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RESEARCH ARTICLE

Android-Based Woman Safety App

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Abstract

Background: The safety of women is a concern of increasing urgency in India and other countries. With increase in the crime rate against women, the rate of usage of technology also increases. Therefore, this research paper aims to find an approach where the increasing crime rate can be prevented. The best way is to give a technological way to this problem, and finally an android based App is designed and developed with title ”Android-based Women safety app”. **Objectives**: The main objective is to develop a prototype by taking reviews from women, design and implement it practically such that maximum help is achieved from police. The app will also help police in preventing the crimes from happening. **Methods**: In our proposed model we have provisions for connecting user’s map with Google map, thus the users are able to use all the features of the Google Map. Moreover, it may be connected to WhatsApp through which user can share live location along with an emergency message. At the same time, it can be shared as a WhatsApp status and thus user’s situation will be known to all the people she is associated, can read the emergency message and take necessary actions. In this proposed system we are using the tools already available in the market. **Findings:** This study stands out from different danger signal(SOS) in many ways. Some features which are supposed to be distinctive are finding out the nearest Police station, use of WhatsApp features etc. After taking feedback from a number of users we are confident that it can really make women safe and can reduce crime against them. 76.9% users have faith in digital technology and electronic devices and eager to use this system. These feedback encourage the researchers for more robust and easily operable system in the future. **Novelty:** This app shows the nearest police station with location and its distance from the user, raise an emergency alert, WhatsApp status and other facilities of social media can be used.

Keywords: Women Safety; Android Studio; Police Station; Women Safety App; Google Map

1 Introduction

Crime against women basically means robbery, rape, sexual harassment, domestic violence which are increasing day by day in most of the developing countries like India.

Researchers and software developers all around the world have built different women safety applications integrating different electronics equipment with software applications. Main purpose of this system is to save the user who may be in immediate trouble, missing in some unknown place, separated from family and friends when travelling. National Crime Records Bureau (NCBR) was established in India in the year 1986 and from that time the bureau is keeping track of crimes against women for every year and used to upload documents in every alternative year. According to fifth round survey of National Family Health Survey (NFHS-5) women in India from fifteen to forty-nine age group has to experience mental, physical, sexual and domestic harassment in most of the times of their lives [(1)]. Some central government initiatives taken for safety of women and girl child are as mentioned below:

- Nirbhaya Fund, a project initiated for security and safeguard for girl child and women [(2)].
- One Stop Centre Scheme, for justice of those women who works under one roof both in private and civic community. According to April 2022 report,
- National Database on sexual offenders for tracking crime against women enforced by Law Enforcement Agencies.

Like the central government schemes each state government has their own schemes and helping websites launched for well being of their female citizen.

This proposed system is an effort to protect women both physically and psychologically. Main functionality of this project is to detect the nearest police station from user's current location and provide her psychological supports and makes her feel safe anywhere anytime as she has a helping hand. In any such vulgar situation connecting and getting help from trusted person is most important.

We have gone through some of the recent works done using different digital technology and are discussed below.

R. Sharmila et.al [(3)] proposed a model that uses two distinct transmitter and receiver modules in their job. The copper thread in transmitter is sewed into the victim's cloth and it is not at all visible to outsider. There are continuous connections between the threads and checked by the comparator. While this continuous flow is disturbed and discontinued, an emergency call along with message and location is sent to registered phone numbers and thus user may escape from the incident.

Manisha Sharma et.al [(4)] proposed an android based way that can be activated within a single click. By employing a GPS location tracker, user can learn about their present address and the emergency contact numbers can receive information from the user. Through GPS, the app locates a position and the location URL is sent to the registered users. It has facility to send messages to nearby mobile phones where this App is already installed.

RoshanKolte et.al [(5)] has developed a very useful women security App where at the time of emergency the user can get in touch with the emergency services, notify to family, friend and security. The system can receive message coming from emergency services and uses GPS for tracking user's location and notify if any change in location arise. There is also provision for use of advanced algorithms to recognize distressing scenario.

A More, K Gawade, P Guled, S Chippa, V Galgurgi et.al [(6)] Proposed a system "SAKHI - SAVIOR" which will be helpful at the time of disaster with a very nice user-friendly interface. Goal of this app is to save women from dangerous situation, just like the above application this app also can be launched with a single click or shaking phone three times. GPS helps to pin point user's location and send message to the registered contacts and nearest police station. SMS based location monitoring system makes the rescue of the victim a fruitful one.

A Choudhary et.al [(7)] proposed their own system with title "We Safe App", on pressing a specific button user's registered contacts will be alerted with updated location of the user. The advantage of this system is that it is very handy for women at emergency situations. On pressing a button an alert message will be sent to the user's registered contacts along with the current location.

Dr. K Srinivas et.al [(8)] in their paper "Android App for Women Safety" introduces a technique where the system has unusual ability to deliver messages to registered contacts continually until they touch the "HELP" button. SMS-based continuous location monitoring information makes it easier to locate the victim promptly and rescue them securely.

Another research paper written by Quazi Maliha Masud et.al [(9)] describes about an Android app called "GoFearless". According to them users feel safe with this app while traveling and help from dangerous situations, so they can feel brave while making their daily commute. It is an Android software and has features like instant alerting the user's position, trusted contacts etc. The system has three emergency trigger buttons (Panic, Cautious, and Update). Moreover, some added features like location of nearby police station, one-tap access to a national crisis line, recording phenomena for future reference are also there.

Authors also have gone through the research article "ANDROID APP FOR WOMEN SECURITY SYSTEM" [(10)]. This software uses SQLite as its back end and the Java SE 7 SDK as front end. Since in present days android phone is used by all, these devices can be efficiently engaged for personal security and other protections. Current situation in most of the places in Assam makes women's security a top priority, and the Android application built by the researcher can face any potential risks. The app

is activated with a single click and the software uses GPS for location identification and sends a message with the location to the registered contacts.

1.1 Research Gap Analysis

In the already existing systems known from R. Sharmila et. al [3], a model with transmitter and receiver was built and message is sent to registered contact numbers whenever disturbing situation occurs. As in this approach a device is connected with the user there is possibility of malfunction of the device and in the worst case the contact numbers included in the handset may not respond to the victim instantly or may not read message at that instant and thus may fail to save the victim in appropriate time. Another approach by Manisha Sharma et.al [4] also built an android system but persons with that particular app installed on the mobile can only get message from victim with location URL. We had studied this approach and found that main drawback in such system is messages are not read immediately by most of the people and thus it may be too late when it is read later. Approach proposed by Roshan Kolte et.al [5] is also based on message sending at the time of danger and it is not at all acceptable as most of the people read messages later only. So we have designed our application to call the police from the nearest station when a women not even knows about her location. This proposed application is very useful at night time as there is provision for contacting dedicated fellow. User installed our app can easily check her nearest police station and call the police whenever she feels the location is dangerous. A number of systems proposed by A Morei et.al [6], Quazi Maliha Masud et.al [9] and Harini R et.al [10], all have message sending facility but no application is using contacting police persons or nearest police station. We believe that only police can help a woman from a very crucial and dangerous situation whether she is inside a home or outside. Individually sharing message is not a acceptable in emergency situation. So to be confident of getting help at right time our system offers provision to connect the nearest police station. No database on nearest police station can be accessed from the other existing Apps. So user has to rely on friends and family members who may be far away from her and unable to reach the spot on time. Thus, our proposed system is unique compared to all existing ones. In addition to calling to the nearest police station it offers facilities for giving access to social media app like WhatsApp and thus a user can use all the features of WhatsApp, send emergency messages to all the saved contacts on the phone and share it as a WhatsApp status. In this way researchers of this project fills up the gaps of already existing systems.

2 Methodology

Most of the Commercially available women safety apps send user location to the registered contact numbers, but we are more curious for something more effective in terms of service which can be accessed at the time of need. This app has facility to connect to nearby police stations. The researchers have added locations of the nearest Police Stations and users can call the Police for help. The whole proposed system is described with the help of Use Case and ER diagram. UML uses a number of diagrams for visual representation of a system with different actors and their roles in different sections. A Use case diagram shows potential interaction of users with the system. Figure 1 here shows the ER diagram of the proposed system, Figure 2 is the use case diagram. In the use case diagram there are three actors. The user, general people and police. These three entities directly interact with the system. Their functionalities are recognizable from the use case in Figure 2.

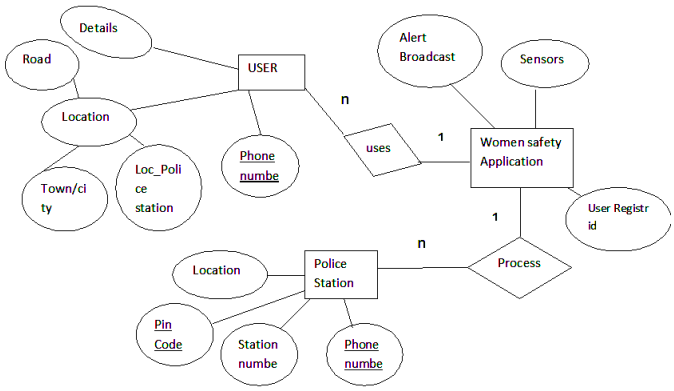

Fig 1. ER Diagram of the Proposed System

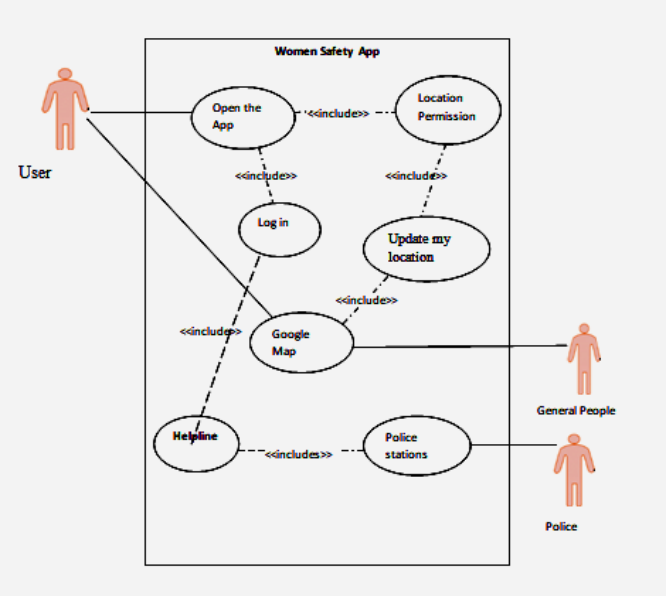

Fig 2. Use Case Diagram

2.1 Working of the App

We have designed our App using Android studio with integrated environment specially designed for it. It is flexible and can easily run on our system. In the android studio project more than one resource file and source codes are included. Among them different modules for the App, library components and Google map engine modules are countable. Different packages that were imported to our Android studio project are:

- Manifests
- Context
- Intent
- Package manager
- Location
- View
- Add Compact Activity
- Firebase
- Button
- IBinder

2.2 Components Used For Task Performs

- getLocation() function is used to get the latitude and longitude to form an emergency message. The location is updated after every 5 milliseconds.
- **Google Map:** External intent is used for connecting the Police Stations directly to Google map correlating the location and latitude of the user.
- Connection is established to WhatsApp package and Intent is used for it. By doing so the people in the contact list of the user can view the message set as WhatsApp status or the broadcast message created by the user. Thus the user can avail all the facilities of WhatsApp and can send message through face book also if connected previously.
- Call is another component where phone permission code, intent and button for making a call to police.
- **Nearest Police Station:** To determine the distance to the nearest police station "The Haversine formula" is used.

For coding, we have chosen Kotlin programming language due to its very good feedback from past developer. Kotlin is JVM programming language is robust and has much clarity in language design. This language is capable of assembling different programming language features.

Whenever a user opens the App, the location permission is enabled automatically. The user can now press the "Update my location" button and thus fetch the current user location. After the location gets updated the user can share an emergency message along with the user's current location, which directly connect with Google map and can be shared as a status where the people can view and understand the user's situation. There is provision to add as many as police stations with greater expectation of help from police.

There is a red button using which user can directly call the Police. User can rename the device which will be displayed in other devices as used or connected device.

3 Result and Discussion

We have tested the App in different locations and confirmed truthful working of the App. Whenever the tool is turn on it can automatically detect the user's location after every 5 milliseconds. The system can fetch the distance of the nearest police station and according to the distance from the nearest police station it displays any one of the three colours, that is red, green or yellow. When the distance between user and nearest police station is more than 8 KM, red colour circle will be displayed. While that distance is from 8 to 4 KM, yellow colour sign will be displayed. On the other hand when the distance between user and the nearest police station is less than 4 KM green colour circle will give signal. Thus, user will have a clear idea on the nearest police station and expect help from them within a few minutes. Make a call to the nearest police station is our own effort to make the system robust and more useful. Though there are similar systems available in many platforms, there is no provision to call police from the nearest location. The emergency rescue numbers from each police station will be put on this system and has to be authenticated and active for 24 hours. This feature is not available with any other applications.

We have tested this App in different locations of Assam and Gujarat and found that the system functions correctly in every case.

Testing of the app was carried out at different locations of Guwahati city. Researchers have tested the App at Jalukbari, Azara, Dharapur and Garchuk locations which are apart from each other with more than 5 Kms. Later the test was carried out in Vodadara of Gujarat state and the app worked efficiently in all these locations. The android phone testing screenshots for these locations are displayed in different figures below. Figure 3 shows the home interface of the app. Figure 4 shows how the user can send the emergency message as a status through WhatsApp platform. Figure 5 shows when user is 4 km away from the Jalukbari Police station. Figure 6 depicts user's location is in between 4 km to 8 km from the Jalukbari Police Station. At last Figure 7 depicts the screenshot with user's location more than 8 Km to the nearest Jalukbari police station. Figure 8 shows screenshots taken from two other police stations Dharapur and Azara as nearest to a user which are located near to Guwahati city.

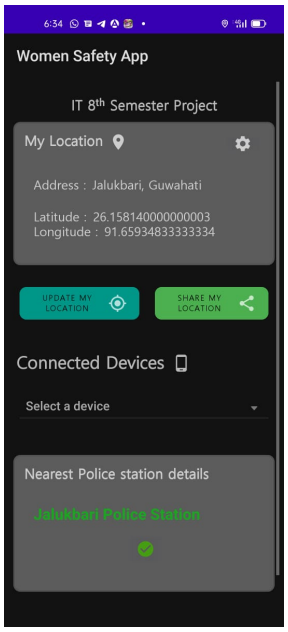

Fig 3. The Home page screenshot

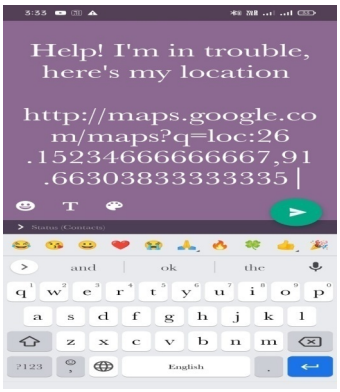

Fig 4. WhatsApp status set by user

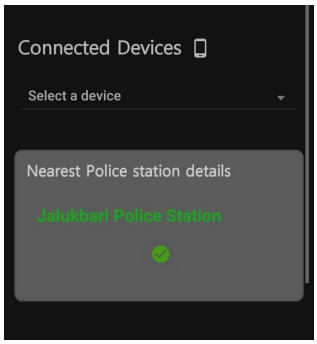

Fig 5. Screenshot where Distance <= 4 Km

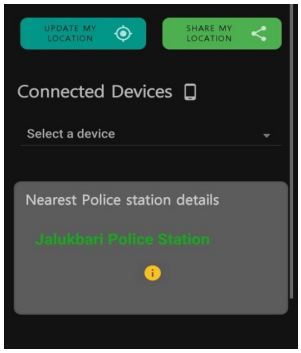

Fig 6. Distance of Jalukbari Police Station between 4 to 8 Kilometers

As discussed earlier our system meets the objectives of the research. The whole android based system was developed successfully and it functions with full potential. We have collected suggestions from women of different age groups and evaluated most important requirement of a woman safety application. We tried to help police through this app such that they can take adequate security measure against a crime going to happen. Through our system police can be informed at appropriate time, and they can help her.

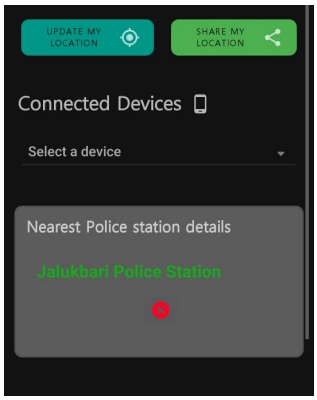

Fig 7. Screenshot of Jalukbari PS > 8Km

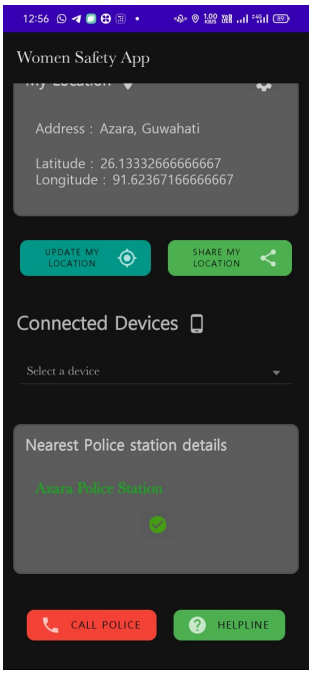

Fig 8. Screenshot showing user's location from Azara police station

3.1 Comparative Analysis

Novelty of the project is achieved in many ways. Broadcasting of danger message sent as WhatsApp status is a unique feature of our system. These features are not seen in any earlier women safety App. From our background study as mentioned in paper [3], a copper threaded model with transmitter and receiver is designed. This system sends call to predefined phone numbers irrespective of present location of the user. But there is no provision for direct connection with police. But to avail security help our app is most useful as it shows the nearest police station and user can make an easy call to the emergency number. Another App mentioned in paper [4], with title "Women Safety Android App" is developed for android user and this system also does not have facility to contact police of the nearest station. It only sends messages to selected contact numbers and phone call to first contact. Paper [6] uses another approach, according to their proposed system GPS is used here, with help of which user

can easily be identified along with the location and broadcast messages to the listed contact numbers and specific contact to the nearest police station. It also uses SMS based location monitoring system and makes rescue of the victim. Lastly a new approach is introduced in paper [9], where a few new features like immediate alerting user's location and connection to trusted contacts etc. are incorporated. Their system is rich with three expression buttons called Panic, Cautious, and Update. Moreover, some added features like location tracker of nearby police station and recording for future position are also there. A recent paper [11] by Kulkarni et.al was discussed in search of any new features to women safety app, but they propose a system to send a call with a single shake at the time of danger to emergency contacts but not to the nearest police station. Researchers of this paper designed this application not only to woman but to any needy people like child, old people or male in danger.

So all the above papers mentioned here use some techniques but no application uses assured help from police or security personal. Most of the above mentioned papers can send message to social media platform like WhatsApp, Face book but in our case we have incorporated different facilities of social media platform, use all the features of WhatsApp and set WhatsApp status informing the dangerous situation.

4 Conclusion

Women feel safe and confident if they use this application both physically and mentally around their locality. Whether they are travelling in public transport, walking on the street or in market or inside shopping mall they feel safe and can call for help in an emergency situation.

There are already existing electronic devices and software tools which are used for safety of women. But after going through some of the recent tools we can see that there are gaps in those devices and becomes tricky while want to use in time of need. So we have decided to develop this App to remove these drawbacks.

From the screenshots shown above it becomes clear that our system is able to locate the nearest police station when she is in need and can contact them within a second. It saves time and give relieves from mental agony.

4.1 Contribution and Unique Features

Android based women safety application can be considered as a support network to help women in danger situation and as a resource build for well-being of human. For any cultured society that values and prioritizes the safety of women can help to lessen incidents of violence and harassment against women. Few potential contributions of this application are as follows:

- This app can be treated as emergency service provided at the time of need.
- By leveraging GPS technology real time location of the victim can be detected and thus ensures prompt response at critical time.
- This app can be considered as educational resource, it provides safety tips, enhance personal safety awareness on surroundings and teach how to take precautions at different situations.
- Allow users to maintain an emergency contact lists of friends, family and security personals.

Unique features particularly of this proposed application are as follows:

- A user of this app whenever feels an unsafe surrounding can check her location and contact police in the nearest police station.
- Victim can contact the nearest police station through emergency number.
- When a user opens the App, the location permission is automatically enabled and by pressing the "Update my location" button, user can know about her current location.
- Police persons will also be benefitted through this app as they will be informed by the user prior to an incident and can save her at proper time.
- User can set WhatsApp status and broadcast message to her contact list and thus ensures getting maximum help from family and friends.

4.2 Future Work

The proposed project is in the process of adding more important features. One of our plans is to include sending voice messages to the police stations and social media handles to attain maximum viewers specially needed at nighttime.

Correlating with the user location we can add an option to display the crime sensitive areas. To get this feature active collaboration with the Investigation officials will be needed.

Another feature may be sending notification to all users if someone using the app when is in trouble.
Option for video recording and send it to the police stations immediately may also be an extra feature.

4.3 Background Survey

Before going to design our proposed system we had made a survey to know the system requirements of the app from different students of Gauhati University, Assam. A few of the comments we found during the survey are written below. The comments are exact piece of words they said.

- "We can make a connection in town. Suppose a woman is walking through my area, and feeling unsafe to walk or go, then she can drop a message in the app. Then the message will automatically pop up my mobile saying that a woman is in my area and then I can voluntarily escort her till she feels safe. It's pathetic to write so as this drops down women freedom but can't avoid too."
- "That's a good thought for starters. But honestly no app can make women safe unless the perpetrators out there, the monsters out there continue committing crime against women. Let's take an examination, nothing can save a woman from acid attack unless the man who plans to throw acid on her face realise that it's a crime and it's inhuman to throw acid on her face."
- "People need to understand that they shouldn't commit crime against women rather than women learning how to protect themselves. The prior is more pertinent and easy to do compared to the latter. But all the best with your plans". She suggested the following points for our App.
  - Safe place identification should be there
  - Should not be restricted to a specific language
  - Ad free
  - Voice note/video recording/text messages along with customized messages should be made available in case the sender is facing problem in writing long text.
  - Nearby police station, hospital numbers should be kept ready
  - Some alarming type buttons should be made available in case of panic/emergency situations
  - Live tracking should be there and the app should also be able to detect/highlight nearby crowded places/police stations etc., if the user gets stuck in an isolated area."

4.4 Feedback from User

A survey was made among the students of different departments of Gauhati University campus situated at Guwahati city. The survey was carried out among thirty-nine (39) students. Among the women students 76.9% believed that technology can make them safe. On the other hand, 53.8% women believe that "Android based Women safety app (SOS)" can reduce crime against women and 41% students are not sure about it. 6.2% responded negatively. That scenario is displayed in Figure 9. The analysis of the feedback depicts that an App designed with android based modern facilities can help and feel women safe if there is a way to reach the police in a few minutes at the time of risk.

This feedback help us to understand importance of a significantly designed app. Lastly, we would like to mention that our app is in incremental phase, and we will soon release it as soon as future plans get accomplished for the betterment of the society and for reducing crimes against women in real terms.

4.5 Limitations

The tool called as women safety App discussed in this paper is an effort to help women when she feels unsafe or worried about her safety. Developer of this tool approached some of the probable users and analyzed credible facilities that should be included in the app from their preliminary background survey. But a few drawbacks which came to notice can be dealt in future are as follows:

- If the situation becomes too bad to use the mobile handset, then the app cannot be operated.
- Internet connection is compulsory to reach the rescuer.
- A more vigorous and automated initiation system with a separate hiding device may be designed such that the app automatically triggers and reach the rescuer within a single press on the keypad of the mobile.

As developer of this application we expect that the drawbacks mentioned above can be addressed with advanced technology in the future.

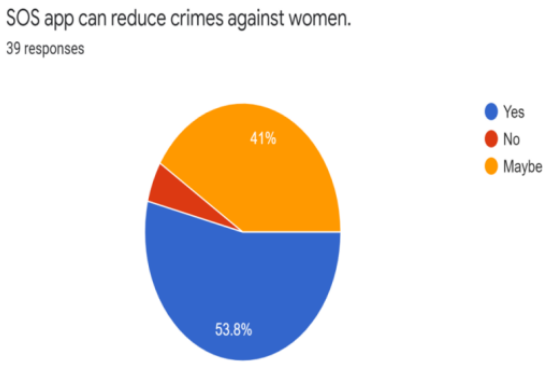

Fig 9. Response in Pie Graph of the Query "SOS App Can Reduce Crimes Against Women"

5 Declaration

Presented in Fourth Industrial Revolution and Higher Education (FIRHE 2023) during 23rd-25th Feb 2023, organized by DUIET, Dibrugarh University, India. The Organizers claim the peer review responsibility.

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