

Participatory Sensor Network Based Emergency and Rescue Management System in Beach

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Abstract:

Due to the weak connection on the beach sometimes people are finding it hard to communicate the rescue team for any type of incidents that happens on the beach, the rescue team takes unreasonably long time to respond. In this paper, the importance of Participatory sensor network system based on the beach Application is described for rescue management at the beach area. The objectives behind conducting this application are to reduce the response time of the rescue teams and the incidents. The application requires to be installed in the user's smartphone. The application use pass by pass method using PSN. The benefits of the application is helping people in shortest amount of time, helping volunteers based cooperation, and spreading emergency situation among the people in short amount of time.

Keywords:- Sensor; network; emergency; beach; safety; rescue

1. INTRODUCTION

Beach management is vast area of study which includes coastal protection, coastal communication service, recreation and peoples safety. In this new era, several approaches has been adapted in beach management as it is consist of multidimensional system that includes socioeconomic, natural, technical and administrative elements intact [1]. It is crucial to know the hydrodynamics of the beaches as the beaches serve as basis for economic activities and trading, ecosystem for marine life and finally beaches are coastal protection [2].

Beaches is a very dangerous place and is also the most common spot as holiday destination. However, beaches are exposed to nature climate change which may result in an emergency situation [3]. Thus, for managing the beaches, a proper integral system function is required. One of the important element which needs attention is the rescue management system [4]. A good rescue management system comprises of several element such as network connectivity, search and rescue team and emergency action.

For beach management, its safety is influenced by its nearshore conditions which may cause the risk of injury or drowning. Thus proper communication is

required to enhance the safety of the people at the beach. Several works has been reported in investigating the steps to improve safety and communication at the beach and costal areas. Grilli et al.[5] reported the application of high frequency radar for tsunami detection at the beaches. Alvarez-Ellacuria et al.[6] reported on beach hazard management based on real time high alert system. Also, a nearshore sea activity forecasting system was reported by Alvarez-Ellacuria et al[7].Salvador et al [8] studied metabolic responses by performing rescue simulation analysis on Life guarding at surf beach. Eom et al.[9] demonstrated a work on forecasting system for Rip currents at the beaches. Zhang, Z et al.[10] demonstrated a rescue and oil spill detection system with an operation numerical model.

Due to the weak connection on the beach sometimes people are finding it hard to communicate the rescue team for any type of incidents that happens on the beach, the rescue team takes unreasonably long time to respond [11]. Thus in this work, the importance of Participatory sensor network system based on the beach Application is described for rescue management at the beach area. This work aims to fill the gap and design a mobile based software application which will help the rescue teams timely and have prompt notification of the event which happened.

This project is using the Participatory sensor network (PSN) concept which refers to sharing information between public and professional users to share and analyses the local knowledge and architecture to enhance data credibility, quality and most important privacy. It combine application model that involve participation at personal, social and civilian scales. In this work, PSN method was used to make people communicate to each other to be aware about the incident that happened. To do that will let at least two mobiles devices communicate to each other by sending a message using Android system.

2. DESIGN AND IMPLEMENTATION

2.1 User case Diagram View

Figure 1 shows the user case-user and system. Based on Figure 1, Use case diagram shows all functions a user and the system can do while using the application.

Figure 2 shows the context model of the application. The proposed application comprises of 7 major features as shown in Figure 2.

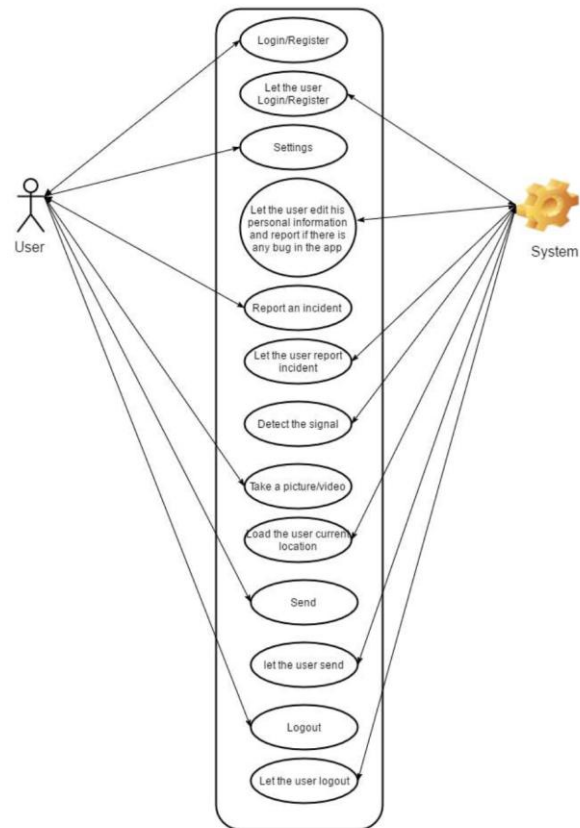


Figure 1. Usecase - User and System

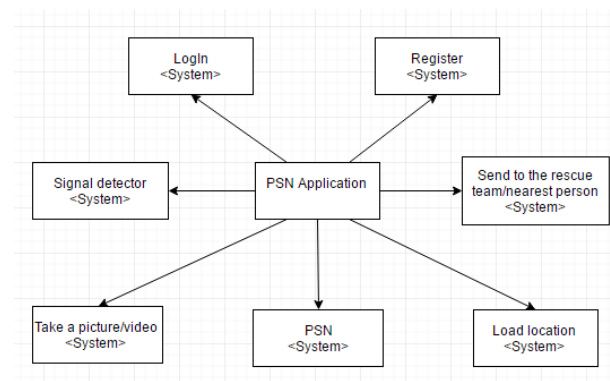


Figure 2. Context model

2.2 Technique

For the safety and security of Coast guards the application will be developed to help the users to report any type of beach incidents. One of the features of the application that it can track the user's location through

Geographical Information System (GPS). Through this application it will fetch the user location automatically once the user clicks on reporting incident button. Other feature is that the user is able to take either one picture or 5 second video of the incident and this information will be send to the rescue team via E-mail. The process of sending is by two techniques, in this project we have two scenarios that will be using these two techniques.

1.Mobile data network technique:

If the user have good Mobile data connection he will be able to send his location and the picture / 5s video via Mobile data and the report will be broadcast with the given information telling the other users that the report incident it has been sent to the rescue team, the benefit of this broadcast that there may be someone who could help the victim while the rescue team is coming.

2. Bluetooth technique:

If the user does not have good Mobile data connection he will send his location via Bluetooth with broadcasting of range nearly 100m and the report will be broadcast with the given information to the other users telling them that this report has not been sent to the rescue team due to lack of connection the benefit of this broadcast that it may reach to someone who has a connection that he will be able to send it directly to the rescue team also there may be someone who could help the victim while the rescue team comes.

2.3 Major codes in the implementation

The codes used for this application is discussed as follow. Based on the code, the main task is to enable the Bluetooth automatically once the user open the application.

```
BluetoothAdapter mBluetoothAdapter =
BluetoothAdapter.getDefaultAdapter();
mBluetoothAdapter.enable();
mBluetoothAdapter.startDiscovery();
```

The algorithm start which will check the speed and decide action accordingly to the speed if it is slow then open just location intent based on this code.

```
ConnectivityManager connManager =
(ConnectivityManager)
getSystemService(CONNECTIVITY_SERVICE);
NetworkInfo wifi =
connManager.getNetworkInfo(ConnectivityManager.
TYPE_WIFI);
NetworkInfo mobile =
connManager.getNetworkInfo(ConnectivityManager.
TYPE_MOBILE);
```

If the user wants to send through Wi-Fi will be calling the Wi-Fi manager and will be using the Wi-Fi service it will check if it's larger than 14 open PostHomeActivity class else if it is less the 14 open Post2HomeActivity class same thing goes to TelephonyManager and if the user doesn't have neither the application will not allow the user to access the PostHomeActivity classes.

```
if (mWifi.isConnected() == true) {
final WifiManager wifiManager =
(WifiManager) getSystemService(Context.WIFI_
SERVICE);
final WifiInfo connectionInfo =
wifiManager.getConnectionInfo();
if (connectionInfo.getLinkSpeed() > 14)
startActivity(new
Intent(HomeActivity.this, PostHomeActivity.class));
else
startActivity(new
Intent(HomeActivity.this, Post2HomeActivity.class));
} else if (mMobile.isConnected() == true)
{
TelephonyManager
tm = (TelephonyManager) getSystemService(Context
.TELEPHONY_SERVICE);
if (tm.getNetworkType() > 14)
startActivity(new
Intent(HomeActivity.this, PostHomeActivity.class));
else
startActivity(new
Intent(HomeActivity.this, Post2HomeActivity.class));
}
else
```

```
Toast.makeText(HomeActivity.this, "Disconnected
From Internet",
Toast.LENGTH_SHORT).show();
```

The follow code is to request from the user to give the permission for the application to access. If not the application will not work.

```
mLocationRequest= LocationRequest.create();
mLocationRequest.setPriority(LocationRequest.PRIOR
ITY_BALANCED_POWER_ACCURACY);
```

The next code will update the location when it is changed.

```
public void onLocationChanged(Location location)
{
    func.Lat = location.getLatitude();
    func.Long = location.getLongitude();
}
```

This function is mainly for Receive Bluetooth process it is for fetching the file when the user accept it we have three cases of where will the file be saved and where do we fetch it.

- 1) downloads/bluetooth";
- 2) bluetooth"; and
- 3) "/Downloads".

Every device saves it in different file so we considered it all

```
File s =
Environment.getExternalStorageDirectory();
String u = s+"/downloads/bluetooth";
String v = s+"/bluetooth";
String x = s+"/Downloads";
String msg;
StringBuffersb = new StringBuffer();
BufferedReader bf = null;
try {
    Dir = new File(w.toString());
    file = new File(Dir, "temp.txt");
    if (!file.exists())
    {
        Dir = new File(u);
        file = new File(Dir, "temp.txt");
        if (!file.exists())
        {
```

```
Dir = new File(v);
file = new File(Dir, "temp.txt");
if (!file.exists())
{
    Dir = new File(x);
    file = new File(Dir, "temp.txt");
    if (!file.exists())
    {
        Toast.makeText(context, "Unable to Location
Bluetooth Download
Folder", Toast.LENGTH_SHORT).show();
        finish();
    }
}
}
```

Finally, the code below function is to read from the file that the application fetched.

```
FileInputStreamfileInputStream = null;
fileInputStream = new FileInputStream(file);
InputStreamReader is = new
InputStreamReader(fileInputStream);
bf = new BufferedReader(is);
}
```

2.4 Prototype

Figure 3 to Figure 6 shows the prototype of the application. This will be visible to the user.



Figure 3. Homepage of Rescue Team application

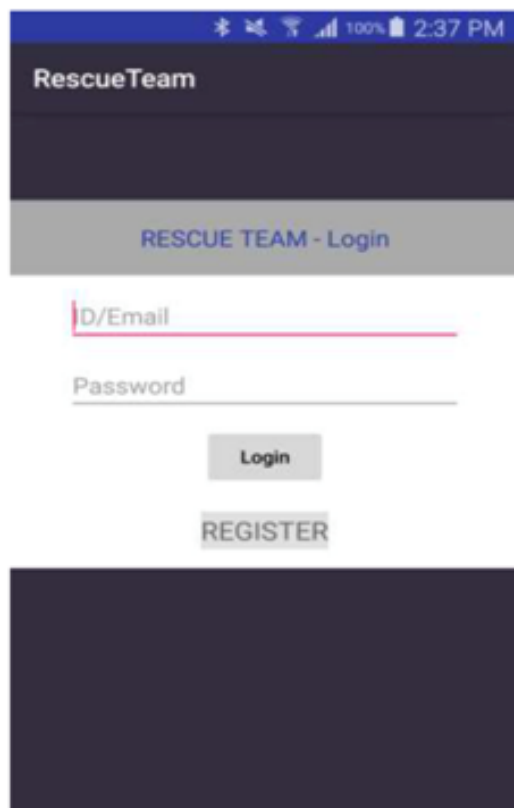


Figure 4. Sign in Page of Rescue Team application



Figure 5. Good Signal shown by the application

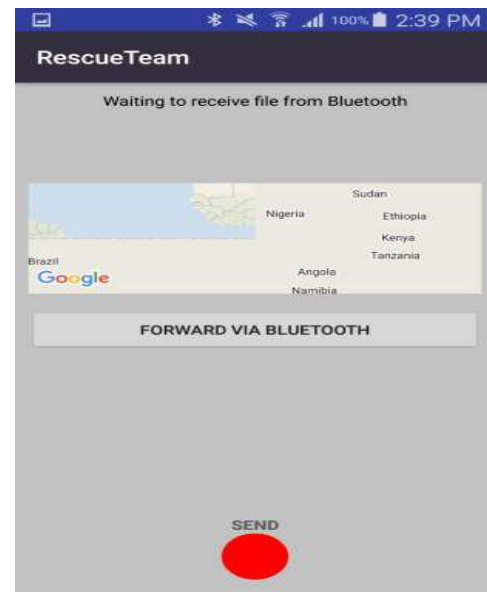


Figure 6. Weak Signal shown by the application

3. Analysis

3.1 Acceptability Analysis

Based on the results of this study 60% of the people were in favor of the application that will help them at the beach to report any incidents, while 40% not in favor. The reason for the people to be in favor that most of them find it hard to communicate to the rescue team due to the weak communication. So the application will help rescue team to reduce the response time to the incidents

3.2 Feasibility Analysis

There are some conditions that makes the application achievable such as the user has to have the application installed on his smart phone, the user has to know how to use the application and allow the application to use Bluetooth and these are the condition that will make the application successful. So the goal could be achieved based on these conditions. The application could work if the user have the devices with them with the Bluetooth technology and they are within the reach of the Bluetooth technology and they have to agree to communicate this way so the devices could form the PSN network that is why is considered an condition and the most important one.

4. CONCLUSION

This project showed the importance of Participatory sensor network system based on the beach Application in solving many difficulties relating to the people around the beach area. The objectives behind conducting PSN system based on the beach Application is to reduce the response time of the rescue teams and

the incidents... etc. This can be done by sharing the application with people which will help them avoiding these problems. Based on the results the main achievement was achieved because, the majority of the people were agreeing of the importance of having such an application like PSN system based rescue system in the beach Application

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