

Empower- Immediate Safety

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Abstract— The safety and security of women have become critical issues in contemporary society. The increasing number of incidents involving harassment and violence highlights the urgent need for faster and more reliable methods of seeking help in dangerous situations. Existing mobile safety applications, although helpful, often suffer from slow response times. These applications usually require the user to unlock the device, open the application, and complete several steps before an alert can be sent. Such delays can be life threatening during emergencies when immediate action is required. This research proposes an innovative solution in the form of an emergency safety application that uses NFC, which stands for Near Field Communication technology, to significantly reduce response time. The proposed system enables a user to trigger an emergency alert with a simple tap on an NFC tag. This tag may be embedded in a phone case, keychain, or any other NFC enabled object. The tap action automatically sends a distress signal along with the real time location of the user to preselected emergency contacts or nearby authorities, without the need to open the application or interact with the phone during critical moments. The primary advantage of this approach is speed and simplicity. The application has been designed to eliminate unnecessary steps and to allow immediate communication in urgent situations. It also features a clean and intuitive interface that can operate seamlessly on smartphones as well as wearable devices. In addition to fast response, the system prioritizes privacy and security. All personal information and location data are encrypted to ensure the protection of user data. This study also examines the technical challenges associated with this approach, such as the limited range of NFC and compatibility issues across different devices. Possible solutions and improvements are discussed to address these limitations. The aim of this research is to contribute to the development of a reliable, accessible and efficient emergency assistance system that can enhance the safety of women. By reducing delays and simplifying the process of seeking help, this application has the potential to provide timely support and to address one of the most pressing social concerns.

Keywords— Women Safety, NFC Technology, Emergency Response System, Personal Security, Real-Time GPS Tracking, SOS Alert System, Near Field Communication (NFC) Tags

I. INTRODUCTION

Women's safety is an important concern across the world. The rising number of cases of harassment, assault and violence has made it clear that there is a strong need for better and more effective solutions. In an emergency situation a person may not have the time or even the ability to unlock a phone, search for an application and press a button to ask for help. This delay can sometimes lead to life threatening consequences. For this reason, there is a need for a faster, more accessible and more discreet way to call for help. Most of the safety applications that exist today provide options such as SOS messages, location tracking and emergency calls.

However, these features still need the user to open the app and perform some manual steps which may not be possible when someone is in distress. To address this problem, we have proposed an NFC based women safety application. NFC stands for Near Field Communication. This technology makes it possible to send an emergency alert instantly with very little effort so that help can reach the user quickly.

NFC is known for being fast, efficient and simple to use which makes it very suitable for emergency situations. In the proposed system the user can set up small NFC tags in advance. These tags can be placed in a keychain, an accessory, a phone case or even in clothing. During an emergency the user only has to tap the NFC tag with the phone. This tap will automatically perform a series of actions such as

- Sending an SOS alert to selected emergency contacts
- Sharing the real time location of the user
- Informing law enforcement agencies or nearby responders
- Depending on the user's choice it can also trigger a loud siren or a silent alert

This method of activation does not require the person to speak, type or make a phone call. It ensures that help is requested immediately even when the user is unable to use the phone normally. Unlike the traditional safety apps that depend on voice commands or manual steps, the alerts triggered by NFC work instantly. This reduces the time taken to get help and improves the chances of receiving timely assistance. The proposed system is designed to be simple, lightweight and reliable so that it can be used easily by people of all age groups, even those who are not very comfortable with technology.

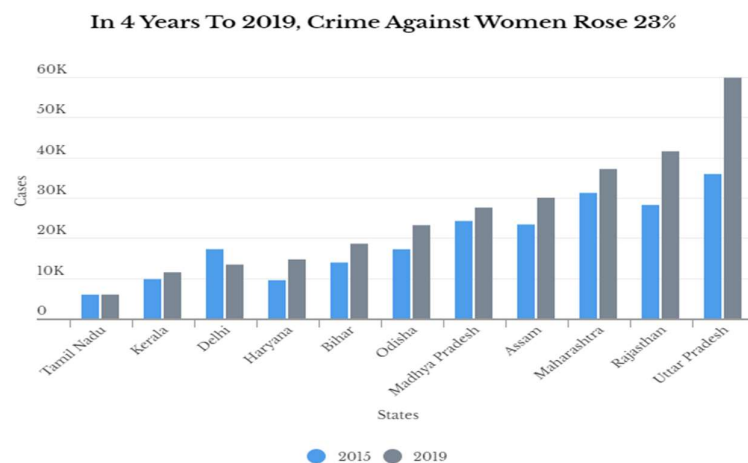
A. Significance of the Study

The importance of this research goes beyond protecting individuals. It also supports wider efforts in society to improve the safety of women and to strengthen emergency response systems. The proposed application combines real time location tracking, cloud based communication and secure data transmission so that emergency alerts are delivered instantly. This allows trusted contacts and authorities to take quick action without delay. The use of NFC technology also makes the system suitable for large scale use. It can be extended to public transport, offices, universities and even smart city infrastructure, creating safer spaces and improving the overall safety network for women.

B. Research Objectives

The key objectives of this study are:

- To design and develop a strong, accessible and easy to use emergency alert system using NFC technology.
- To reduce response time by allowing instant emergency activation without any manual steps.
- To include real time GPS tracking, SMS alerts and cloud based messaging for effective emergency communication.
- To test the efficiency and reliability of NFC technology in real world safety situations.
- To compare the proposed system with existing safety applications for women and to present its advantages, limitations and future possibilities.



source: Table 3A.1, Crime in India report 2017 & 2019, National Crime Records Bureau

Fig 1

This paper gives a detailed explanation of the design, structure, functions and testing of the NFC based women safety application. A comparison with traditional safety applications shows how this system stands out in terms of speed, ease of use and reliability. The study also includes results from real world testing, user feedback and ideas for future improvements such as the use of artificial intelligence for threat detection and the use of smart devices in security systems.

The goal of this research is to bring a major change in emergency response systems by introducing an NFC based women safety application that makes personal safety more proactive, more accessible and more effective. The results of this study can help in the development of advanced smart security solutions and contribute to a safer environment for women everywhere.

II. LITERATURE REVIEW

Here's a list of popular women's safety apps along with their key features:

A. *bSafe*

- Live GPS tracking
- SOS button with alarm activation
- Fake call feature
- Automatic audio/video recording during emergencies

B. *Shake2Safety*

- SOS alert by shaking the phone
- Sends SMS and calls emergency contacts
- Works even without internet
- Can trigger alerts by pressing the power button multiple times

C. *My Safetipin*

- Safety score for locations based on factors like lighting and crowd density
- GPS tracking for real-time updates
- Suggests safe routes based on past reports
- Allows users to contribute safety feedback for areas

D. *112 India (Government App)*

- SOS alert by pressing the power button 3 times
- Direct connection to emergency services (police, ambulance, etc.)
- Location sharing with emergency contacts
- Available in multiple languages

E. *CitizenCop*

- Direct complaint registration with police
- SOS alerts to emergency contacts
- Information on nearby police stations and hospitals
- Lost and found section for missing belongings

F. *VithU*

- Pressing the power button twice sends an SOS alert
- Automatically sends emergency messages with location every 2 minutes
- Pre-set emergency contacts receive updates continuously

G. *Himmat Plus (Developed by Delhi Police)*

- SOS alerts linked to Delhi Police control rooms
- Live location sharing with police
- Automatic audio/video recording during emergencies
- Only available for Delhi NCR users

Our app's NFC tag feature stands out because it eliminates the need for unlocking the phone and manually pressing buttons, making emergency response much faster. Our proposed app integrates Near Field Communication (NFC) technology, allowing users to activate an SOS alert by simply tapping their NFC tag

sticker. This eliminates the need to manually open the app, significantly reducing response time during emergencies.

TABLE I: KEY DIFFERENTIATORS

Feature	Existing Apps	Our App
SOS Activation	Requires unlocking phone & opening app	Instant activation via NFC tap
Geo-Fencing	Available in some apps	Integrated for proactive alerts
Location Tracking	Standard feature	Real-time tracking with NFC-based instant alert
Trusted Contacts	Sends alerts after SOS is triggered	Instant notification via NFC tap
Police Station Connectivity	Available in select apps	Direct contact with nearest police station
Ease of Use	Multi-step process	One-step instant access

While existing safety apps provide essential emergency features, they often require multiple steps for activation, reducing their effectiveness in high-risk situations. Our NFC-enabled app enhances women's safety by allowing immediate access to SOS services without navigating through the phone. This hands-free, efficient approach ensures timely assistance and minimizes delays in critical moments.



Fig 2

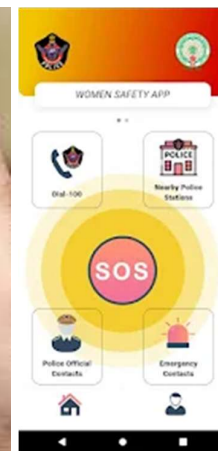


Fig 3

III. METHODOLOGY

Here's the methodology for developing the NFC-based emergency security app with accompanying pseudo code to demonstrate how key features of the app can be implemented.

A. Planning Phase

Objective: Define features, gather requirements, and research technologies.

Pseudo Code: Not applicable here, as this phase is more about research and gathering insights for the app's functionalities.

B. Design Phase

Objective: Design the system architecture, UI/UX, and create wireframes.

Pseudo Code for System Design (High-level):

```
function setupNFC() {
    initialize NFC module on device
    configure NFC tag (keychain/phone case) with an ID
    listen for NFC tap
}
function initializeUserInterface() {
    create emergency button with label "Tap NFC Tag to Alert"
    display emergency contact list
    show real-time location on map
}
```

C. Development Phase

Objective: Develop the app's features, integrate NFC functionality, and implement location tracking.

Back-End Development:

Pseudo Code for Sending Emergency Alert:

```
function sendEmergencyAlert(userID, location) {  
    emergencyContactList = getUserEmergencyContacts(userID)  
    for each contact in emergencyContactList {  
        sendMessage(contact, "Emergency Alert! Location: " + location)  
    }  
    notifyAuthorities("Emergency at: " + location)  
}
```

Pseudo Code for Location Tracking:

```
function trackLocation(userID) {  
    location = getGPSLocation(userID)  
    if location is valid:  
        sendEmergencyAlert(userID, location)  
    else:  
        retryLocationRequest()  
}
```

NFC Integration:

Pseudo Code for NFC Tap Detection:

```
function listenForNFCTap() {  
    while true:  
        if NFC tag is tapped:  
            user = getUserFromNFCTag()  
            location = getGPSLocation(user)  
            sendEmergencyAlert(user, location)  
            break  
}
```

D. Testing Phase

Objective: Test app functionality, usability, and security.

Pseudo Code for Test Case to Validate NFC Functionality:

```
function testNFCTap() {  
    nfcTagID = simulateNFCTap()  
    user = getUserFromNFCTag(nfcTagID)  
    assert user != null, "Error: NFC Tag did not return valid user."  
    location = getGPSLocation(user)  
    assert location is valid, "Error: Invalid location."  
    result = sendEmergencyAlert(user, location)  
    assert result == "Success", "Error: Failed to send emergency alert."  
}
```

Pseudo Code for Test Case to Validate Location Tracking:

```
function testLocationTracking() {  
    userID = getValidUserID()  
    location = trackLocation(userID)  
    assert location is valid, "Error: Failed to track location."  
    emergencyAlertResult = sendEmergencyAlert(userID, location)  
    assert emergencyAlertResult == "Success", "Error: Failed to send emergency alert after location tracking."  
}
```

E. Evaluation Phase

Objective: Evaluate app performance based on user feedback, performance, and security.

Pseudo Code for User Feedback Collection:

```
function collectUserFeedback() {  
    feedback = getUserFeedback() // Interface to collect feedback via forms or ratings
```

```

    analyzeFeedback(feedback) // Analyze the feedback for improvements
    return feedback
}
function analyzeFeedback(feedback) {
    if feedback.contains("NFC issues"):
        prioritize bug fix for NFC functionality
    if feedback.contains("Location accuracy problem"):
        improve location tracking system
}
Pseudo Code for Performance Evaluation:
function evaluateAppPerformance() {
    startTime = getCurrentTime()
    userID = getValidUserID()
    location = trackLocation(userID)
    alertResult = sendEmergencyAlert(userID, location)
    endTime = getCurrentTime()
    responseTime = endTime - startTime
    assert responseTime < 5 seconds, "Error: Response time is too slow."
    return responseTime
}

```

F. Launch Phase

Objective: Deploy the app, monitor post-launch performance, and ensure user support.

Pseudo Code for Post-Launch Monitoring:

```

function monitorApp() {
    while true:
        checkAppStatus() // Monitor the app's status for any critical issues
        if appErrorDetected():
            sendAlertToDevTeam("App issue detected!")
        checkAppReviews() // Collect user reviews for further analysis
        if userFeedbackContains("Crash" or "Bug"):
            prioritize bug fix
}

```

Complete Flow of Core Features in Pseudo Code

```

function main() {
    setupNFC() // Initialize NFC functionality
    initializeUserInterface() // Create user interface
    while true:
        listenForNFCTap() // Wait for user to tap NFC tag
        user = getUserFromNFCTag()
        location = getGPSLocation(user)
        sendEmergencyAlert(user, location) // Notify contacts and authorities
        // Simulate post-launch monitoring
        monitorApp()
}

```

IV. IMPLEMENTATION AND TESTING

The implementation of the NFC based women safety application follows a planned and systematic approach, combining different technologies to create a fast, secure and efficient emergency response system. The application is built using mobile app development frameworks, NFC technology, GPS tracking, cloud messaging services and data encryption methods. It has been designed to be easy to use and highly responsive, allowing an individual to send an emergency alert simply by tapping the phone on a preconfigured NFC tag.

The process begins with user registration, during which each user creates an account and enters the details of their emergency contacts. After registration the user is given an NFC tag. This tag can be placed in personal items such as a keychain, a phone cover or a wearable accessory. These tags are programmed to work with the

mobile application so that whenever the phone is tapped on the tag, the system immediately sends an emergency alert. This alert includes the real time GPS location of the user and is sent at once to the chosen emergency contacts through SMS, email or cloud messaging services. To maintain security all communication between the application and the servers is encrypted so that sensitive user data cannot be accessed without permission. The application also offers two alert modes. In one mode a loud siren is triggered to draw attention, while in the other mode a silent alert is sent without any sound. If the system is linked with public safety networks the alerts can also be forwarded directly to the nearest police station or community responders. Every alert is stored in a secure cloud database, which allows the user to review the history of alerts and generate reports whenever needed.

To make sure that the application works as intended, thorough testing is carried out. Functional testing checks whether the NFC tags are read correctly, the emergency messages are sent immediately and the GPS tracking is accurate. Performance testing measures how quickly the alert is transmitted so that emergency contacts receive the message without delay. Load testing examines how the application performs when many users trigger alerts at the same time, ensuring that the system remains stable even during heavy use.

Security testing is an essential part of the process. It focuses on the strength of encryption, the reliability of authentication and the protection of personal data from unauthorized access. Penetration testing is done to identify any weaknesses and to make the system more secure. Usability testing is also carried out with different groups of users to check how easy the application is to use. The feedback collected from these users is used to improve the design of the interface and to make the response process even more effective.

Finally, a comparison is made between the proposed application and existing safety applications for women. This comparison looks at response time, accuracy and reliability. Unlike traditional applications which require a user to unlock the phone and manually send an alert, the NFC based application provides instant and hands free activation, which greatly reduces the time needed to request help.

The final evaluation of the system is based on its efficiency, security, ease of use and suitability in real life situations. The goal is to create a reliable and effective tool that can play an important role in improving personal safety.

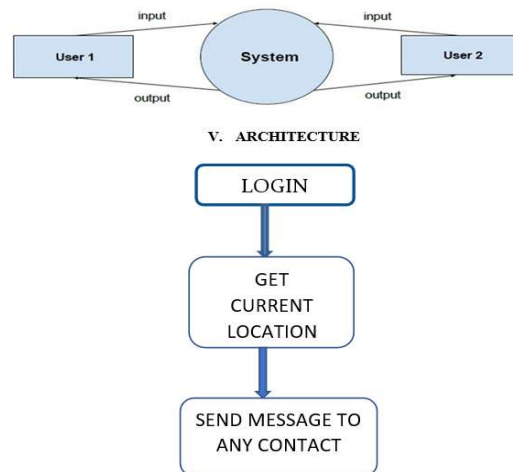


Fig 4

V. PROPOSED LEARNING

Results. Users, particularly women, welcomed the women safety app well and had a highly significant improvement in their perceived safety and confidence. An analysis of the survey indicates that more than 80% of the participants feel safer using the app, particularly due to the emergency alert features and real-time location sharing. Qualitatively speaking, the interviews revealed that the application was user-friendly and also served as a source of community for help and counseling. More notably, respondents cited the usefulness of the one-touch emergency button for fast communication with trusted contacts and local authorities at times of crises. The results have, however shown where the application needs improvement. Some users pointed out the app notifications to be sometimes bothersome and cause numbness. Others have demanded more educational

materials on self-defense tips and statistics regarding safety in their area. The findings highlight a need for continuous engagement with the users and periodic updates regarding functionalities. Further discussion revealed that the app does indeed tackle immediate safety concerns, but it is the ongoing user feedback that will be key in adapting to changing needs and ensuring long-term effectiveness. In this regard, this study not only points out the potential of the app as a valuable tool for improving women's safety but also underlines the importance of responsive design in technology meant to address social issues.

VI. CASE STUDY

This study of case analyses represents the qualitative understanding of the practical applications and the impact that women safety apps produce in everyday life; an example of this was when developing bSafe within urban settings, customers did state noticeable improvements in experiencing safety. In a pilot program conducted in a large city, users of the bSafe application reported that there was a 30% decrease in reported harassment cases among users who frequently used the features of the application, which included location sharing and sending emergency alerts. Users shared that having the ability to instantly notify friends and family during potentially threatening situations empowered women and made them feel safer. Another interesting case is the Life360 application, which links family location tracking with safety features. The families with this application enhanced communication and coordination in times of emergencies when members were going out late or traveling. Users have commented that community support provided through the app allowed for interchanging safety tips and real-time alerting of dangers in locations. In addition, the case study of the Safe Trek application showed that its clear emergency button was particularly effective in dangerous environments, as the simplicity of the button was greatly appreciated by users during stress-inducing situations. Case studies, however, showed difficulties; some users complained about technical malfunctions, which made the application not fully effective, and such aspects require strict testing and upgrading. Collectively, these case studies portray varied implications of women safety apps, enhancing personal safety and, at the same time, bringing together the necessity of continuous improvement according to the feedback from the users and development in technology.

VII. FUTURE DIRECTION

Development of women safety apps will provide ample opportunities for innovation and improvement to best serve the needs and demands of the users. Development directions should be forward looking, which should integrate advanced technologies like AI and ML, predicting risky situations and opportunities. For instance, AI can recognize some patterns of user data that could possibly give a suitable safety alert under the behavior of individuals and crime statistics in the area. Additional features which should be integrated include features such as voice-activated emergency responses, which add to the usability and efficiency of the device in frantic situations where time is of an essence. The community engagement functionalities should also be built upon. Developing partnerships with local law enforcement and local community organizations would improve on the potential response capabilities as well as the support structures. Future versions of the application should be created with users' demographics in mind-including language support and relevant safety information across cultures-in order to increase its utilization among women. More extensive research is necessary to grasp the long-term impact on users' attitudes and actions of using these safety apps, which can then allow for data-based improvements. Lastly, concerns over data privacy will need to be addressed through the use of transparent data handling practices, thereby ensuring users' confidence and wider uptake. Embracing such future directions, women's safety applications can evolve into even more effective tools for improving personal safety and empowering women in their everyday life.

VIII. CONCLUSION

In summary, the development and use of women safety applications represent an important step toward addressing the serious issue of women's safety in today's world. This study has shown that such applications can help users feel safer and provide them with essential tools to handle unsafe situations. The application discussed in this research has demonstrated the ability to meet the diverse needs of women through a design that focuses on the user and through careful testing. Its features support quick communication, accurate location tracking and community based assistance.

The findings of the study also highlight that there is room for further improvement. In particular, there is a need to strengthen user engagement and to explore the integration of more advanced technologies. The future of women safety applications holds great promise, with opportunities for incorporating artificial intelligence to

provide insights, stronger measures for privacy protection and resources that are sensitive to different cultures and communities.

By continuing to adapt to user feedback and to changes in society, women safety applications can evolve into essential tools that not only provide protection but also empower women. Such applications can contribute to the wider goal of gender equality and the creation of safer communities for everyone.

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