

# Integrating User Preference with Theft Identification and Profile Changer in LBSNs

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## ABSTRACT

The Location Based Social Networks (LBSNs) enable inferring User Spatial Temporal Activity preference so as to provide personalized context aware Place of Interest (POI) recommendation. However the existing systems lack in utilizing LBSN by integrating multiple locations based services to leverage the battery consumption and memory usage. Therefore POI recommendation is integrated with efficient mobile theft identification system and context aware profile changer. Algorithms such as STAP (Spatial Temporal Activity Preference), Top-K and Context Aware Profiler are used.

**Keywords:** STAP, LBSN, GPS, POI, PFR, IMEI

## I. INTRODUCTION

With the arrival of GPS- equipped smart phones, Location Based Social Networks(LBSN) has gained increasing popularity in recent years. In LBSNs ,users not only interact with their friends by sending messages, sharing photos, but also with physical Points of Interest(POIs) showing their presence in real-time,leaving their comments, etc.. These large-scale user generated digital footprints bring an unprecedented opportunity to understand the spatial and temporal features of user activity. In LBSNs, user activity is mainly represented by check-in which indicates that a user visited POI at a certain time. Along with POI categories that are often associated with user activities, we can semantically characterize the activities of a user in a place. By mining these activity records, we are able to understand user spatial temporal activity preference which can then enable various location based applications like POI recommendation.

## II. METHODS AND MATERIAL

### 2. User Spatiotemporal Activity Preference

#### 2.1 User Place of Interest Recommendation

Modeling user spatial temporal activity preference incorporates a novel user Spatial Temporal Activity

Preference (STAP) model for personalized POI recommendation is able to improve the user experience of location based services. However, modeling user spatial temporal activity preference from user check-ins is not trivial. Since the check-in data is usually sparse and is represented as user-location-time-activity quadruples it is difficult and complicated to directly discover the regularity from such sparse high-dimensional data. Thus to capture the spatial features, instead of segmenting a city into grid cells, Personal Functional Regions are built for each user using their check-ins, which can then be used to infer ones spatial activity preference. To resolve the data sparsity problem in capturing temporal features, similar user's activities are exploited and temporal activity preference model are collaboratively built. Finally a context-aware fusion framework is proposed to combine them together.

#### 2.2 User Preference Modeling Based on PFR

Preference modeling is done through spatial and temporal activities of a particular user in a independent way and then clubbing together. First the Spatial preference of a user is calculated by identifying the frequented region of a user. *Frequented Region:* A region is a geographical area with a center  $l$  and a radius  $d$ . Region  $r$  is a frequented region of user  $u$  if and only if user  $u$  has performed more than  $s_{freq}$  of one's total check-ins,i.e.,a region is said to be a frequented region if user

check in frequently in particular area and is calculated as a ratio between check-ins in that region to total check-ins is greater than the frequency threshold ( $\text{freq} = A_u, r/A_u \geq s_{\text{freq}}$ ). In this,  $l$  and  $d$  determine the location and size of the region. The threshold  $s_{\text{freq}}$  determines the lower bound of the frequency  $u$  visits  $r$ . To describe individual's functional regions, user's activity diversity in one's frequented regions are quantitatively measured. Since User's activities in their frequented regions usually fall in few categories rather than all of the existing categories,  $C_l^d$  of  $C$  (POI categories). Measurement of how deterministic one's activity is in a frequented region  $r$  is done by calculating the difference between the entropy of the user's actual activity distribution and maximum entropy of the activity distribution in  $r$ . The maximum entropy of the activity distribution  $H_{\text{max}}(C_l^d)$  is calculated as:

$$H_{\text{max}}(|C_l^d|) = \log_2 |C_l^d|$$

*Ratio of preference bias:* For a user  $u$  and one of their frequented regions  $r$ , the ratio of preference bias measures the fractional difference between the entropy of user's  $u$ 's activity distribution in region  $r$ ,  $v_{u,r}$  in  $r$  and the maximum entropy of the activity distribution in  $r$ , which is calculated as follows,

$$\text{ratio}_{\text{PB}} = \frac{1 - H(v_{u,r})}{H_{\text{max}}(|C_l^d|)}$$

Higher value of  $\text{ratio}_{\text{PB}}$  implies the stronger activity preference bias of  $u$  in  $r$ . Since the PFR of a user should be an area where the user has strong activity preference.

*Personal Functional Region:* A PFR  $r_u$  for user  $u$  is a user frequented region where  $u$ 's activities have higher ratio of preference bias i.e.,  $\text{ratio}_{\text{PB}}$  is greater than equal to a threshold  $s_{\text{ratioPB}}$

The user check in is sorted in a descending order and evaluated for PFR for each check in by considering the nearby region around the check in. The Region should be a frequented region as well as the particular user has strong preference bias on that frequented region and that is considered to be a Personal Functional Region for the user. Temporal preference is calculated by collaborative preference for every One hour time epoch in a week.

Temporal Activity Preference is calculated based on the temporal patterns of similar users.

### **PFR Implementation Algorithm:**

Input: array list<PFRbean>, item list, place type

Function call:

Showdialogbox("pick place type", items)

Function definition:

```
1. void dialogbox(string type, string items[])
    void onClick(DialogInterface dialog, int which, Boolean
    isChecked)
        if isChecked
            add selected items
            .setPositiveButton("OK", new
            DialogInterface.OnClickListener()
            void onclick(DialogInterface dialog, int which)
            if selected items != null
                if (type)
                    PFRbean.setType(selected
                    items)
                    getNearbyLocation()
                else
                    PFRbean.setloc(selected
                    items)
                    selectTime(selected items)
            .setNegativeButton("Cancel", new
            DialogInterface.OnClickListener()
2. void getNearbyLocation
    Uses google maps
    Accept latitude and longitude coordinates and
    proximity radius
    PFRbean.getType()
3. void selectTime(type)
    Get current date
    Launch date picker dialog
    Showdialogbox("choose" location list)
    Get current time
    Launch time picker dialog
    Get activity and if it is new checkin, add it to
    PFRbeanlist and use it the next time if checkin happens at the
    same place.
```

### **3. User Mobile Identification and Profile Building**

First the Registration is carried by identifying the user mobile by retrieving the parameters like sim numbers and memory card identity number. If the mobile is a

dual sim mobile both sim numbers are registered in a local database like sqlite. The current GPS coordinates are also recorded. User has to give some additional parameters like additional mobile numbers, mail id so our application will send sms and mail to the particular mobile number and mail id regarding theft or any monitor able activities regarding user phone. After User mobile registration user can sign into the application and can set up a context aware profile.

#### ***Profile Building Algorithm:***

Input: location name, latitude and longitude coordinates

Checkbox:Bluetooth,wifi,sync

1.Get activity from sqllite db

2.Use hash maps to store profile modes such as("home",0),("office",1),("others",2)

3.Get arguments –username, IMEI,longitude and latitude coordinates and active string

4.According to the location, based on latitude and longitude coordinates ,considerably changes the profile modes.

#### **4. Service Thread implementation**

The user mobile identity and context aware profile monitoring process is implemented using Service thread which runs in background. This thread is activated when user installs the application after registration and sign in process gets completed the first time. The Service Thread runs forever even the phone gets restarted by using Boot Complete Receiver. The Service Class continuously monitors GPS location and triggers the profile which has close proximity. It also continuously checks for sim number, Memory card number and IMEI.

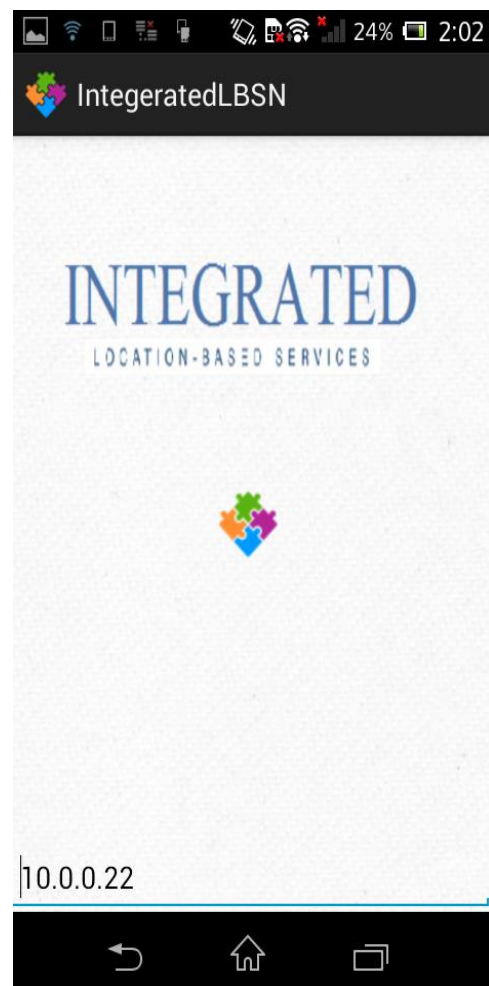
#### **5. Integrated Location Based Services (Theft and Profile Management, Personalized POI)**

All the Location based services are integrated together as all the services use location service in a continuous way when run independently. Battery efficiency and memory utility can be improved when application using similar services or resources are grouped together to give integrated services. The Service Thread continuously monitors GPS, SIM numbers, memory card number, IMEI for automatic profile change, theft identification and personalized poi recommendation and

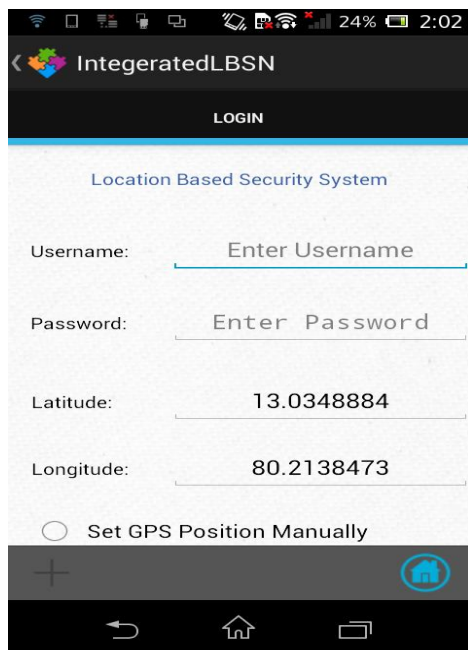
notifies user by sending sms and email to registered alternate mobile number and email provided.

The spatial and temporal preference model extracted is clubbed together to give a personalized POI recommendation. POI recommended by identifying the nearest PFR from user current location and the temporal pattern is evaluated for user activity preference and respective points of interest will be recommended for the user in a Top Down scenario based on priority. Integrated services help to improve Battery efficiency and memory utility. When application using similar services or resources are grouped together to form integrated services users can be delighted with a single touch from their smart phones to acquire services.

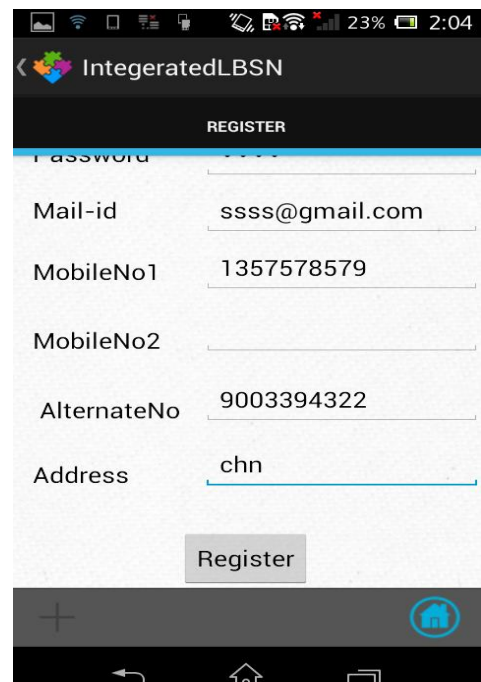
### **III. RESULT AND DISCUSSION**



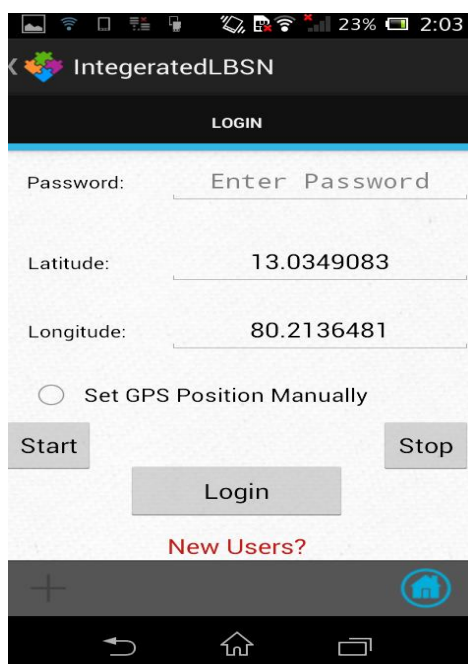
**Figure 1.** Home page of the application



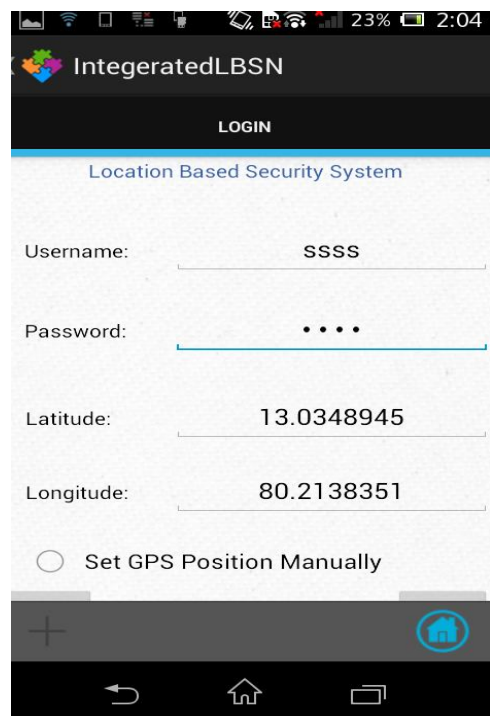
**Figure 2.** User login page and it automatically finds GPS coordinates and the user can also set GPS position manually.



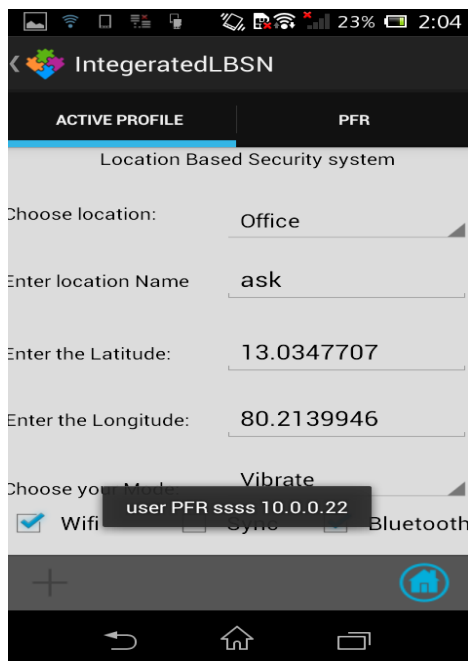
**Figure 4.** The user has to fill in all necessary details for registration.



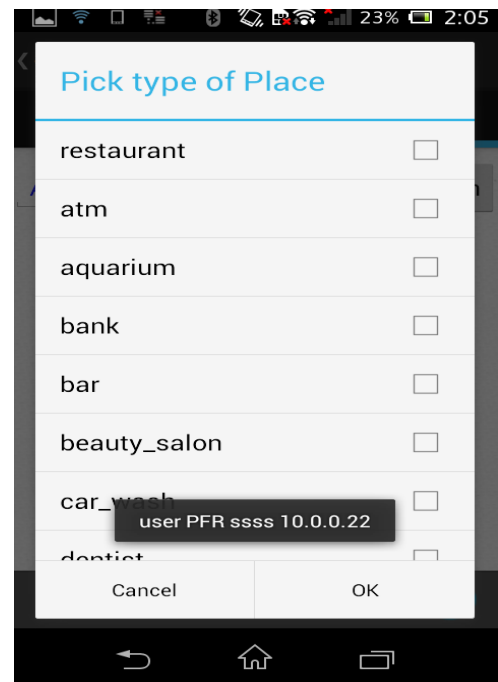
**Figure 3.** If user is a new user the application redirects to registration page by clicking on new users tab



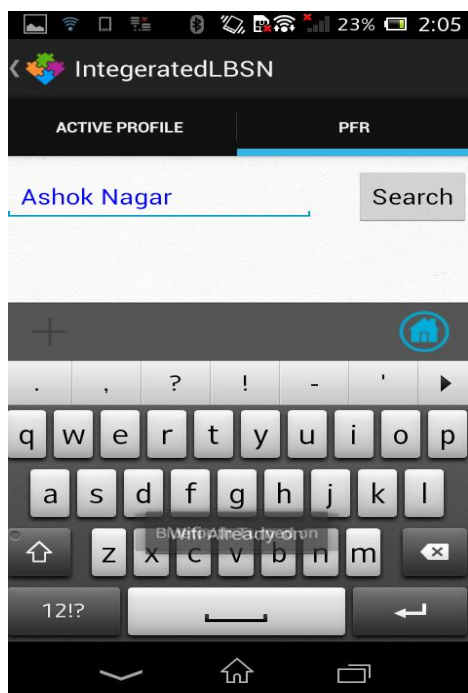
**Figure 5.** After registration the user can log in with the registered username and password.



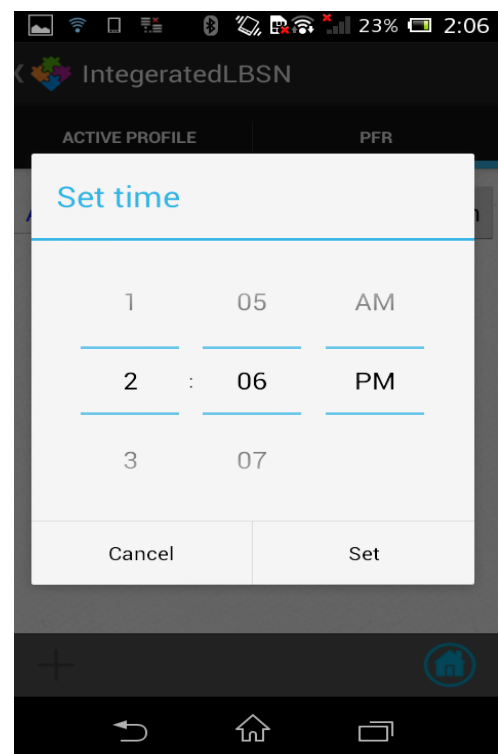
**Figure 6.** The user can set the required profile modes at various locations by selecting active profile fragment.



**Figure 8.** The user can select the desired activity from pick type of place.

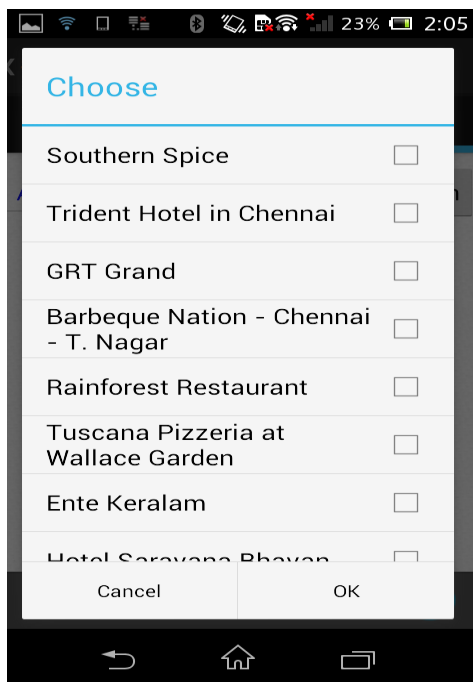


**Figure 7.** The user can select the Place of Interest in the search bar.

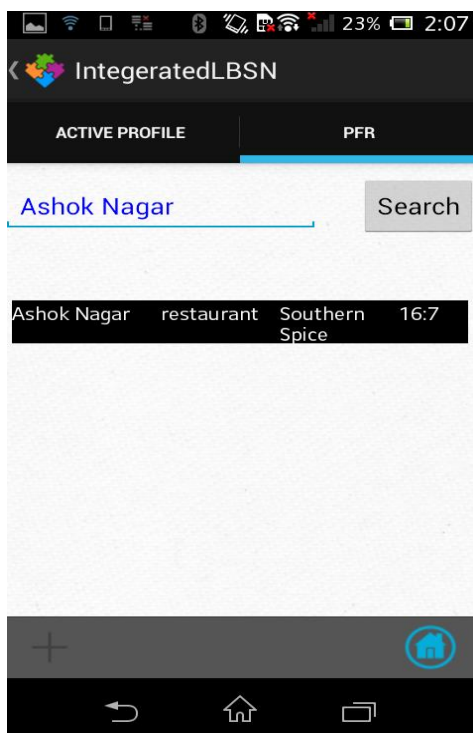


**Figure 9.** The user can set the time for the specified activity.

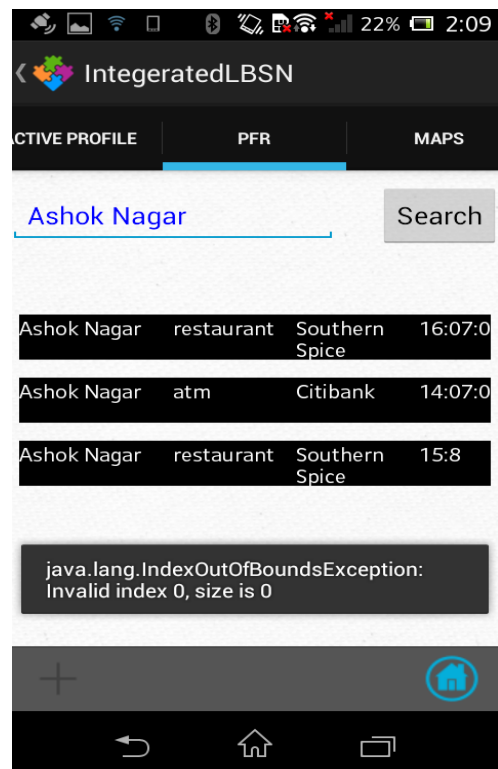




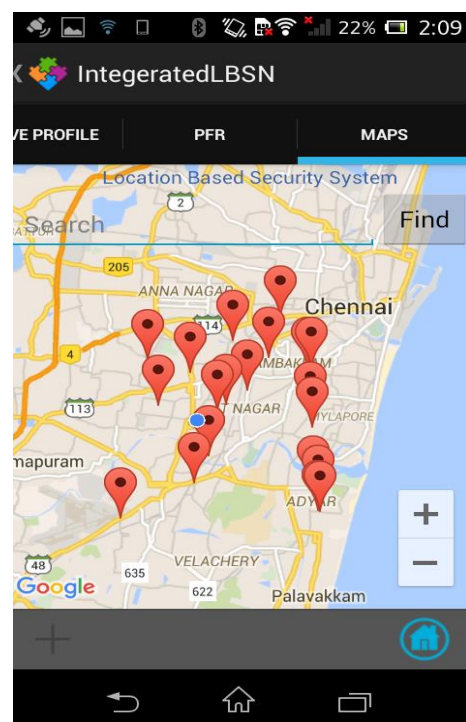
**Figure 10.** The user can then select the place of interest from a list of categories suggested.



**Figure 11.** The selected activity and place of interest is stored in sqlite database.



**Figure 12.** The similar activities stored are exploited to determine Personal Functional regions of a user in a particular region.



**Figure 13.** The map fragment gets loaded while PFR fragment usage is in progress and uses google maps to display POI recommendation.