

Cheeka : A mobile application for personal safety

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Abstract—The number of users having smartphones equipped with GPS have increased rapidly. Hence, it can be used efficiently for personal security or various other protection purposes. This paper presents Cheeka, a multipurpose personal safety application developed for smartphones belonging to various platforms like Android, Windows Phone and Blackberry. It enables the user to track their Facebook friends with the timestamp of the position. If the user feels he is in danger, the application reports the location to the user's trusted contacts for every few minutes unless the user feels he is safe. Thus, it works like a security guard following behind till the person reaches a safe place. It consists of several other key features like speed monitor, panic alerts and unauthorized power offs. Cheeka also has the functionality of displaying the user's friends who are nearby through Augmented Reality. The ubiquitous nature of Cheeka leads to the cross platform application development across desktop and mobile.

Keywords—Cheeka; GPS Tracker; Facebook friends tracker; Family Safety; Speed Monitor; personal safety; travel; bodyguard; smartphone; Android; Windows Phone; Blackberry

I. INTRODUCTION

Nowadays it is not safer for a person to travel alone mainly at night. Both for men and women, there is a risk of bullying, theft or kidnap. Parents are worried about their kids hanging out or driving and if it is late at night, it becomes a nightmare for them. Furthermore, women are afraid to travel alone and they feel someone should accompany them. In addition, people are afraid of losing their costly smartphones during travel.

In this paper, we present Cheeka, a personal safety application for smartphones of various platforms like Android, Windows Phone and Blackberry O/S. The name being coined from the pug who appeared in the “You & I” advertising campaign of Vodafone’s cellular service in India [1]. The dog follows the boy in unlikely locations, prompting the tagline, “Wherever you go, our network follows”. We named our application as Cheeka since it acts as a personal security guard following the user similar to the pug in the ad.

The rest of the paper is organized as follows. Section II presents some related works. In Section III, the unique functionalities of Cheeka are explained in detail. Subsequently, the working of Cheeka is discussed in Section IV. Section V discusses the lite version of the Cheeka which is tailored for

desktop. Section VI presents the testing results and the improvements for future work. Finally, Section VII concludes the work of this paper.

II. RELATED WORK

There are a variety of general-purpose and specific mobile applications for GPS tracking including Life 360’s GPS Tracking Pro [2], RunKeeper [3], EasyTracker [4] and much more. All of these have the main function to store and display the locations of the friends on a map. In addition, some applications may support functionality mainly focusing on sports/fitness. For example, RunKeeper application has some specialized features like the computation of calories consumption or the measurement of heart rate. Nowadays, increasing crimes against children insists in providing a safety support system for children [5].

Our application Cheeka does not target specific test group or activity. Instead, it focuses on common usage by everyone irrespective of the age groups and also irrespective of the activities like sports or fitness. The functionality of Cheeka is far unique and richer than the functionality provided by the other commercial applications in the market.

III. CHEEKA AS A PERSONAL SECURITY

In contrast to other similar applications, Cheeka consists of six unique functionalities:

A. Social Integration

First of all, Cheeka has the important unique feature, social integration through Login with Facebook so that the user can track the location of the Facebook friends. The social integration eases the user's way of sharing their locations. The user can share the location and also view the friend's location only when both of them accept the location requests initially (similar to the Facebook friend request). For example, even if two persons are friends in Facebook, they must authorize each other as friends in Cheeka so that the locations can be shared.

Fig. 1 depicts the two screenshots of the login with Facebook screen in the Windows Phone and Blackberry versions of Cheeka.

Fig. 2 depicts the list of Facebook friends using Cheeka being shown in the Friends tab in the Android and Windows Phone version.

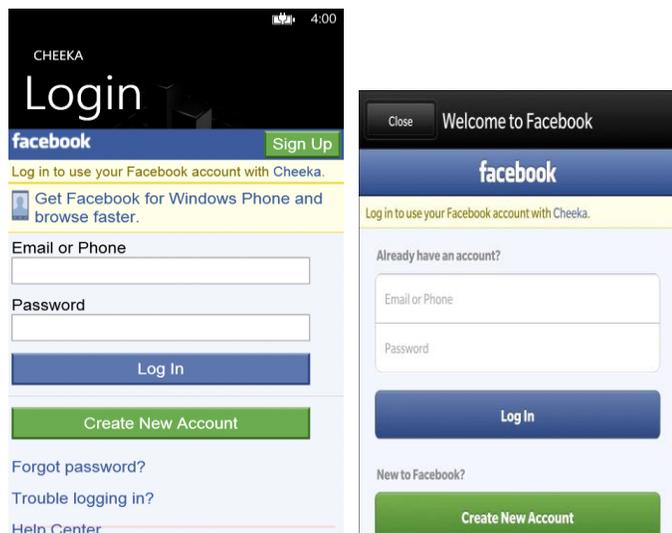


Figure 1. Login with facebook screen. Left: Windows Phone version of Cheeka, Right: Blackberry version of Cheeka

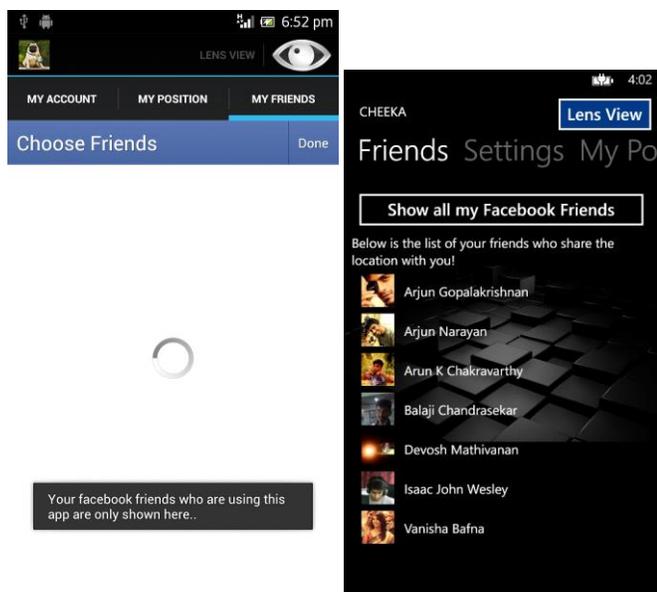


Figure 2. Friends tab of Cheeka. Left: Android version, Right: Windows Phone version

B. Personal Safety Modes

The second key feature is that Cheeka consists of various personal safety modes. "Black Cat" mode sends SMS and mobile notifications about the current locations of the user to the trusted contacts at regular time intervals (which can be set by the user). For example, if the user is walking alone in a street and feels unsafe, the user can activate the black cat mode (Fig. 3). Then, Cheeka starts sending SMS and mobile notifications containing the location and timestamp of the user to the trusted contacts specified in the application's settings.

Once the user reaches a safer place, the black cat mode can be deactivated and Cheeka stops sending the notifications after informing the trusted contacts that the user reached the safe place.

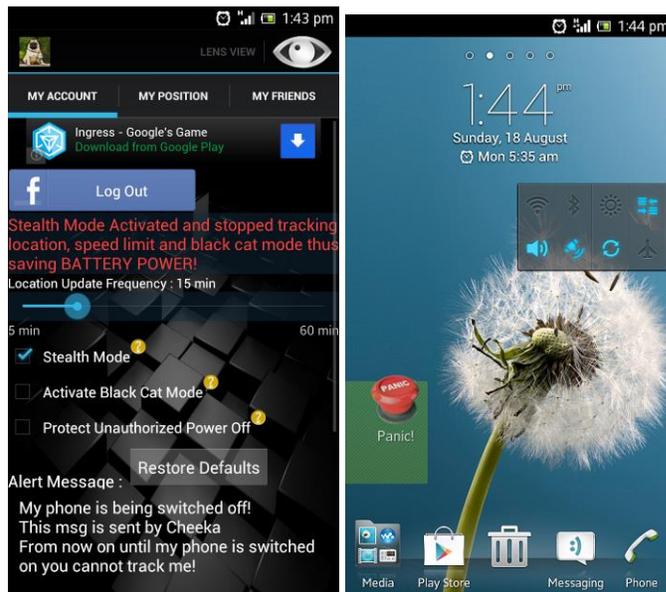


Figure 3. Settings tab of the Android version of Cheeka (left), Home Screen of an Android device (right)

"Panic" Button is a shortcut that can be added to the home screen or placed anywhere on screen so that the user in danger can press it to inform the trusted contacts through SMS or mobile notifications about the location so that they can help the user. Fig. 3 displays the home screen of an Android device where the positioning of the panic button shortcut is shown.

C. Device Safety

Thirdly, Cheeka prevents the theft of the smartphone by helping the owner to track the lost phone as soon as possible. In order to use this feature, the "Prevent Unauthorized Power off" option should be activated. Fig. 3 shows the alert message which can be set by the user, to be sent to the trusted contacts when the phone is switched off. Suppose, when the user searches for his lost phone, he can use his friend's mobile or trusted contact's mobile to track his phone. Even if someone attempts to switch off the mobile phone, the trusted contacts are alerted with the SMS and mobile notifications about the last location and the timestamp when the mobile is being switched off. Thus, the user can track his stolen phone if he acts instantaneously after getting these details. However, this feature is currently made available only in Android smartphones because the Android O/S only supports the broadcasting of device shutdown [6].

D. Speed Monitor

The next important feature of Cheeka is the "Speed Monitor". For instance, if the parents want their child to drive safely, they should set the speed limit and activate speed monitor in the child's smartphone. Now, when the child crosses the specified speed limit or modifies the speed limit,

the parents get the SMS and mobile alerts instantly. In addition, Cheeka also allows the user to set the limit on the number of message alerts sent per day (Fig. 4).



Figure 4. Speed Monitor page of the Windows Phone version of Cheeka

E. Privacy

Generally, the location based systems may increase the risks to the privacy and security of the individuals [7]. So the users are not only notified of tracking but also an option called "Stealth Mode" to prevent tracking is included. Suppose if the user does not want to disclose his locations and stop tracking temporarily, Stealth Mode can be activated. Moreover, during Stealth Mode, the battery power can also be saved since the tracking is being stopped (Fig. 3).

F. Augmented Reality

Finally, an attracting feature of Cheeka is viewing the friends who are nearby through Augmented Reality. Augmented Reality (AR) is a live, direct or indirect, view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data [8]. In Cheeka, the user can specify the radius in kilometers and the friends within this area are displayed through Augmented Reality. The information is presented in layers on top of the image being captured by the camera [9].

IV. WORKING OF CHEEKA

Similar to all the other GPS tracking applications in the market, Cheeka has the functionality of storing the locations of the user every few intervals (which is specified by the user in the settings). It not only stores the location through GPS, but also based on the network location. For example, in Android O/S, Fused location provider [10] is used in Cheeka in order to track the best location based on the underlying location

technology. It consists of various location sources like GPS, Cell-ID and WIFI with each having its own level of accuracy, speed and battery-efficiency. With such technology, tracking can be achieved both in outdoors and indoors.

The user can view his past locations and also his friend's past locations. Each location is shown with a timestamp and is displayed on a map. Fig. 5 displays the screenshot showing the past positions of the user's friend in the Android version of Cheeka. Fig. 6 shows the screenshot of the My Position page of the Blackberry version of Cheeka. It displays the most recent location of the user on the map.

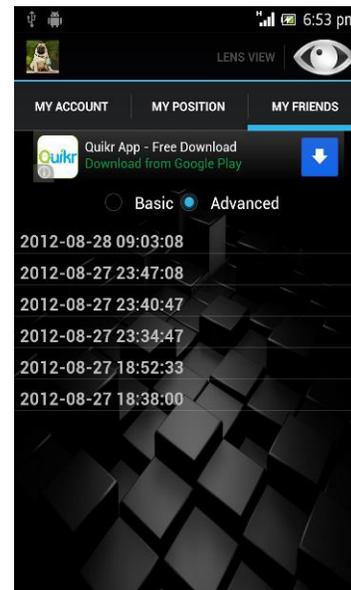


Figure 5. Past Positions page of the Android version of Cheeka

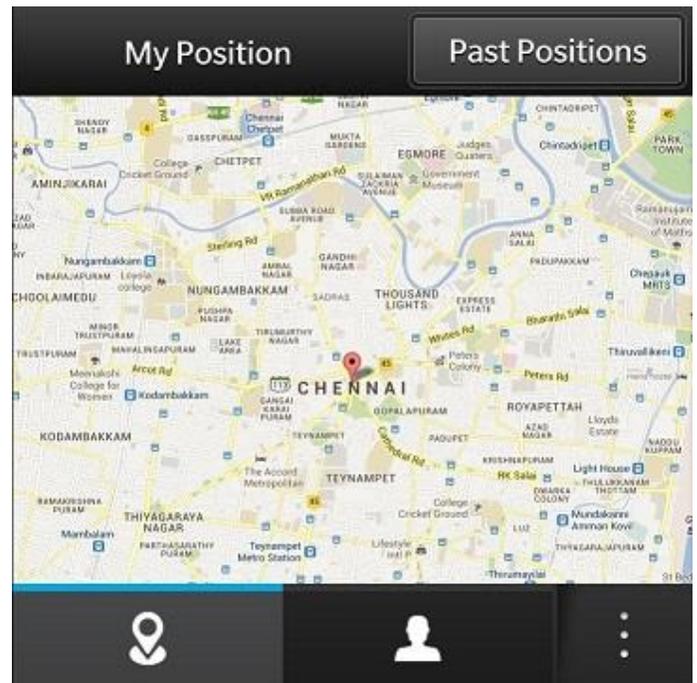


Figure 6. My Position page of the Blackberry version of Cheeka

Cheeka maintains a user-defined list of "Trusted Contacts". These contacts will be alerted by SMS and mobile notifications in case of any emergency. It allows the user to enter the mobile numbers of the trusted contacts to which the SMS alerts has to be sent. It also allows the user to select the list of trusted contacts from the list of the Facebook friends who accepted to share their locations with the user to whom the mobile notifications has to be sent (Fig. 7).



Figure 7. Trusted Contacts page. Left: Android version of Cheeka, Right: Windows Phone version of Cheeka

For SMS notifications, operator charges may apply. On the contrary, mobile notifications are free of cost. The users are notified by the application Cheeka with its push notifications. For example, Fig. 8 displays the screenshot showing the push notification alert received by the user.

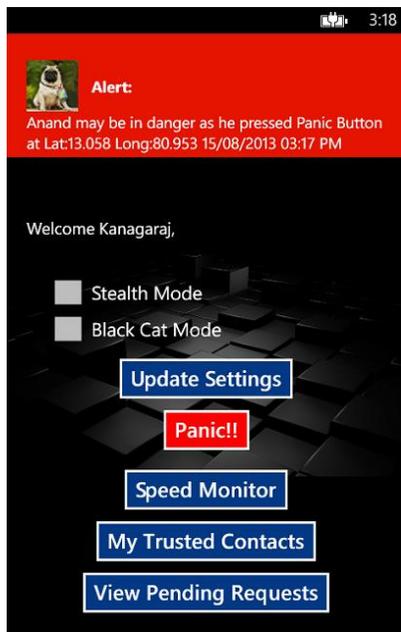


Figure 8. Push Notification alert in the Windows Phone version of Cheeka

V. CHEEKA LITE IN DESKTOP

Cheeka lite, the desktop version serves its basic necessity even though it lacks a few major functionalities. It consists of minimal features like social integration, self-tracking, tracking of the friend's locations and emergency alerts. Fig. 9 displays the main menu page which contains the various options available for the user in the desktop version of Cheeka.

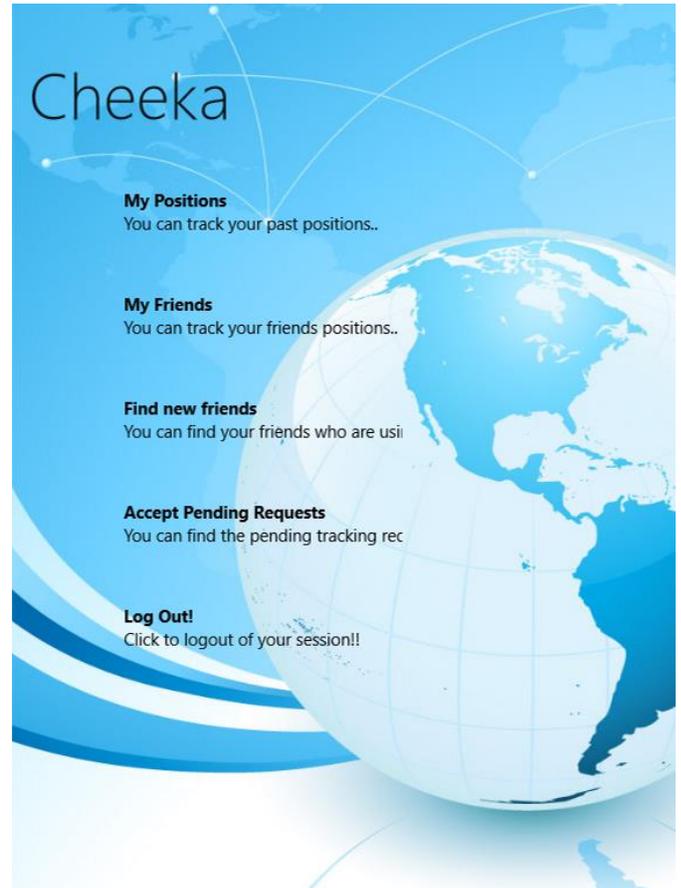


Figure 9. Main Menu page in the Windows 8 Metro version of Cheeka

A. Social Integration

Similar to the mobile versions of Cheeka, the desktop version comprises social integration, where the user can login with the Facebook account to track his Facebook friends' locations and also to share his locations with them. The user can accept or reject the location sharing requests. Fig. 10 depicts the login with Facebook page of the desktop version of Cheeka.

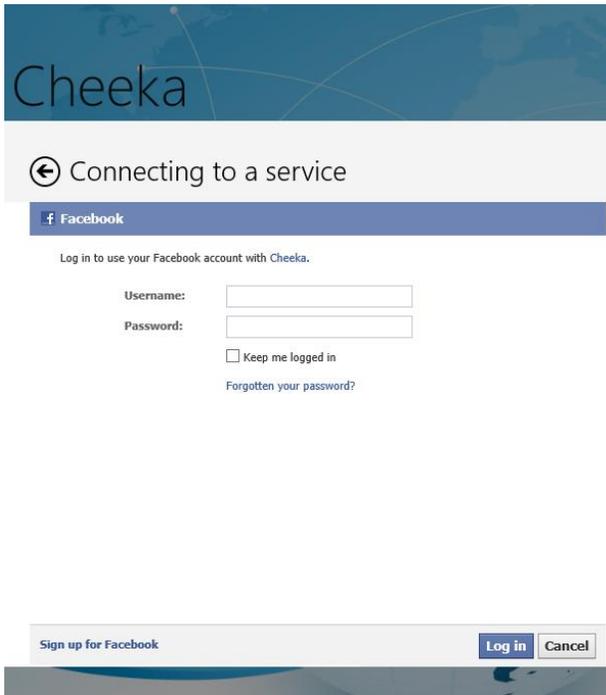


Figure 10. Login page of the Windows 8 Metro version of Cheeka

B. Self Tracking

The desktop version of Cheeka also enables the user to track his own previous locations. The most scintillating feature is that the users' past locations are retrieved irrespective of the device or platform used. For example, if the user uses Cheeka using his Facebook account in various mobile devices or even various platforms like Android or Blackberry or Windows Phone, all the locations tracked are shown from the database. The past positions of the user are displayed exactly similar to the one shown in Fig. 11.

C. Tracking of friends

The crucial part of the application is the tracking of friends. Unlike the mobile version, this is achieved precisely by showing the past locations of the friends on the map simultaneously. For example, the user can choose more than 1 timestamp and Cheeka shows the locations of the friend for the selected timestamps on the map simultaneously. Fig. 11 displays the screenshot of the past positions of the user's friend with three positions being selected and hence the three markers on the map. Thus the desktop version of Cheeka depicts a clear view of the real time positions on the map based on the stored data.

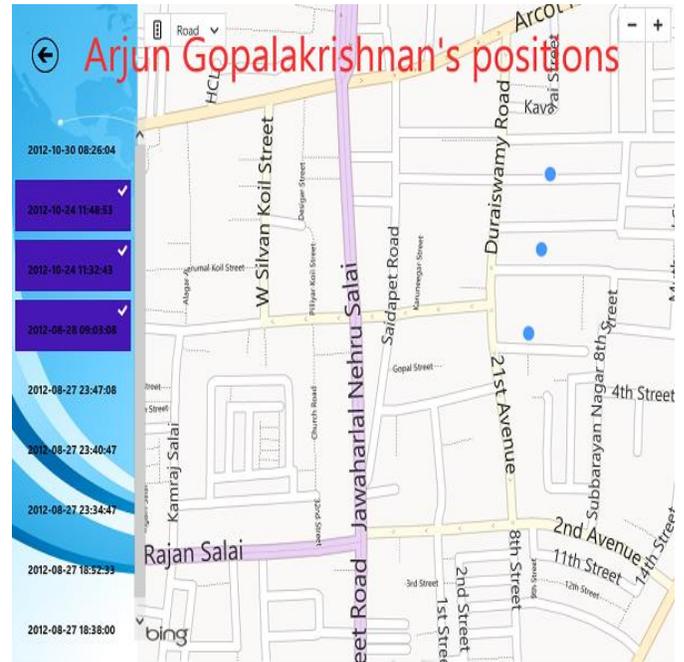


Figure 11. Past Positions page of the Windows 8 Metro version of Cheeka

D. Emergency Alerts

The heart of the application is the emergency alerts being sent to the contacts in case of emergency. This is implemented even in the desktop version of Cheeka. For example, if the person is listed as Trusted Contact by any friend, in case of any emergency, alerts will be sent to the person. Both the mobile and desktop versions of Cheeka receive the alerts at the same time. So there is no risk of losing any alerts during simultaneous logins.

VI. TEST RESULTS AND FUTURE IMPROVEMENTS

To evaluate our application we conducted a series of tests and analyzed the results before its release in the Android Play Store and the Windows Marketplace. 5 different users who were connected to each other through Facebook in the application were allowed to share their locations among them. The various users were testing the application at different places. For example, user A was testing in a place with high GPS signals and 3G network, user B in a place with a high GPS and a slower 2G network, user C in a place with a poor GPS and a 3G network, user D in a place with a poor GPS and slower 2G network and user E in a place inside a building with poor GPS and a moderate network connectivity. The location accuracy is obtained from the detected location and the known physical location and is plotted in the graph against the time interval in minutes (Fig. 12). This shows that even when the GPS signals are poor and the network connectivity is low, the application tracks the user with at least 50% accuracy so that the users in case of emergency or danger can be traced by their trusted contacts. In addition to this, the users also tested the speed monitor feature which reports the users when he crossed the speed limit specified. During the test, once the user crossed the speed limit, the application sent the alert to the trusted contacts specified in the settings.

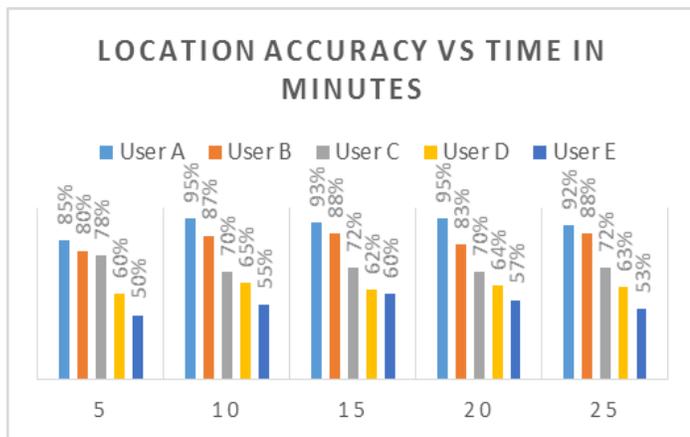


Figure 12. Graph depicting the test results

In one of the test cases, the application failed when the user tried to use the speed monitor feature while travelling in public transport system like trains. In order to solve this, either the application should be able to detect the mode of transport or the user should disable the speed monitor manually when travelling in public transport systems.

The major area of research in future will be the availability of Open Crime Data on sensitive areas. For example, such crime data is already created by the UK Home Office and is distributed publicly as a part of UK government's transparency program [11]. This will be implemented by crowdsourcing which means the creation of information from a crowd of people [12]. For instance, the users of the application Cheeka are allowed to review any area about its crime rate and the safety during different timings. Based on the collected data, the application warns the users in future if the user is travelling towards the unsafe areas. The application also activates the "Black Cat" mode automatically in such areas so that the trusted contacts are being alerted about the person's location periodically. The accuracy of the collected data plays an important role and thus there should be a moderator to manage the data by avoiding incorrect data.

Other challenges for future work and improvements include the portability to other mobile platforms such as iOS, the addition of other social networking profiles like Google Plus and Twitter, the extension of device shutdown alert feature to other platforms, the addition of a new feature to detect manhandling with the help of accelerometer and gyroscope sensors in the smartphones so that the snatching of the phones and mistreating can be detected and alerted. Another important extension of this application is the feature that alerts the nearby friends and the nearby police station based on the location in

case of any emergency. Also, the desktop version can be improved by including the tracking capabilities based on Wi-Fi and other location sensors so that it can be used to protect laptops from theft.

VII. CONCLUSION

In this paper, the application Cheeka, having a lot of unique functionalities in contrast to similar applications in the market, is presented. Since everyone travel with a smartphone, whether they travel alone or not, they can use their phone as a security guard for them. Majority of the people are feeling unsafe during travel. Thus Cheeka can ensure safe travel not only for the person who is travelling but also for the one who cares about the person.

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