



Fig. 5 Adjust scan radius functionality



Fig. 7(c) Filter based on Wikipedia only

B. Filter Data Source

Fig. 6 shows the filter data source functionality, where the user can choose to display data from Google only, Foursquare only, Wikipedia only or display all. The choice is flexible to cater user preferences and to avoid overcrowding of overlay information on the screen.

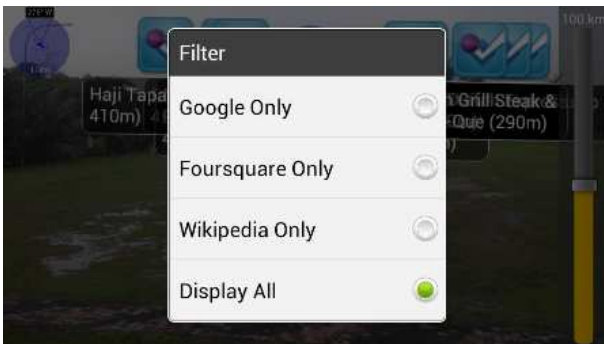


Fig. 6 Filter data source functionality



Fig. 7(d) Display all with no filter

C. Filter Scan Category

In order to maintain a readable viewing window on the mobile phone, Footprint also includes a function to filter scan category. This is to reduce the pack of overlay information, hence increasing readability. In the selection window, there are several options to choose from, which are: Food, Transport, Landmark, Entertainment, Medical or Emergency, Other, and Highlighted Places of Interest (POI). Selecting any of the options will omit out all other categories except the selected category. As a side note, another option refers to POI that does not fit any of the categories, and Highlighted POI option refers to selective elements from all the categories.

For example, if the user selected Food category, only overlay information that is concerned with foods and dining will be displayed as shown in Fig. 8(a).

Fig. 7(a) to Fig. 7(d) shows the interface of each filter category; Google, Foursquare, Wikipedia, and Display All.

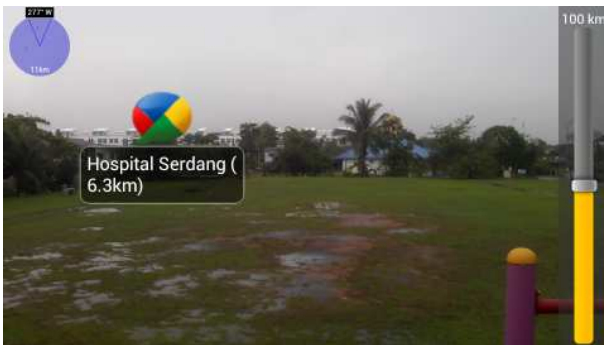


Fig. 7(a) Filter based on Google only

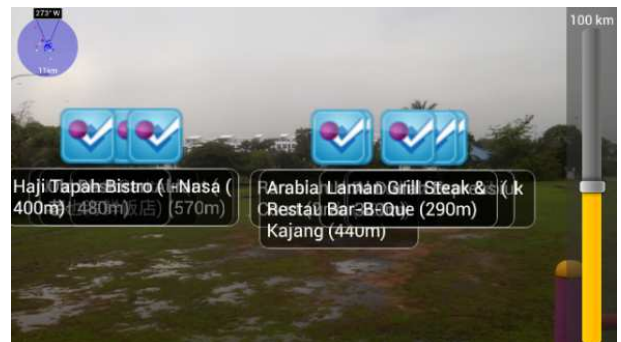


Fig. 8(a) Filter based food category

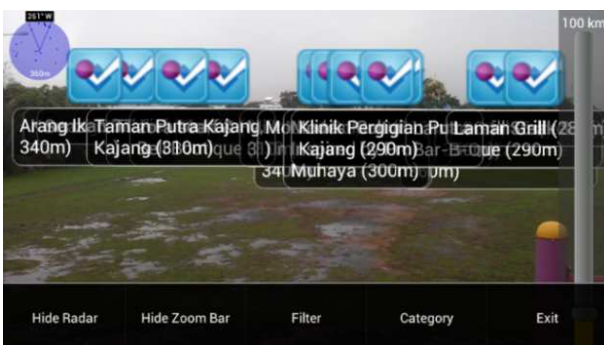


Fig. 7(b) Filter based on Foursquare only

If users selected Medical or Emergency, only overlay information that is concerned with medical and emergency, such as hospital and police station will be displayed as shown in Fig. 8(b).



Fig. 8(b) Filter based on medical or emergency category

Footprint’s capabilities to filter data source and scan categories are imperative because, without the information categorization, the users may experience information overflow [11].

III. RESULTS AND DISCUSSION

The footprint is evaluated using Visual Verification, which is a type of application verification method that uses distinctive visual approaches such as photos and videos to record down application behaviours during typical usage, as well as any certainty and uncertainty that the application has undergone during product usage. Unlike traditional testing and verification processes where it emphasizes on written materials and standards to follow, this type of verification emphasizes on realistic usage scenarios and record down the process for product feature and function verification.

Verification in Footprint focused on recording real-time and in realistic usage scenarios in user’s environment. A video recording of the product has been conducted. Fig. 9 shows the display of additional information pertaining to the respective Places of Interest (POI) based on Google Place API. The user only needs to click on any markers (overlay information) that are displayed on the screen.

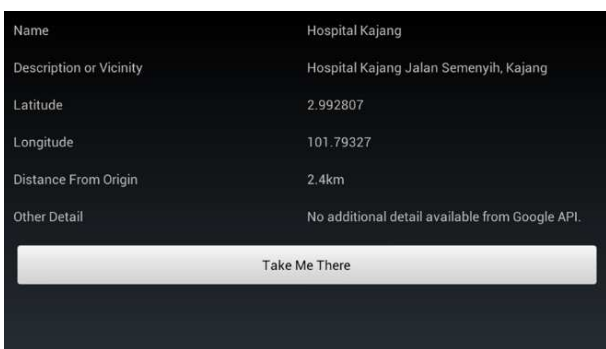


Fig. 9 Display all additional information

Next, Fig. 10 shows an example of additional information from the Geonames-Wikipedia web service when Wikipedia markers are being clicked. Note that Wikipedia provides a better description of the vicinity and other details. Standard information such as the latitude and longitude of the location and distance to reach location is being provided by all APIs.

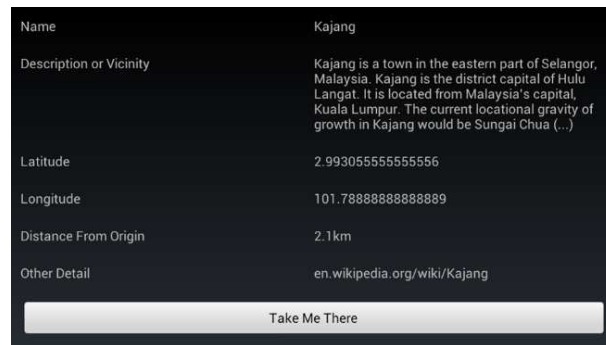


Fig. 10 More detailed information

To acquire the knowledge on how to reach to the POI, users can first click any POI marker that is desired. Once additional information is displayed, users can then click the “Take Me There” button. Fig. 11 shows the display on the mobile display.

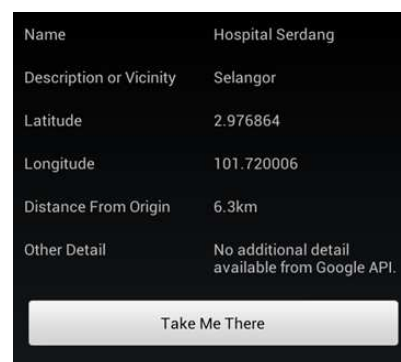


Fig. 11 Mobile phone user interface on POI: Take Me There

Fig. 12 shows that once the button is clicked, a list of options or intents will be displayed. Users can open up any navigator application for navigation purpose, but it is highly encouraged to use Maps since the intent is being declared with Google Maps in mind. The next figure shows that once the map application is being loaded, the application will have the destination coordinates. This is because Footprint will send device coordinates as a source, and POI coordinates as a destination for any navigator intent that will be launched. For Maps, simply click the Start button on the bottom right, and the application will navigate for the user.

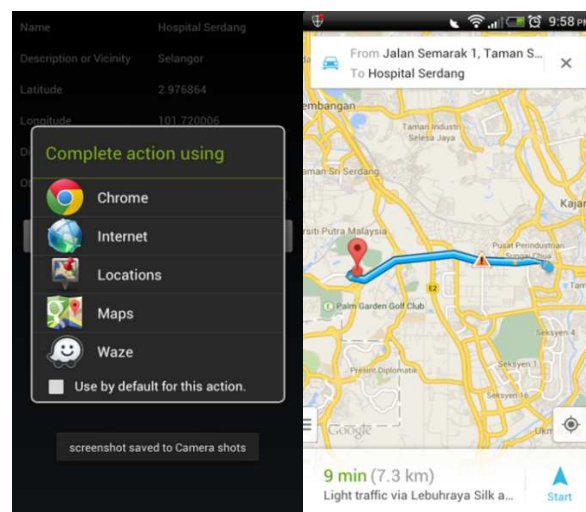


Fig. 12 Google map navigation

IV. CONCLUSIONS

This paper presented the design and development of Footprint, an android-based tourism information search application that capitalized on the mixed reality methodology. The benefit of Footprint is two-fold. First is cost elimination on physical information materials such as tourism brochures, maps, and pamphlets. Second is time-saving for searching travelling-related information, such as restaurant, hotel, and landmark. Footprint also presents added values such as a free promotion for merchants because Footprint is capable of presenting overlay information on geo-tagged tourism objects as far as 30 meters away. In addition, Footprint provides an entirely new information seeking experience to the users, whereby overlay information is displayed on the phone screen by just pointing the mobile phone camera to the direction of the tourism object.

However, there are only two limitations that would critically affect the performance of Foot-print. The first limitation is the constant requirement of Internet connection. Unlike other similar applications (there are actually less than 3 applications with the same functionality), Foot-print does not store geographical data locally for the sake of minimizing application size and reduce device workload. This means Footprint will have to acquire geographical data through online method, as it has shown on Data Retrieving Logic chapter. Footprint requires sending HTTP GET request to geographical web services, only then it could retrieve JSON that carries geographical information. Without an Internet connection, Footprint will not be able to display information overlay on the screen, because Footprint will inevitably fail to retrieve JSON text from web services.

Secondly, Footprint requires mobile phones with a back camera. Realistically, smart devices with no back camera are almost non-existence, but nothing is sure in this world. Not too long ago, a Singapore mobile device company has launched a camera-less android smartphone that comes with v4.0.3 Ice Cream Sandwich version. Even though the application should work within an environment that has no camera, because the main concept of retrieving and displaying result is through sending HTTP GET request, acquire the information, and paint the icon on screen whereas camera view is just for aesthetic purposes, the application behaviour is still unknown in the camera-less phone.

If device requirements and platform can be considered as a system limitation, then it is an arguably acceptable limitation that has been set by the markets. Footprint strictly requires devices that run on an android platform with the minimum of Gingerbread version 2.3.3. Realistically, application with platform restriction and platform versioning is hardly a distinct limitation, because it suffers by almost all programs and applications, especially those applications that are not mainstream and designed to be platform-specific. Ultimately, Footprint does have its system limitation on what environment it could work in, but the same limitation could be said to apply to almost every application in the market. The requirement of needing an Internet connection is the only turning point here, where it would transform Footprint from a mixed reality tourism application into a useless camera-view application.

In the future, Footprint is hoped to capitalize on crowd-sourcing information to provide a sense of community-based, tourism-adventuring and to make recommendations based on user ratings. This will encourage a highly personalized information seeking activity based on real environment. This experience would one day become a trend, as when more reality-environments will be shaped into surreal, yet virtual alternatives through Internet of Things (IoT), where it aims to offer ubiquitous resource access through multiple devices, networks, and user content [12], [13].

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