

WIFI Walker – Mobility WIFI Signal scanner

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Abstract— Nowadays, WIFI is a widely deployed network technology everywhere. It is the cheapest/lowest cost solution to support Internet access for your mobile device in a limited area. WIFI access point and router devices have been deployed in anywhere. Especially in Hong Kong or any high population cities, signal overlapping and interference is the most concern for the network service degradation. This Android application – WIFI Walker – build for the WIFI signal scanning and recorded in a single data store for the locational WIFI signal summary. This report shows the first phase of the application and list out the idea of next phase application function.

Keywords—mobile, IoT, 5G, wireless, WIFI, RSSI, localization, fingerprint.

I. INTRODUCTION

WIFI – one of the widely deployed network technologies. We accepted that this is an easiest way to speed adopt everywhere to provide the Internet access for mobile device. However, as the characteristic of WIFI signaling, the 2.4G and 5G bandwidth are open channel for everyone to use (license is not required). Bluetooth signal is under 2.4G channel also. We often find that the WIFI performance is affected due to another WIFI network is using the same WIFI channel.

In this project, the Android Application – WIFI Walker has been developed for scanning the specific location WIFI Signal and store the summary to a signal store database. The WIFI signal summary in specific location will shows out at the application map for referencing.

In next phase of this application, the data summary can be used for analysis for WIFI usage and channels advise for WIFI access point deployment.

II. APPLICATION FUNCTIONALITY AND STRUCTURE

This application is separated to 2 parts - Mobile and Server side. The mobile application can run standalone to show out your current location WIFI signal environment. The Server side is used to store the WIFI signal data capture by the mobile and provide the 30 WIFI signal data capture history alongside your current location.

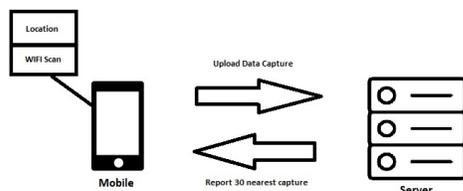


Fig. 1. Client – Server Application

A. Mobile Application – Android based

The Android based Mobile Application – WIFI Walker is using the Google Map and locational technique to identify the current Mobile current location.

Then, once the mobile current location values obtained, WIFI Signal scanning function will capture all WIFI Signal around your mobile.

- Location (Latitude, Longitude)
- SSID
- WIFI Channel (24XX , 5XXX)
- Authentication Protocol Support (WPA,WPA2)
- Received Signal Strength Indicator (RSSI)

The data capture will process every 5 minutes of the “executed application” in mobile background process.

B. Server Side

Server side will store the captured result and store in a signal data store. Depend on the current mobile location, the Server will response the mobile with 30 most recently WIFI record nearby the current location and pin at application MAP.

C. WIFI Signal Statistic Summary

Mobile can provide the WIFI Signal Statistic Summary for the recent area which your mobile located. It summarizes the Total WIFI channel statistic, log, in order to get the overview of the area WIFI signal status.

D. Source Code Adpot

Android Mobile application – The sample map location application provided by arriolac [1] has been referenced for the based application. The WIFI signal parts has been used Android WIFIManager [2] for signal capturing.

Server-side application – The raspberry PI based Linux platform has been used for a Web Server for getting the capture result and response the record by APACHE. A tailormade PHP program for data capturing purpose.

III. NON FUNCTIONAL CONCERN

There are various difficulties of this solution design related to how sensitive of the mobile signal capturing, the capture data accuracy.

A. Mobilty WIFI sharing device

Current mobility WIFI sharing device is comment. The solution design may have challenge if the captured WIFI

Signal / Access Point is not at a fixed location. It would affect the accuracy of the location identification.

B. Mobile device signal capture

Mobile handhelds are classified as several category such as high-end, middle-end or low-end mobile. The result capture may be affected by the device performance especially the RSSI result.

C. WIFI Fingerprint

As there is a solution about the WIFI Fingerprint for the location identification, based on the datastore, it can possibility show your Latitude and Longitude if “you get the same/near WIFI Signal SSID capture”. However, there is a long way to prove how large datastore / database is needed.

IV. APPLICATION SCREEN CAPTURE AND FUNCTION

In this session, it shows the mobile application screen capture. In this test first phase of development, we have spent around 2hours to capture the WIFI signal around Shatin region and giving out the sample data after removal any abnormal capture such as data corruption. There are around 2700 lines of the data captured in our data store.

```
DateTime: Mar 08, 2022 11:02:17 AM / Latitude
22.3796405 / Longitude 114.1978035 / Here / [WPA2-
PSK-CCMP][ESS][WPS] / 2457 / -77

DateTime: Mar 08, 2022 11:02:17 AM / Latitude
22.3796405 / Longitude 114.1978035 / Linksys02375 /
[WPA2-PSK-CCMP][ESS][WPS] / 5200 / -84

DateTime: Mar 08, 2022 11:02:17 AM / Latitude
22.3796405 / Longitude 114.1978035 /
Linksys32696_5GHz / [WPA2-PSK-CCMP][ESS][WPS]
/ 5745 / -87
```

Fig. 2. Sample data capture example – Server Side

Data is separated by slash “/” as follow:

- Captured Date time in UTC format
- Latitude
- Longitude
- SSID
- Authentication Protocol Support (WPA,WPA2)
- WIFI Channel (24XX , 5XXX)
- Received Signal Strength Indicator (RSSI)

For the mobile application, the sample UI [Fig. 3,4] has been developed based on the temple provided by arriolac[1]. The Google MAP API has been used and based on the data store captured WIFI signal information and location. The application pins out the nearest 30 records for reference.

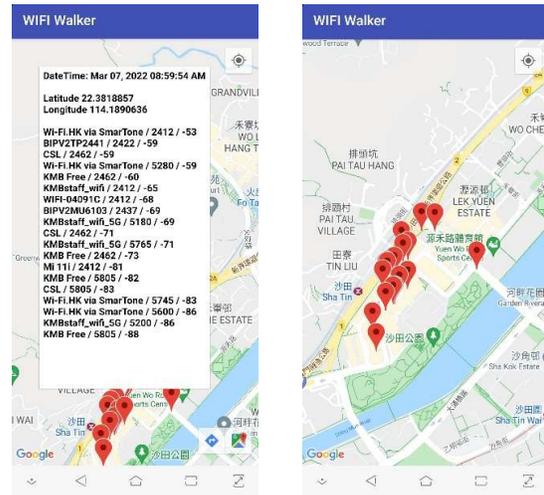


Fig. 3. WIFI Walker – nearest 30 pins capture

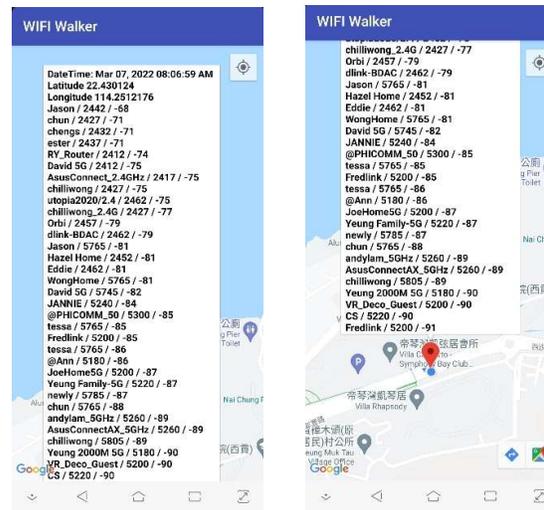
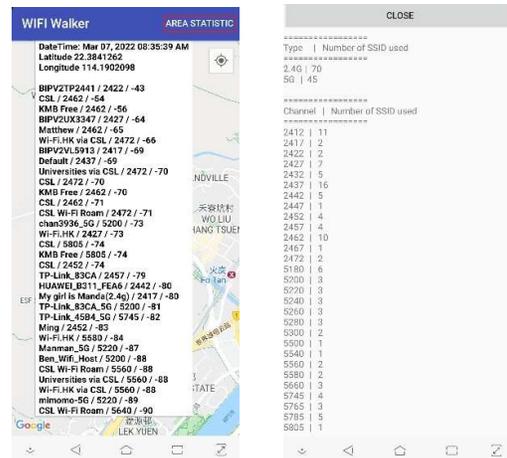


Fig. 4. WIFI Walker – actual location

The AREA Statistic button provides the function of the recent area WIFI signal summary. About the signal usage, most of the channel adopt, WIFI SSID and signal log.



```

08:11:16: MST U / 2022-09-30 12:AM
Latitude 22.3830166
Longitude 114.1899875
HLDPCWiFi / 2447 / -50
Shatin Plaza / 2447 / -50
HLDPCWiFi / 5785 / -64
Shatin Plaza / 5785 / -64
HKTFWIFI / 2462 / -85
Shatin Plaza / 2462 / -87
HLDPCWiFi / 2462 / -70
Shatin Plaza / 5270 / -73
HLDPCWiFi / 5220 / -73
WiFi HK via BEA / 2412 / -73
INFERAL_2_4G / 2432 / -75
Vannex Shatin / 2437 / -76
OPPO_SF48ES_50 / 5680 / -80
ChinaMobileShop / 5180 / -82
ChinaMobileHKShop / 5180 / -82
MSP / 5180 / -82
PT13-WF / 2462 / -83
PT13-WF / 5180 / -83
HLDPCWiFi / 5220 / -83
ZTE_18F25F_5G / 5640 / -83
Shatin Plaza / 5270 / -84
TP-Link_734_5G / 5680 / -84
Shatin Plaza / 2427 / -85
MSP / 2462 / -85
Shatin Plaza / 2427 / -86
HLDPCWiFi / 2427 / -86
ChinaMobileShop / 5260 / -88
ChinaMobileHKShop / 5260 / -86
PT13-WF / 5260 / -86
MSP / 5260 / -86
tmwififree / 2457 / -87
LHK_Router / 5745 / -89
STH_125-STP2 / 5580 / -90
kw(2.4 GHz) / 2417 / -91
ASUS_shop_5G / 5180 / -91
WiFiLHK via HKYWCA / 5260 / -92

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Fig. 5. WIFI Walker – AREA Statistic

V. NEXT PHASE DEVELOPMENT

As this is the first phase of the development, the base function has been created for scanning feature of WIFI signal. The next phase development has been planned for achieve more function on this application.

A. Graphical WIFI channel summary

Similar with the real time traffic jam alert, the WIFI channel adviser is used to report the highly occupied channel usage reporting.

B. Security advise feature

The captured result includes the WIFI SSID authentication method. It can provide the advice of specific WIFI setting security issue.

C. Location characteristic changes

Reporting the location characteristic changes by WIFI Signaling which can determine the possible “population, retail shop, telecom” movement.

D. Locational fingerprint in wide area

Based on the WIFI capture, it can be acted as the fingerprint structure to locate the acutal location of the mobile.

E. Available free WIFI for emergency used

By some of the emergency moment, if there is no telecom infrastructure, the WIFI historical capture can be used for the database about the available free WIFI locator.

VI. CONCLUSION

This application created for the WIFI research for geographical WIFI statistic capture. It can be used to summarize the channel usage and signal strength level in a specific area. It would be useful if most of the real time captured data by each mobile that similar the google car traffic jam reporting structure. Furthermore, for emergency usage, it can be used to locate the Free WIFI access point for Internet access.

REFERENCES

- [1] arriolac, <https://github.com/googlemaps/android-samples>
- [2] Android WIFI Manager, <https://developer.android.com/reference/android/net/wifi/WifiManager>