A NEW RESIDENCE DETERMINATION METHOD FOR USER AUTHORIZATION IN GEOSOCIAL NETWORK NEIGHBORHOOD

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ABSTRACT – Geosocial network neighborhood application allows user to share information and communicate with other people within a virtual neighborhood or community. User authorization is an essential part in a geosocial network neighborhood, to specify access rights and privileges to resources. Therefore, determination of residence status is important to enforce access control in the virtual neighborhood. In this paper, a new method for user authorization using residence determination status is presented. To identify residence status, a combination of successful self-check-in track record and minimum amount of threshold frequency is needed to upgrade user profile. As a result, the proposed method enables the geosocial application to represent different user profile: temporary and permanent residency.

1. INTRODUCTION

Geosocial network neighbourhood is one of the branches in social networking that allow user to share information and communicate with other people within a virtual neighbourhood or community. Typically, geosocial networking application uses location awareness to track geolocation information that consists of current user location coordinates; longitude and latitude. Location-aware features in users' mobile device will assist GPS self-check-in function to match users' house address and current location. Some research has been done on location-awareness in geosocial networking such as geo-social metric for distance matter [1], privacy in geo-social networks [2], location recommender [3] and new clustering technique in geo-social network [4].

However, none of the current studies have address user authorization problem for safer virtual neighborhood environment, particularly using location-aware features. User authorization is an essential part in a geosocial networking application. Authorization is the function of specifying access rights or privileges to applications' resources. In virtual neighborhood, it is important to differentiate whether a resident is staying within its own living areas in order to enforce access control in the virtual neighborhood application.

2. METHODOLOGY

2.1 Resident Engagement Incentives

In order to determine residence status, Shi et al. suggested to consider the time-span of user visits to places and the multiplicity of user visits to a place to cluster places [4]. However, they do not provide any empirical work regarding this. Following their suggestion, this study proposes a new residence determination method called resident engagement incentives that will be used to determine residence status through their successful self-check-in track record. In the context of this study, resident engagement incentives is defined as: *user participation in the geosocial network neighborhood by self-investing personal resources, such as time and physical energy.*

Resident engagement incentives have two engagement profiles to categorize residents in different groups: temporary residency and permanent residency. User with cumulative incentives point less than threshold value is categorized as temporary residency whereas user with high cumulative incentives point that surpass the threshold value is categorized as permanent residency. User with temporary residency status indicates that the user have not been verified in the neighborhood.

Resident engagement incentives is an accumulated point system that use mobile phone GPS to track user location. During registration, user needs to state its home address. Geosocial neighborhood application will track user location through the GPS sensor with accuracy of 10 meter. Most Malaysian workers might have working hours from 8am to 6pm. Thus, to increase possibility of tracking user home address, the application will track user location for every six hours, starting at 2am, 7am, 2pm and 7pm respectively. Only one successful verified track record is needed within this four subsequent time in a day. Successful verified track record will be saved into database.

2.2 Identify Threshold Frequency

To identify residence status, a combination of successful self-check-in track record and minimum amount of threshold frequency is needed to upgrade the user profile. Therefore, the threshold frequency should be identified to determine residence status.

In Malaysia, there is a ruling that explains the determination of residence status for individuals. Income Tax Act 1967 (ITA 1967) Section 7 and subsection 7(1B) are related to this ruling. The purpose of determination of residence status is to charge income tax on the individuals. The residence status for tax purpose is determined based on the number of physical presence (182 days or more) of that individual in Malaysia in a basis period for a year of assessment and not by his

nationality or citizenship [5]. Thus, 182 will be the threshold frequency to determine residence status of user.

Referring to this guideline, we produce Equation (1) to determine the residence status for geosocial neighborhood application. A GPS check-in of a user *i* is the day in which the user stays at its own living place. A user GPS coordinates will be recorded on that particular day if GPS coordinates match with the user home address coordinates. A_i is the check-in date in which the GPS coordinates are recorded for the user *i*. *F* is defined as the threshold frequency for accumulated days of user GPS record.

$$a_i = \frac{|A_i|}{F}, a \in (0,1) \quad (1)$$

3. RESULTS AND DISCUSSION

In this section, snippet of users' geolocation coordinates record in database and determination of residence status are presented. In this application, Javascript programming language is used to implement the location-aware technique to track user location with GPS, set a timer to track user, and save successful record into database.

A total of sample dataset of track record with different frequency has been tested on the proposed method based on the threshold frequency. Each dataset refers to verified user track record with date. Each track record is described by RID, Date, Latitude, Longitude and UserID. The RID field is the unique record ID. The Date field indicates the date of verify track record. The Latitude and Longitude field is the GPS coordinates of resident user. Finally, the UserID field is a unique user identifier in the project.

RID	Verify_Date	Latitude	Longitude	UserID
1	2017-03-21	2.24635	102.277624	1
2	2017-03-21	2.246399	102.277737	2
3	2017-03-21	2.246428	102.277841	3
4	2017-03-21	2.246409	102.278027	4
5	2017-03-22	2.24635	102.277624	1
6	2017-03-22	2.246399	102.277737	2
7	2017-03-22	2.246428	102.277841	3
8	2017-03-22	2.246409	102.278027	4

Figure 1 Dataset in database

Results show that the proposed method has successfully determined residence status based on the residence engagement incentives and threshold frequency. Residence status is labelled with "temporarily" or "permanent".

User ID	Verify Track Record
1	311
2	104
3	5
4	4

Threshold Value:
182 Result

ID	Cluster ID	Status
1	1	Permanent
2	2	Temporarily
3	3	Temporarily
4	4	Temporarily

Figure 2 Result of Residence Determination

4. CONCLUSIONS

In conclusion, a new residence determination method has been suggested for geosocial network neighbourhood application. This method uses location-aware features on mobile devices to record users' geolocation coordinates. A combination of successful self-check-in track record and a pre-defined threshold frequency on user geolocation coordinates record will determine residence status: temporary or permanent. The proposed method has achieved promising results that can determine residence status in a virtual neighborhood or community. The proposed method contributes to a new way for user authorization in a geosocial network neighbourhood application. Future extension of current work will include participants' involvement parameters: daily devoted time, and number of daily task; as part of the resident engagement incentives in determining residence status for geosocial neighborhood application.

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