissions for convenient service expansion.

2.2 Near-field Service Design and Implementation

(1) Hardware Implementation

Based on analysis of near-field service device requirements, existing iBeacon devices must be configured and deployed on-site. iBeacon uses Bluetooth Low Energy (BLE) technology to broadcast its unique ID through periodic advertising frames (named Advertising). Any BLE-enabled device can receive these broadcasts. The primary configuration involves three device identifiers: UUID, Major, and Minor [?]. UUID (Universally Unique Identifier) distinguishes one's own iBeacon devices from others; Major represents the primary device number for a group of related iBeacon devices; Minor represents the secondary device number for individual iBeacon devices. The WeChat Official Accounts Platform generates a set of device numbers for each added device based on user requirements. Using the APP provided by the device supplier, the device numbers provided by WeChat are bound to corresponding devices. When mobile Bluetooth is turned on and users enter WeChat's Shake & Find feature, the appearance of "Nearby" indicates successful reception of iBeacon broadcast messages. Shaking within the Nearby tab displays the interface bound to the WeChat Official Account, completing the binding of an iBeacon device to the WeChat Official Account.

(2) HTML5 Page Usage Scenario Analysis

Usage scenario analysis examines the direction of Shake & Find activity pages from a user experience perspective, employing different page designs, functions, and interactive styles for different scenarios. Based on functional requirement research and device placement planning, three types of HTML5 pages were developed, designated as PAGE1, PAGE2, and PAGE3.

PAGE1 is used for outdoor Bluetooth devices. This page serves as an introductory page. Since devices are primarily placed outdoors, pages mainly use cellular networks. To ensure smooth browsing without wireless signals, each page is controlled to approximately 200KB, with image content compressed using PNG8 format for reduced color requirements [?]. Simple icons are replaced with SVG and ICONFONT (such as vector icons provided by Bootstrap).

The page introduces lecture-related information beyond the poster content, including images of the lecture location, information about the speaker, and some images related to the lecture content. Therefore, the HTML5 page design theme must be fixed as lecture-related information introduction. Each page maintains a single focus, composed of exquisite images and concise text, with page tran-

sitions completed through simple slideshow flip effects. Appropriately adding some sentimental and interesting pages can increase the page's dissemination rate, and the WeChat sharing JS API is used to add custom sharing to Moments functionality. The implementation method is as follows:

```
$(function(){ wx.config({ debug: false, // debug mode appId: '${app_{id}}', // unique identifier timestamp: '${timestamp}', // timestamp for signature generation nonceStr: '${nonceStr}', // signature: '${sign}', // signature jsApiList: ['onMenuShareTimeline'] // list of JS interface
```

PAGE2 is used for iBeacon device A near the library venue. The main characteristic of this scenario is the presence of wireless network signals, so this page primarily delivers relatively large related materials such as videos and high-definition images to complement the speaker's presentation content. Another feature of this scenario is that the environment should remain as quiet as possible, so when playing videos, the user's network environment is detected and corresponding friendly prompts are provided. This is implemented through the JS SDK provided by the WeChat Official Accounts Platform.

The implementation method is as follows:

```
// Import WeChat JS SDK
<script type="text/javascript" src="__{{PUBLIC}}_/js/jweixin-1.0.0.js"></script>
$(function(){
  wx.config({
    debug: false, // Enable debug mode
    jsApiList: ['getNetworkType'] // Required, list of JS interfaces to be used
  });
  wx.ready(function () {
    wx.getNetworkType({
      success: function (res) {
        var networkType = res.networkType; // Returns network type 2G, 3G, 4G, WiFi
        if(networkType != 'wifi'){
          alert('Recommended to browse under WiFi conditions (library WiFi signal: xxx)');
        }else{
          alert('To maintain quiet in the library, please lower the volume when watching');
        }
      }
    });
  });
}); // wx.ready ends
```

The effect is shown in Figure 1 [Figure 1: see original paper].

PAGE2 is used for iBeacon devices near the lecture venue. This page is primarily used during the lecture process, featuring video playback and PPT download functions. Since the lecture venue provides wireless network coverage, the page size can be appropriately increased. However, to maintain page loading speed, video playback uses external links. The page design focuses on participation rather than content, with simple and intuitive operations to increase user

engagement. Messages such as “Thank you for participating” are placed on the next page.

PAGE3 is used for iBeacon device B near the library venue, primarily for non-lecture processes such as post-lecture voting and library material recommendations. Since device B and device A are located in the same scene, their signals cannot coexist simultaneously. During the lecture, device A’ s Bluetooth signal is released; when the lecture is about to end, device A’ s signal is turned off and device B’ s signal is activated to ensure readers shaking near the end of the lecture will access PAGE3. This page emphasizes functionality and interactivity.

(3) JS Interface Call Analysis

Quickly Guiding Users to Follow

To enable readers using this service to simultaneously follow the WeChat Official Account and enhance dissemination effects, the three pages require role control to increase the library’ s WeChat Official Account follow rate. After accessing pages through Shake & Find, users’ identity IDs must be obtained to determine whether they follow the library’ s official account. If not followed, the page redirects to the follow page; after successful following, users enter the secondary page. This is implemented through the follow JS API provided by Shake & Find as follows:

```
// Import JS API
<script type="text/javascript" src="js/BeaconAddContactJsBridge.js"> </script>
<script type="text/javascript">
BeaconAddContactJsBridge.ready(function(){
    // Check if following
    BeaconAddContactJsBridge.invoke('checkAddContactStatus',{},function(apiResult){
        if(apiResult.err_{code} == 0){
            var status = apiResult.data;
            if(status == 1){
                // If already following, redirect to corresponding PAGE
                window.location.href="http://phelps.sinaapp.com/tp/index.php/Beacon/video";
            }else{
                alert('Please follow us first :D');
                // Jump to follow page
                BeaconAddContactJsBridge.invoke('jumpAddContact');
            }
        }else{
            alert(apiResult.err_{msg})
        }
    });
});
</script>
```

Multi-dimensional Data Statistics

After near-field service concludes, multi-dimensional analysis of users who participated in Shake & Find is required to provide better services for future activities. The data statistics interface provided by the WeChat Official Accounts Platform can achieve this function. By device dimension, it can query the number and frequency of users who performed Shake & Find operations on a single device, as well as the number and frequency of users who clicked Shake & Find messages. It can also batch query multiple devices to observe which devices have the most Shake & Find operations, thereby determining foot traffic around devices. By page dimension, it can query the number and frequency of users who accessed a single page through Shake & Find, as well as page click numbers and frequencies. It can also batch query multiple pages to observe page PV and UV, thereby determining page visit frequency. Through these two sets of statistics, user focus points of activities can be analyzed, providing a data foundation for activity effect evaluation.

Case Study

The WeChat Official Account used in this study is the Beijing Administrative College Library Public Service Account [?]. Through research with relevant departments, we learned that lecture posters would be placed in the library, cafeteria, and teaching building. The lecture venue was set on the second floor of the library, with the theme about a colleague's Qinghai-Tibet Railway cycling trip. Based on this theme, random surveys indicated that most colleagues hoped to watch live footage during the lecture and access related books to understand cycling knowledge.

Through analysis of the lecture process, a total of 5 iBeacon devices were required. One device was placed near each poster, with intervals controlled at more than 50 meters. Two devices were arranged at the lecture venue. Due to the small indoor space and numerous objects, these two devices were used sequentially (one after another) to ensure no mutual interference, and they needed to be deployed at higher positions without obstruction. Signal recognition was confirmed through Shake & Find testing.

Based on the above scenario analysis, three pages were designed for near-field services: PAGE1 bound to iBeacon devices near poster locations, PAGE2 and PAGE3 bound to the lecture venue and activated sequentially to ensure signals did not interfere with each other.

All indoor and outdoor iBeacon devices were deployed on October 20, 2015, with corresponding pages bound. According to WeChat Official Accounts Platform statistics, Shake & Find operations peaked at 90 times that day, as shown in Figure 2 [Figure 2: see original paper].

The lecture was held on October 21, 2015, with 37 participants total, of which 14 directly participated in Shake & Find activities via WeChat, as shown in Table 1 .

Table 1: Changes in Shake & Find Participants Before and After the Lecture

Date	Shake & Find Users	Shake & Find Operations	Click Users	Click Operations
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Field investigation at the lecture revealed positive participant response and generally favorable feedback. However, observation of Shake & Find data before and after the lecture identified several issues:

- (1) Lecture attendees were primarily young teachers and some graduate students. The Shake & Find function was relatively novel, and simply promoting “This library supports WeChat Shake & Find” through wall posters failed to achieve the expected effect, with many readers still unaware of how to use it.
- (2) Statistics showed that Shake & Find operations exceeded the number of users, indicating some readers may have shaken multiple times when they didn’t get the desired page initially, suggesting Bluetooth signal overlap in certain areas.
- (3) Many readers’ phone systems did not meet the usage standards, resulting in the Shake & Find option not appearing in WeChat even after enabling Bluetooth.

In response to user feedback, we conducted detailed analysis of the near-field service and actively sought solutions. The library posted more detailed instructions for using Shake & Find, allowing readers to access usage methods through paper instructions, librarian guidance, or QR code scanning. A reader phone service channel was established to upgrade phone operating systems free of charge to meet Shake & Find configuration requirements. Multiple tests were conducted during activities to ensure Bluetooth signals did not overlap, preventing page crossover during Shake & Find operations.

The near-field service designed in this study offers several advantages: using the WeChat browser as the front-end development and display platform overcomes browser compatibility issues while avoiding inconsistencies from operations on different phone systems such as Android and iOS. iBeacon devices compatible with WeChat are already mature products in the market. This study used iBeacon products provided by Bright Beacon, the first domestic company to launch complete iBeacon solutions, for configuration testing. The products are perfectly compatible with WeChat Shake & Find applications and have their own independent APP for convenient parameter configuration. After device activation, WeChat defaults to binding the Official Account follow page, which plays a crucial role in official account dissemination.

This Shake & Find near-field service can be extended to more innovative near-field service cases. With WeChat opening more development interfaces, Shake

& Find applications in libraries have great potential. For example, the WeChat WiFi connection function would allow users to connect to WiFi directly through WeChat's scan function upon arriving at the library, eliminating the need to ask for wireless network signals and passwords. This would close the loop between online users and the offline library, better improving library service efficiency [?]. Additionally, the recently opened HTML5 page interface for obtaining device information enables indoor precise positioning in libraries based on Bluetooth devices [?], helping readers quickly locate their positions and providing nearby service resources.

Today, more and more innovative library WeChat Official Accounts are emerging, and the WeChat user base continues to grow. Reader demands have expanded beyond simply using mobile libraries to more comfortable and intelligent usage. Beijing Administrative College Library proposes the concept of library near-field services. Through the WeChat Shake & Find function, physical library entities can achieve the capability to connect with users at close range and provide personalized information, interaction, and services. This paper analyzes and elaborates on the requirements research, scenario conditions, and statistical data interface modules for near-field services, promptly collects and analyzes user feedback after usage, proposes corresponding solutions, and points out directions for future research. With more open interface permissions for WeChat Shake & Find, the rapid rise of HTML5 technology, and increasingly widespread wireless network coverage, WeChat applications in libraries will have significant development space in the future.

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Author Contribution Statement

Chen Chen: Drafted the manuscript and revised the final version; Xu Pingcang: Deployed equipment for lecture use; Li Hong: Conducted user survey analysis; Yu Tao: Implemented the lecture.

Conflict of Interest Statement

All authors declare no conflict of interest.

Supporting Data

Supporting data is available in the online version of the journal at <http://www.infotech.ac.cn>.

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