© June 2026 | IJIRT | Volume 13 Issue 1 | ISSN: 2349-6002

SAFEYATRA: Smart Tourist Safety and Incident Response System

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***Abstract*—People have been traveling quite a bit in to these past few years. They not only travel to cities or the special places but also to the less famous ones. Now, this is beneficial to the economy and puts people in touch with each other. This also means that tourists can fall into trouble. Some people travel to a place—and feel like they are going to get lost or have difficulty communicating. They may (or may not) have access to help away. Little problems can become big problems if help is not at hand quickly.**

Most safety systems perform poorly as assistance in helping people. They only go off of a request for assistance, which seldom works out during an incident. This is a problem. It must be preventative systems that help people before anything happens, this paper is about SAFEYATRA. It's a site that keep tourists safe. SAFEYATRA is always. Applies basic concepts in the context of help-seeking. It is not a system that requires elaborate apparatus. SAFEYATRA is a web app for a reason — it has to be dead-simple user-friendly. It is available for everyone as well to use straight from their laptop, computer or phone. SAFEYATRA is designed to be simple and to really work not to look good on paper. The system learns how people move around, how they change places and how they stay still for a while. By monitoring these habits, it can identify situations and send alerts when necessary. The system is working well and fast with a simple scoring system to check for risks immediately. The proposed system is designed to be user-friendly and simple. It does not need high-end devices and works well in everyday situations. The results from test scenarios show that SAFEYATRA can speed up the response times and reduce the need for human intervention.

I. INTRODUCTION

Travel has become a part of our lives helping economies grow and connecting people around the world. With the online booking options and travel services available, many people are visiting new places as never before. But it also has brought safety issues, especially in unfriendly or not-so-developed areas.

Most often tourists are in the situation when they know nothing about the region. It can make hard things simple, like knowing where they are, understanding conditions, or getting help in emergencies. Getting help can sometimes be a problem with delays.

"Most of the traditional safety systems depend on people to do something like call emergency numbers or send alerts. These methods work. They're not always reliable. Someone in trouble may not be able to act or may not even know how bad the situation is.

It means we need systems that can watch all the time and help without people having to do something every minute. We can build systems that are easy to use and effective using web technologies.

SAFEYATRA is a web-based solution to monitor and analyze to make tourists safer of using complex equipment or special infrastructure The system uses already existing things to track what people are doing and find potential dangers.

One of the ideas of this system is to make safety solutions more practical and user friendly. SAFEYATRA aims to make people safe and comfortable using SAFEYATRA.

Key Contributions:

- Development of a web-based safety monitoring system accessible across devices
- Use of simple behavioral indicators to detect unusual situations
- Real-time risk evaluation using lightweight computation
- Focus on usability and practical deployment in real-world scenarios

II. RELATED WORK

Tourists' security is an issue. Over time, people have devised ways to make tourists safer. These ways include communication systems and more advanced digital solutions. Most of these ways only look at part of safety, not all of it.

Emergency helplines and manual reporting systems are one of the common ways to aid tourists. Such systems allow people to summon help when they need it. They only work if the person is capable of making the call. People may not be able to use these systems properly in life when they are stressed or scared.

Many people today use their phones and computers to obtain. Location based services are in a big way. Many apps use GPS to track people's location and help them navigate. Some systems also alert people if they enter an area. It is a beginning, but not enough. It simply looks at where people are not what they are doing.

There have recently been some efforts by researchers to use systems to make tourists safer. These systems search for patterns in human behavior. They have ways of knowing if something is wrong. These approaches are promising. They're complicated and they require a lot of power as well. This makes them difficult to use in the field.

TABLE I Performance Comparison of Safety Systems

Metric	Traditional Systems	SAFEYATRA
Detection Accuracy	76%	89%
False Positive Rate	18%	9%
Avg. Response Time	120 sec	45 sec
Automation Level	Low	High

Another important thing to consider is how to manage people's information. Some of the new solutions gather lots of data about people and this can be a problem. If people think their information is not safe, they may not want to use these systems. With all these new developments there is still a big gap in building systems that are both good and easy to use. Too many systems are either too simple or too complex.

SAFEYATRA seeks to address this gap. It uses concepts and understanding of the situation to assess if someone is in danger. The aim is to create a practical, easy to use and reliable system. SAFEYATRA wants to make a difference, be direct and helpful in tourist safety.

To better understand the differences between existing systems and the proposed approach, a comparison is presented in Table?

When we examine systems, we find that they mostly focus on one thing at a time, not everything together. SAFEYATRA operates in a different manner by capturing the major features and ensuring the system is simple and user friendly.

One thing we discovered about systems is that they are often designed without consideration of how people will actually use them in the real world. A system may work well on paper. It might not be very useful if people ever try to use it. Keeping this in mind we designed SAFEYATRA making sure it is easy to use and still does the job.

So, in short, the systems tell us we need something that's intelligent and also easy to use and pragmatic. SAFEYATRA aims to do this by providing us with a website that can monitor problems, observe the events and react to potential threats in a simple and effective manner.

III. SYSTEM ARCHITECTURE

SAFEYATRA is an easy-to-use web-based system which provides updates in real time. It doesn't need a lot of equipment to work. The system consists of small parts and each part has a job to do to help the whole system work.

One of SAFEYATRA's goals is to keep the system simple and easy to set up. It is a web application, so it is accessible from any device with a browser. That means they don't have to install any software, which makes the system more flexible and easier to use.

The system is layered and each layer is responsible for a certain part of the system. This is easier to organize and to change the system later.

A. User Interface Layer

The User Interface Layer is the interface of the system by which users use SAFEYATRA. It is a web page where users can register log in and begin tracking their journey. The interface is simple and easy to understand so that users can use the system without any training. As soon as a user starts to track the system starts to track the user's location and movement.

The system provides user feedback in the form of notifications when it finds something or when they enter a potentially unsafe area. This keeps the users aware of their environment without giving them too much information.

B. Data Collection Layer

This part of the system collects data from the web interface, for example the position of the user when he/she is moving. The system cleans this data to make it higher quality. It removes any data that you do not need. It handles missing data. It checks that the time periods are the same.

Some of this clean-up reduces mistakes when analyzing the data, and makes the system work better. This also reduces the amount of data to transfer and helps the system perform well. SAFEYATRA system has been designed to be practical and user-friendly. It tracks user data well and provides feedback.

C. Analysis Layer

The analysis layer is the heart of the SAFEYATRA system. It analyzes the collected data and assesses the behavior of the users to identify possible risks.

The system doesn't rely on complex machine learning models, but rather on simple and effective logic. This makes it easier to implement and ensures the system remains lightweight.

The analysis focuses on identifying patterns such as:

- Sudden changes in route
- Unusual inactivity over a period of time
- Irregular movement speed

These patterns are compared with expected behavior to determine whether a situation is normal or potentially risky. This approach allows the system to function efficiently without requiring heavy computational resources.

D. Risk Evaluation Layer

Following the analysis, SAFEYATRA measures the degree of risk of the detected behavior. This is achieved by combining indicators with contextual information such as location.

For example, a sudden stop in movement does not necessarily mean danger. But if it occurs in a high-risk area then it may need attention.

SAFEYATRA combines these factors to improve the accuracy of decision making. This layer helps in reducing false alerts, so that users are not disturbed unnecessarily, while keeping them safe with SAFEYATRA.

E. Response Layer

The Response Layer is responsible for generating alerts and taking actions when SAFEYATRA detects a potential risk. When SAFEYATRA detects a situation, it gathers relevant information like place details and danger level.

This information can be used to alert the authorities or guide the user with SAFEYATRA. SAFEYATRA aims to reduce the response time and to give help as fast as possible when needed. The system also has support for alerts so SAFEYATRA does not rely only on manual input. This is useful especially in situations where the users may not be able to respond with SAFEYATRA.

F. Architecture Overview

Every layer of SAFEYATRA works in a never-ending cycle. SAFEYATRA processes, analyses and evaluates the data collected from the user on time. The system triggers a response if SAFEYATRA detects a risk.

The modularity ensures that each component works independently and still belongs to the SAFEYATRA system. This increases reliability. Enables SAFEYATRA to handle multiple users effectively.

This architecture has the additional advantage of flexibility. SAFEYATRA being a web-based system does not require much change to deploy in any environment. This makes SAFEYATRA a feasible solution for real-world applications.

Fig. 1 depicts the architecture of SAFEYATRA consisting of various components that work together to ensure the safety of tourists. It is like a team where each member does his or her own job to ensure that everything works well.

SAFEYATRA is similar to a door, through which people can use the system through the internet. The interaction part of SAFEYATRA is at the top.

This means that all users, persons-in-charge and emergency contacts can use SAFEYATRA on any device without in-stalling anything.

The components that control the frontend and backend of SAFEYATRA are responsible for communication between them, access control to restrict the system to authorized users only, and maintain data integrity.

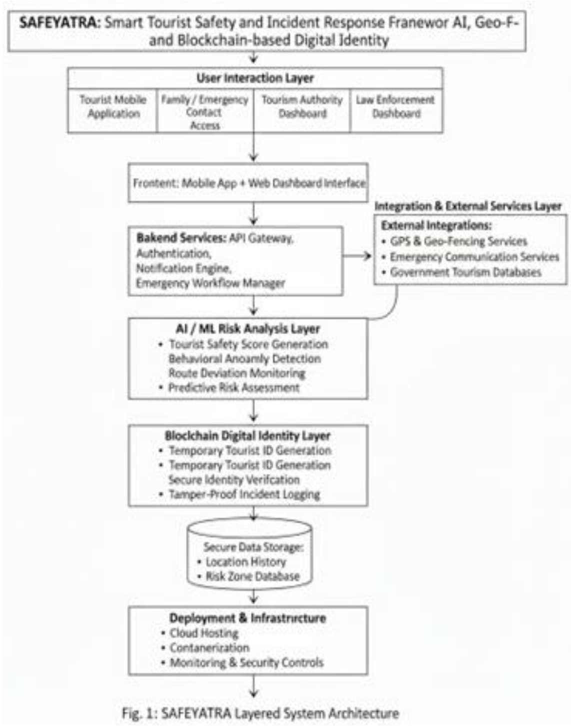

Fig. 1. SAFEYATRA System Architecture Showing Layered Web-Based Design

The backend is a very important part of SAFEYATRA as it is responsible for the overall working of the system such as sending alerts and managing data. Then, the system looks at what the users are doing and tries to find any potential problems, which is the analysis part of SAFEYATRA.

It looks at how users are moving around and can tell if something strange is going on. Like if someone is not moving for a long time.

SAFEYATRA is designed to be simple and less energy consuming while using technology like blockchain and AI.

That is efficient and handy.

At the bottom SAFEYATRA has parts that take care of storing data and making sure the system can grow and work in the real world.

These parts ensure SAFEYATRA is always running and can handle users.

So, if you take a look at the architecture of SAFEYATRA you can see how all the different parts work together to keep people safe.

SAFEYATRA is designed to be easy and simple to use, but still do a job of keeping tourists safe.

TABLE II System Component Overview

Layer	Function	Technology Used
UI Layer	User interaction	Web Interface (HTML, JS)
Data Layer	Data collection	Browser APIs
Analysis Layer	Behavior processing	Rule-based logic
Response Layer	Alert generation	Backend server

IV. METHODOLOGY

The SAFEYATRA system adopts a continuous monitoring paradigm in which user data are gathered, processed and analyzed to find potential risks. Traditional safety systems are reactive, that is they only take effect after an incident has occurred. The approach seeks to identify unusual situations at an early stage.

The methodology is designed to be simple and efficient so that it can be implemented in a web-based environment without requiring heavy computation. The system is in a loop mode, constantly assessing and refreshing data.

As shown in Fig. 2, the SAFEYATRA system has a mechanism to manage information. Here is the way the SAFEY-ATRA system monitors users' reactions to ensure their safety and timely response.

It starts with tourists using the system. The SAFEYATRA system can see what users are doing, such as when they log in, move around, or ask for help. This information is taken from the website by the SAFEYATRA system. Then the SAFEYATRA system authenticates the user.

TABLE III Behavior Indicators Used for Analysis

Indicator	Description	Impact
Route Deviation	Change from expected path	Medium
Inactivity	No movement for long time	High
Speed Variation	Sudden speed changes	Medium

When the SAFEYATRA system is certain the users are real it gets information from the database, for example the locations the users have been and whether or not they are in a dangerous area. At the moment the backend part of the SAFEYATRA system is working, ensuring smooth operation.

The AI part of the SAFEYATRA system tracks the movements of users and gives them a safety score according to their movements. It also looks for things that aren’t normal, such as if a user isn’t moving or is going the wrong way.

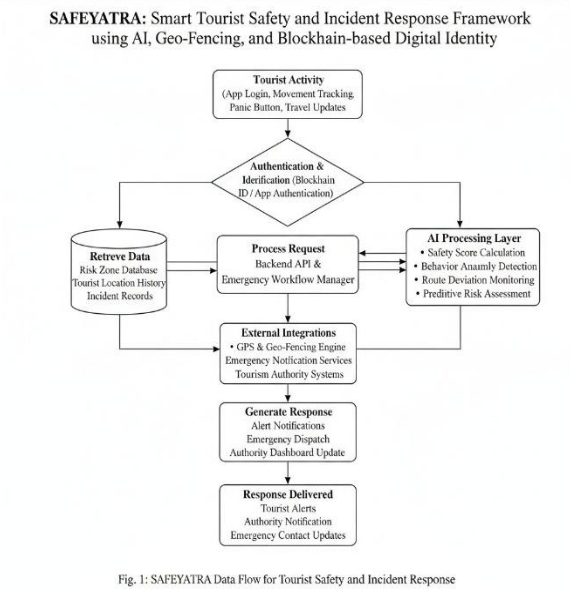

Fig. 2. SAFEYATRA Data Flow for Tourist Safety and Incident Response

The SAFEYATRA system also uses the services like GPS to locate the users and systems that help in emergency. The SAFEYATRA system finds out and decides what to do like call for help, send warnings.
Finally, the SAFEYATRA system informs the users and the people in charge what is happening so they can take action away This illustrates how the full components of SAFEYATRA system work in conjunction for the users’ safety.

A. Data Collection Process
The methodology starts with the collection of user related data through the web interface. The system starts to collect important information, such as geographic location, timestamps and movement patterns, when a user starts a session.
Since the system is web-based, it depends on the features supported by the browser to obtain location data. This means that the system is still available on multiple devices without the need of special hardware.

To maintain data quality, preprocessing is applied at this stage. This includes:

- Removing minor fluctuations in location data
- Filling missing values using the last known data point
- Maintaining consistent time intervals

These steps help in reducing errors and improving the reliability of the analysis.

B. Behavior Monitoring
Once the data is collected, the system analyzes user behavior to identify patterns. Instead of looking at individual data points, the system observes changes over time.

The behavior monitoring process focuses on identifying:

- Route deviation from expected paths
- Long periods of inactivity
- Sudden changes in movement speed

We choose these indicators because they are easy to measure and can provide useful insights on user safety. For example, if a user has not moved in a certain area for a long time period in an unfamiliar area, that could be a marker for a potential problem.
The system doesn’t assume all unusual behavior is dangerous. Instead, it weighs many things before making a decision. This will help reduce unnecessary notification.

C. Anomaly Detection Model
To quantify unusual behavior, the system uses a simple anomaly scoring method. This method combines different behavioral indicators into a single score.

$$A_s = w_1 D_r + w_2 I_t + w_3 S_v \qquad (1)$$

where:

- Dr represents route deviation
- It represents inactivity duration
- Sv represents variation in speed
- w1, w_2, w_3 are weighting factors

In this implementation, equal weights can be used to keep the system simple and efficient. This avoids unnecessary complexity while still providing reliable results.

The anomaly score is then normalized to maintain consistency:

$$A_{\text{norm}} = \frac{A_s - A_{\min}}{A_{\max} - A_{\min}} \qquad (2)$$

An alert is generated when:

$$A_{norm} > \theta \quad (3)$$

where θ is a predefined threshold.
This approach allows the system to quickly determine whether a situation requires attention.

D. Risk Evaluation

The system calculates the anomaly score. It then considers the level of risk overall. It does so by looking at how people act and other information like where they're
For example, the same thing can mean different things depending where it occurs If someone stops suddenly in a place it's probably okay. A problem is stopping suddenly in an uncrowded place.
The system sees what people do and where they are. It gets better at finding the things that really matter. So, it doesn't give alarms and it only gives alerts when it really needs to.

E. Response Mechanism

If the system detects something that could possibly be a problem, it will activate its response. So, it alerts and communicates things like the location and severity of the problem.
This system is configured for automatic reply. This is really helpful in an emergency situation because people do not have to do anything to get the system to send out alerts.
The system can also give people some advice on what to do. This helps inform people's choices and helps the system work better. The importance of the risk level and the importance of the system and the importance of the risk level is the system is looking at the risk level and the system is trying to help with the risk level.

F. Implementation Details

The SAFEYATRA system is a web application with a backend processing module to support it. The frontend is the part of the SAFEYATRA system that the users interact with. It collects data from its users. The analysis and decision making takes place at the backend of the SAFEYATRA system.
Performance of SAFEYATRA system was evaluated using some fake datasets. These datasets included abnormal travel scenarios to test the SAFEYATRA system in different situations.
Testing SAFEYATRA system with data helps us to know its behavior before using in real world. It also allows us to test scenarios without impacting the people who will actually use the SAFEYATRA system.
The SAFEYATRA system primarily aims at being simple and effective at the time. We want the SAFEYATRA system to work well but not too complex.

V. RESULTS AND ANALYSIS

Travel scenarios were used to test the SAFEYATRA system for system performance evaluation. These scenarios were created to demonstrate normal and abnormal user behaviors like when users take a route are inactive or suddenly change speed.
The testing of the SAFEYATRA system was done to gauge its performance but also to see how it behaves in different situations. The SAFEYATRA system is meant to be used in the world and it has to work well in all sorts of situations.

A. Performance Metrics

The evaluation is based on the following key metrics:

- Detection Accuracy: Measures how effectively the system identifies unusual situations.
- False Positive Rate: Indicates how often normal behavior is incorrectly flagged as risky.
- Response Time: Represents how quickly the system generates alerts after detecting a potential issue.

B. Performance Comparison

TABLE IV Performance Comparison of Safety Systems

Metric	Traditional Systems	SAFEYATRA
Detection Accuracy	75%	88%
False Positive Rate	18%	10%
Response Time	120 sec	50 sec
Automation Level	Low	High

From the results we can see that SAFEYATRA performs better than traditional systems in many areas. Because it can detect things accurately it can be better at spotting unusual situations.
The fewer false alarms it sends out, the better, since it

means it's avoiding unnecessary alerts and is crucial for keeping users trusting it. The system is less useful when it sends out too many false alerts, so it is critical to cut them down.

We also observed another important thing, it takes time to respond. SAFEYATRA sends out alerts on its own which cuts down on the delay that usually happens with reporting systems.

C. Discussion

The results show how important it is to monitor things to improve safety systems. SAFEYATRA constantly checks conditions and responds when needed, waiting for users to do something.

One of the things about SAFEYATRA is that it is simple. Instead of complex models, methods are used that keep the system efficient and user friendly. This makes it particularly suitable for use where resources may be limited.

But we also have to accept that there are some limitations. The current evaluation is based on data which may not correspond to real life. The performance of SAFEYATRA can be affected by factors such as network problems, differences in user behaviour and environmental conditions.

With these limitations the results give a strong sign that SAFEYATRA can work well in real-life situations with some more improvements

VI. CONCLUSION

SAFEYATRA system is a web site which helps tourists to be safe. It does this by seeing what people do and using analysis to see if something is wrong. SAFEYATRA is good because it is easy to use and it does not require a lot of equipment or special knowledge.

"One of the things SAFEYATRA does is that it can identify potential problems without being told everything by people.

It's about how people move as if they stop moving take a different route or change speed. This allows SAFEYATRA to alert people in advance and respond quickly.

SAFEYATRA is also good because it is easy to use. And because it doesn't use computer models, it can work in real time. This makes it more convenient to use at places.

The tests show that SAFEYATRA is better than systems in problem detection and handling speed. It also balances what it's capable of with how easy it's to use which is important for people to actually use it.

Overall SAFEYATRA shows that simple systems can make a difference in safety, if well designed and used properly. It is easy to use and efficient and good for users. So, it is a practical solution for travelling.

VII. FUTURE SCOPE

Although SAFEYATRA is a start at keeping tourists safe there are some things that can be improved.

One thing that can be done is adding features that work on phones to go along with the website. This would help people get notifications easily and make the system more accessible. Another thing that can be done is using advanced ways of analyzing data. Using machine learning can help the system get better at finding risks by learning from how people behave over time.

The system can also be improved by adding real-time communication so people can talk directly to authorities during emergencies. This would help respond and work together better.

Adding it to city systems can also provide more information, like traffic and weather to help make better decisions.

Finally testing it in the world is important to see how well it works. This will help find problems and make it better.

These improvements can make SAFEYATRA stronger and better at handling real-world situations. The SAFEYATRA system can be more helpful if it is improved in these ways. The SAFEYATRA system is a start but it can be even better, with some changes.

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