Location and Time Based Reminder System on Android Mobile Device

Nur Rokhman
Department of Computer Sciences and Electronics
Gadjah Mada University
Yogyakarta, Indonesia
nurrokhman@ugm.ac.id

Lubab Saifuddin
Department of Computer Sciences and Electronics
Gadjah Mada University
Yogyakarta, Indonesia
lubab.saifuddin@mail.ugm.ac.id

***Abstract*— The increase of human activities has lead to the need for an activity reminder system. Nowdays, a mobile device has become a daily communication device. An activity reminder system that runs on a mobile device is more advantageous because the user does not need any additional device. Mobile device can be accessed anytime and anywhere. In this paper, an activity reminder system based on location and time has been proposed. The reminder system uses the venue on Foursquare and Google map. By using this reminder system, a notification will be given to the user when the user's location is detected either near the venue or when the time in is close to the time of the activity.**

Keywords—reminder system; foursquare; location based service

I. INTRODUCTION

Nowdays, many activities have to be done by human being to fulfill their needs, but these activities increase the possibility of a person to forget some of the activities. For example, the main activity of student is to study and sometimes needs to borrow book from the university library at the campus. Althouugh the plan has been added, it tends to be forgotten.

Since its introduction, communication technologies have been able to help people fulfill all their communication needs. It started from a cable phone which can only exchange information using the medium of sound to the smartphone which small but incorporating many advanced features such as calendar, phone book, send and receive e-mail, maps, and reminders. It has helped people in the information exchange or performing many activities.

Increasing human needs makes the activities increases. But, this makes a non-urgent activity tend to be forgotten. A reminder system was significantly effective in lowering no-show rate of patients [1][2].

A medication reminder system to increase the doctor-patient interaction has been developed [3]. The system alarm patient to take medicine and show the medicine description. The patient does not need to remember the dosage timing. A location-based reminder system architecture which elaborated the way people use, the change of people behavior and the features most influence has been proposed [4]. The system which use the GPS technology was designed to improve the performance of reminder system. An application to find public facilities by using Foursqare data has been developed [5]. By using this system, people could find the public facilities around the current position easily.

Location based services has been widely explored [6], but some people worried about the privacy when use location based services [7]. A location-based reminder system which use Google Map has been developed [8][9][10].

In this paper, a location-based service has been proposed as part of activity reminder system. This paper used a venue of Foursquare as the reference location. There are many advantages of using Foursquare such as ease of access and automatic update when the Foursquare user update the detail information of the location.

II. SYSTEM DESIGN

The reminder system was designed to utilize the GPS data from Foursquare venue APIv2 and spatial data from the Google Maps API. The reminder system architecture is illustrated in Fig. 1. The system requests to the Foursquare API for the venue and requests to the Google Maps API for the spatial data. By receiving a response from the Foursquare API and the Google Maps API, the reminder system processes the response and displays the result on the user screen. The system also requests a user's location via GPS and then check the stored data.

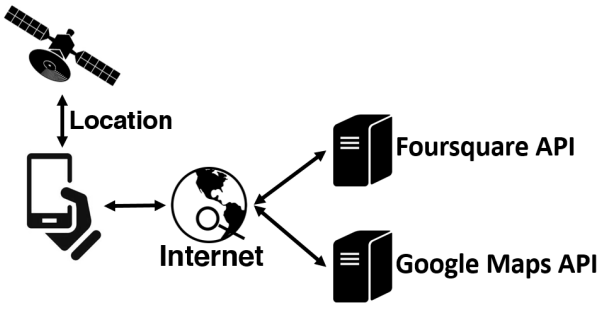


Fig. 1. System architecture of the reminder system

A. *Use case diagram*

The user of reminder system is the only actor of the system. User may do many things such as add notes, view stored notes, change or delete stored records, search the venue and start or stop services that are running on background data. The use case diagram of the reminder system is shown in Fig. 2.

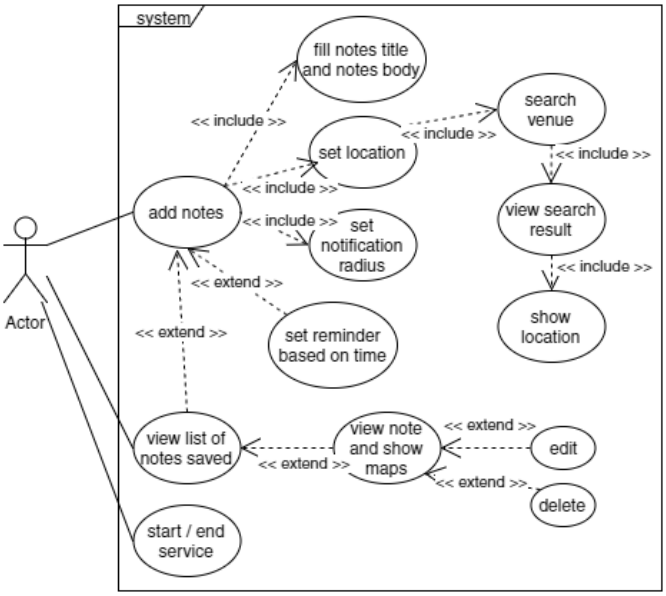


Fig. 2. Use case diagram of the reminder system

B. *Class diagram*

This reminder system uses three objects namely notes, venues, and user. Object notes represent the contents of the note created by the user. It consists of the venue identity, the title of the note, the content, and the venue. Object venue represents the venue name, address, category, longitude and latitude of the location. Object user represents the exact longitude and latitude of the user location. Object venue is a composition of the object notes. The reminder system measures the distance between user's and venue's location in the saved notes. The class diagram of this application is shown in Fig. 3.

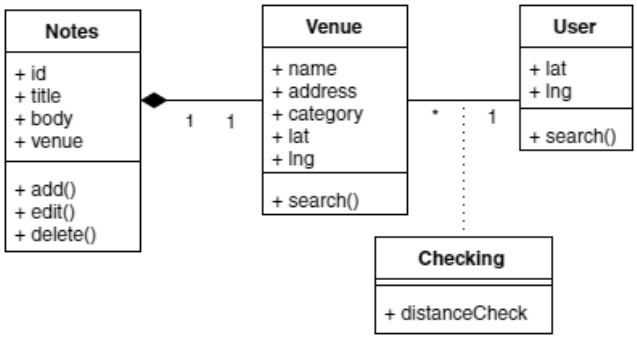


Fig. 3. Class diagram of the reminder system

C. *Activity diagram*

This reminder system is composed of several processes. Fig. 4 shows the activity diagram of the system. It consists of adding records, searching the venue and viewing the record. In the adding records process, the system will initially retrieve the data which stored in the shared preferences or the previously stored venue. This data is used when the page is being used to perform the conversion of the notes.

The reminder system facilitates the user an option to search for the venue first before storing notes by directing the user to the venue search page. The system takes data from the user input box. It consists note title, note contents and details of venues which are selected to be stored in the database system.

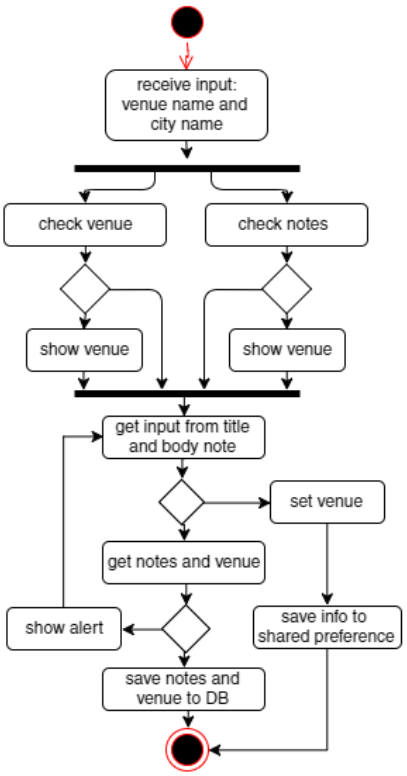


Fig. 4. Activity diagram of adding note process

In the searching venue process, a user may search location based on the input from the venue name or the nearby venue from a designated point. The reminder system requests to the Foursquare API by using input from the user. The respond will be given in the JSON format. The respond is processed and displayed on the user page in a list containing some found venues. This process is shown in Fig. 5.

The next process is searching the details of the record which stored in a map. The process is started by taking the object venue and the detail records from the shared preference. A request for a spatial data is sent to the Google Maps API. The Venue is described on a map by using a marker. In this process, the user may view the notes, modify or delete the records. These processes are shown in Fig. 6.

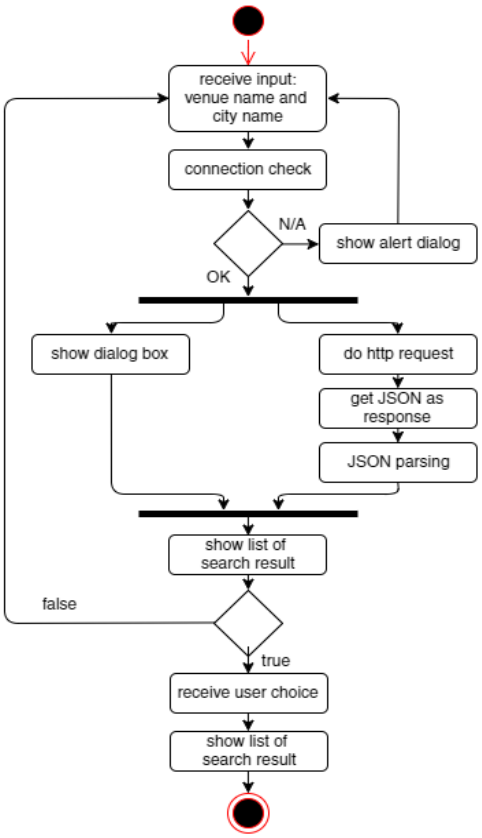
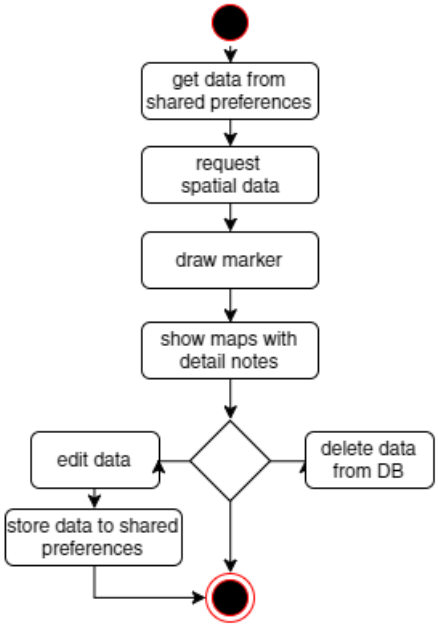


Fig.5. Activity diagram of serching venue



Fig, 6. Activity diagram of showing detail note

III. SYSTEM IMPLEMENTATION

The reminder system was implemented by using Android SDK Revision 12.1. It used Google Maps API v2 to access spatial data and Foursquare API v2 to access data from Foursquare venue. The system used the Android operating system functions, namely:

1. MAPS_RECEIVE
2. INTERNET
3. READ_GSERVICES
4. ACCESS_NETWORK_STATE
5. WRITE_EXTERNAL_STORAGE
6. ACCESS_COARSE_LOCATION
7. ACCESS_FINE_LOCATION

This paper described the major implementations namely searching the venue, saving the records and notifying when the user's location was detected within the scope of the venue.

A. Searching venue implementations

Venue search process became the primary process in the reminder system. The process was carried out either based on the name or the location of the venue. Both of them were used as the references for the request to the Foursquare API. The *HttpGet* function was used to make the request. The receiving responses were processed immediately. Detailed information about the venue name, addresses, and geographical coordinates were taken from the object. These object components were inserted into the hash map array. Then, an array of adapters was used such that the object could be shown by using *ListView* function. These processes are shown in Fig. 7.

```
HashMap<String, String> venueListHash =
new HashMap<String, String>();
venueListHash.put
(TAG_response_venues_name, name);
venueListHash.put
(TAG_response_venues_location_address,
address);
venueListHash.put
(TAG_response_venues_categories_pluralName
, pluralName);
venueListHash.put
(TAG_response_venues_location_lat, lat);
venueListHash.put
(TAG_response_venues_location_lng, lng);
venueList.add(venueListHash);
```

Fig. 7. Inserting object into the array list

B. Writting note implementations

The reminder system stored the data which consist the activity title, the activity contents, the venue name, the venue location, the category, the distance, the geographical coordinates, and the time limit. Distance was used as a parameter to the reminder system. All information was stored in the form of a string into the SQLiteDatabase. SQLiteDatabase is an Android database system. As a user saved an activity data, the application checked whether it was a change from an old activity data or a new activity.

C. Service implementation

The user of reminder system might turn on or turn off the service from the application's main menu page. When a users

activated the service, the reminder system took the geographical coordinates form of the user's location. Checking method was carried out by calculating the distance between the user's location and the location of each venue in the stored data.

As shown in Fig. 8, the check location algorithm was activated by the change of the current location of the user within the specified timeframe. As soon as the user's location changed, the system recalculated the distance between the user and the venue. When the distance was smaller than the specified parameter then the reminder system notified the user. The notification contained the record stored with the venue. The checking was repeated for all the records stored in the database system.

```
if(distance < Double.valueOf(nts.getRange()))
{ Notif.createNotification_(_context,
  String.valueOf(nts.getID()));
  Log.v("dihapus",nts.getName());
  listNotes.remove(index);
  index -= 1; }
```

Fig. 8. Distance checking process

IV. RESULT AND DISCUSSIONS

In this paper, a reminder system based on location and time has been developed. The Google Map and the Foursquare were used to provide the location data. The reminder system showed the location on a digital map (Fig. 9). By using this digital map, the user could set the location and save the note (Fig. 10). Whenever the user of the reminder system was near the location, the system alarmed the user and showed the note (Fig. 11).

By using this reminder system, a user could set a reminder to an activity to be activated either by location, time, or both location and time (Fig. 10). A note of an important activity should be activated by both location and time. Peoples tend to be a procastinator. A long time activity tends to be forgotten. By using the reminder system, whenever the user approaches the activity location, the reminder system remind the user to do the activity, since the user already near the location, even though it was far from the deadline. The reminder system would alarm the user when the activity almost reaches the deadline.

A unimportant activity or a long term activity could be notified based on the location. The notification would be activated when the user near the location.

The reminder system was equipped with the location search facility (Fig. 12). A user might write a location name. The system would show the location name which contained the written location name. The system would show the map of a location, as soon as the user choose a location name from the location name list. This facility assured the user not choosing the wrong location.

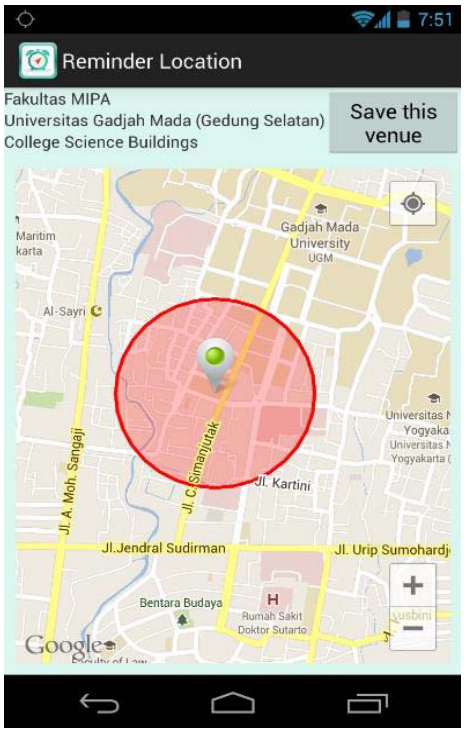


Fig. 9. Map of a venue.

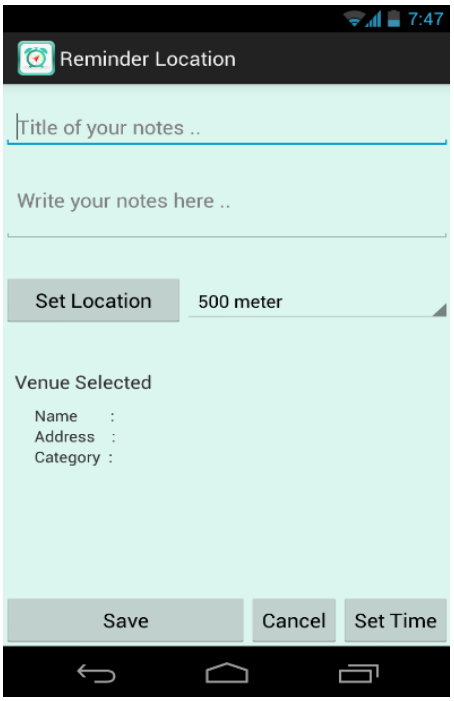


Fig. 10. The interface of saving note process

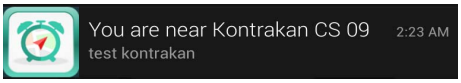


Fig. 11. Location based reminder

Fig. 12. Location search facility

V. CONCLUSIONS

Based on the design, implementation, and testing of the system, it that can be concluded that :

1. A reminder system which works based on the venue location and activity time has been completely developed. The system was built by using the APIs of Foursquare and Google Maps. This system also used spatial data from Google Maps to describe the location of the original venue in geographical coordinates.
2. Based on the testing results, the system was able to notify the user when the user was in the radius parameters of each venue location. The system provided notifications when a note was detected approaching the deadline.
3. An note of an important activity might be alarmed based on the activity location and the activity time.

REFERENCES

[1] A.Parikh, K. Gupta, A.C. Wilson, K.Fields, N.M. Cosgrove, and J.B. Kostis, "The Effectiveness of Outpatient Appointment Reminder Systems in Reducing No-Show Rates", The American Journal of Medicine (2010) 123, 542-548.

[2] S. McClean and M. Perera," The Use Of Short Message Service (SMS) For Patient Appointment Reminders", Journal of Mobile Technology In Medicine, Vol. 1, Issue 3, Sep 2012

[3] D. Ameta, K. Mudaliar, and P. Patel, "Medication Reminder And Healthcare – An Android Application", International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT), Vol. 6, No. 2, June 2015.

[4] P. Shah, R. Gadgil, and N. Tamhankar, " Location Based Reminder Using GPS For Mobile (Android)", ARPN Journal of Science and Technology, Vol. 2, No. 4, May 2012.

[5] G.S. Budhi and R. Adipranata, "Public Facilities Location Search With Augmented Reality Technology in Android", International Conference on Information, Communication Technology and System (ICTS), 2014.

[6] M. Mohammadi, E.Molaei, and A. Naserasadi, "A Survey on Location based Services and Positioning Techniques", International Journal of Computer Applications (0975 – 8887) Vol. 24, No.5, June 2011.

[7] H. Yun, D. Han, C. C. Lee, " Understanding The Use Of Location-Based Service Applications: Do Privacy Concerns Matter**?",** Journal of Electronic Commerce Research, Vol. 14, No 3, 2013.

[8] M. Singhal and A. Shukla, "Implementation of Location based Services in Android using GPS and Web Services", IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 1, No 2, January 2012.

[9] Y.B.Thosar and V.P. More, "Location Based Task Reminder System Using Android Mobile", International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882, Vol. 4, Issue 3, March 2015.

[10] K. Singhal, G.Rane, A. Ambre, N. Surve, J. Sonawane, " Location Based Reminder: An Android Application", International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 5, Issue 1, January 2015.