An Integrated Mobile Framework to Support Desert Travellers in Oman Using AI Techniques

Preethy Kurian[1], Ali Juma Al Zadjali[1] and Vikas Rao Naidu[1#]

[1]Middle East College, Muscat, Oman
[#]Advisor

ABSTRACT

The studies conducted in the Middle east region shows that desert safari and camping trips are one of the leading areas in the Arab region in terms of psychological recreation and entertainment. With the growth of the tourism industry, the number of people coming to Oman's deserts is increasing yearly. However, travellers also face many challenges when travelling through deserts and rugged areas in the Middle East. According to (Seeker, 2022), there are several factors that a person may face in deserts, so the awareness of overcoming these factors is the key to survival in deserts. In addition, the research shows that most desert deaths are due to environmental risks due to a lack of preparedness. Also, the factor of high temperature is the most crucial cause of dehydration, which can also lead to death. Hence, knowledge of survival techniques is essential for any traveller while planning the trip. According to (Kissiah, 2022), many people may lose directions during desert trips, and the best time to search for missing persons is the first 48 hours. In such cases, the rescue team must have sufficient information on travellers to initiate rescue operations soon.

Several mobile applications exist for tracking children or family members when they go out. The FollowMee application is an application that converts ordinary mobile devices into mobile GPS devices, which can work under weak networks (Daily, 2022). The iSharing application is an application that is considered one of the best applications through which family members can be tracked in real-time using GPS. The device also sends alerts when the member reaches or leaves a destination. However, most of these existing applications do not serve the purpose of desert travellers because of their limited features. Hence, an application is needed to boost travellers' confidence in adventurous trips by providing the necessary guidance.

Introduction

The main aim of the research study is to propose a mobile based framework to reduce the percentage of people getting lost in the desert. Also, to facilitate travelers with proper guidelines and precautions for their adventurous trips. The proposed mobile framework allows travelers to record their essential data, which will help the rescue team track them in case of emergency. The proposed application also is integrated with artificial intelligence techniques to know the percentage of hydration in the body and allows travelers to pay attention to the amounts of fluids in the body.

Data collection is crucial in identifying trends, possibilities, and solutions to research problems and assessing potential consequences. Using a questionnaire will determine if the community is aware of the importance of awareness of the risks of travelling through the desert and remote areas. The spiral methodology is planned for the software development cycle as it is compatible with the project environment. Because it analyzes risks periodically, this methodology can reduce errors associated with sensitive functions such as evaluating the dehydration level of travelers. Also, this model takes a more extended period to re-implement the stages to refine the final product and its appearance with high quality. The spiral framework also supports completing the critical steps of deployment of mobile framework successfully.

The presence of a system that accompanies the adventurers and is present on their phones throughout the duration of the trip, urging them and through which they are also able to request help, even in the absence of network

coverage. It is the best solution that can be offered to the adventurers, even with the lack of awareness among the adventurers. Supporting the system with an artificial intelligence model that is able to know the percentage of hydration in the body and helps them pay attention to the amounts of fluids in the body is one of the best solutions that can be used through only the camera of a smartphone. When talking about artificial intelligence and producing a model capable of processing inputs correctly and accurately, the Python programming language is most appropriate in terms of accurate data processing and giving results clearly based on the input data. In addition, the best technologies that give the possibility of integrating artificial intelligence into the phone must be used, as here we can use Kivy framework, it is an open-source library for Python, as this library allows programming one source code that works for Android and IOS platforms, and this library is also very organized programming , which is Python, where there is no software barrier that differs from the original programming language.

Literature Review

The spread of desert sports in the Arab regions and camping under the stars is one of the most beautiful things that adventurers can do in order to entertain themselves, but the problem is in entering places that lack population density and civil presence, as this leads to the loss of some adventurers in the deserts. Because of the lack of experience in knowing the desert roads or the lack of survival skills in the desert, the adventurer may get lost in the deserts and expose him to all kinds of risks that may cost him his health or his life.

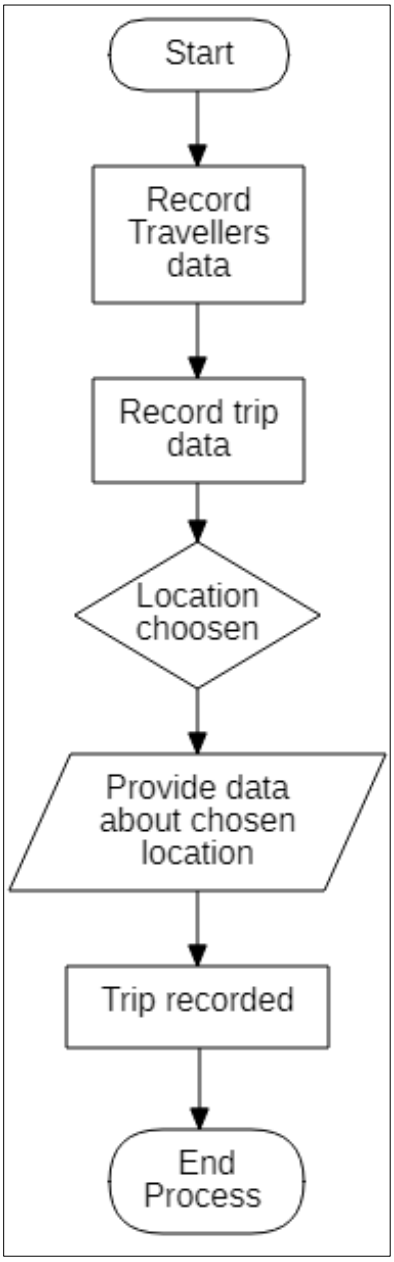
Dozens and sometimes hundreds of people are lost in remote areas annually, as people are often lost in separate places far from densely populated cities. A group of these people who are lost in the desert are never recovered alive and it depends very much on the people themselves in terms of experience in facing the same situations. Where 133 people were missing in the Kingdom of Saudi Arabia in the year 2020, and the majority of them were found alive and in good health, as this is due to their possession of sufficient information and experience that helps them in facing this situation. Where experts in the field advise that the first thing that must be done in cases of getting lost in the desert is to find a source of water because of the brightness of the sun and its rays and the dryness of the air causes a rapid loss of water from the body without the person noticing it, as this leads to a weakening of the vital functions of the person, and a shelter must be found It protects from the sun's rays, even if the shelter is hills or rocks. The experts also added that the person should be covered with clothes as much as possible to reduce lost fluids from the body and also protect themselves from the sun's rays. And if there are extra clothes or blankets, it is possible through these things to make a protective shade from the sun until sunset, and then it is possible to move to another point to search for other food sources or to search for help. (Samir 2021). In my opinion, people who constantly go to remote places should be educated, whatever the reasons that necessitate them to go to those places. In addition to the author of the article that new techniques should be added in addition to awareness that help solve related problems and give a clear vision for decision-making. The article is taken advantage of by including the necessary recommendations in the application for the user to see in order to benefit him in the event of an emergency. In addition to a checklist containing the basics needed by the adventurer in the desert.

There is a certain number of types of data that are collected about the missing, depending on the conditions in which people were lost, and this determines the data that must be collected. Where basic information must be collected in general, and depending on the situation of the loss of the person, his information is collected in particular, where among the information that is collected in general are the basics that enable the concerned authorities to confirm the identity of the missing person, and this information is mostly the name of the person, his physical structure and his prominent characteristics that The identity of the missing person is confirmed, and then the medical history of the person comes, so that the rescue authorities can know the best and most appropriate method for the case of loss. In my opinion, Data collection must be with high accuracy, and this data must be the data that is sure to help deduct a large part of the search because of the importance of every minute when searching for missing persons. Through the above article, important data is collected in order to find the best data that can facilitate the search for missing persons.

Where data is collected from the user in the application based on the data that would provide the greatest opportunity to find the missing.

Methodology

The spiral model was chosen for several reasons that are compatible with the progress of the project in term of quality, as it was found that the stages of this model are compatible with the type of project. Whereas, the spiral model is compatible with the project because it analyzes risks periodically, which enhances the reduction of risks that can be faced. This action reduces errors due to the application being associated with a sensitive function such as rescue operations. Also, this model takes a longer period in terms of re-implementing the stages to refine the final product and its appearance with high quality.



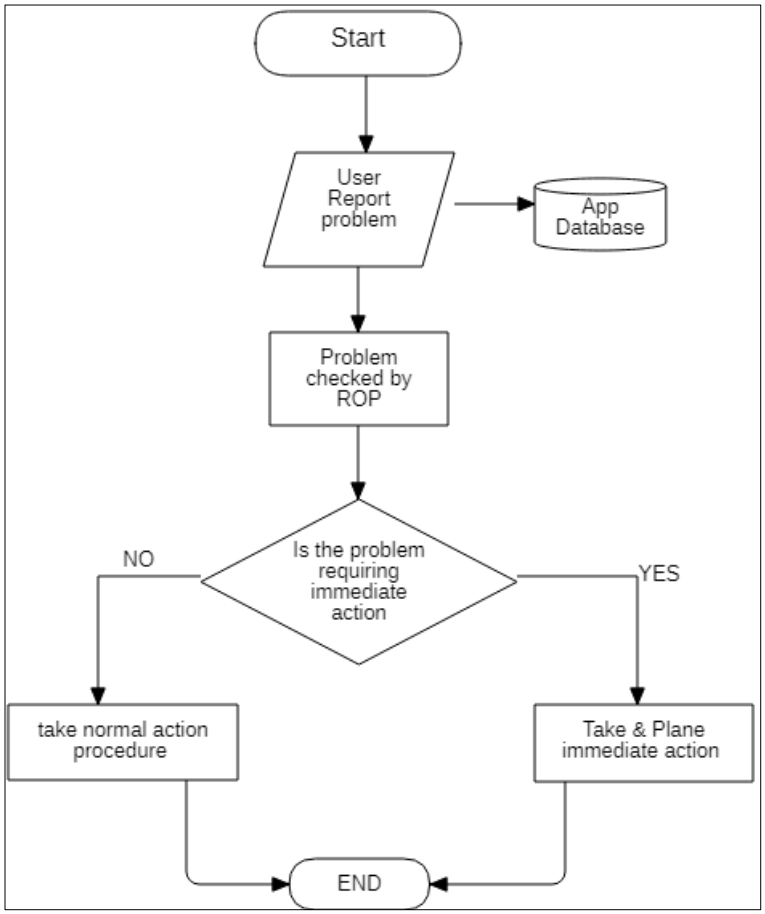


Figure 3. Record trip

Figure 3. Location page

To build the system in an integrated manner, the artificial intelligence model must first be built in order to recognize the percentage of hydration in the body through facial images, as there are signs indicating dehydration of the human body through the face, such as chapped lips, dryness, and dullness of the skin color. The model can be built through the Python programming language with the tensorflow library included in the model as this library is open source and dedicated to neural network algorithms that enable image analysis through these algorithms. Where this model will be built by PyCharm, which is an integrated development environment for the Python programming language, and the Kivy framework will also be used, as this framework can work in well-known operating systems such as Windows, Android, and also IOS. The model can be trained by condensing the data with appropriate features to develop accuracy. Testing the model after ensuring that the appropriate accuracy is obtained. Also, after obtaining the required accuracy, the model will be integrated into the application. After that, the Firebase database will be linked to the application to send and retrieve data and link it to the competent authorities such as the police, the traveler, or the adventurer himself.

System Architecture

The aim of developing this system is to assist adventurers or travelers through land trips, as it provides the authorities with a greater and more ability to track lost travelers or even those who need urgent assistance in remote and rugged places. To create this system, it needs a system based on the Python programming language and the Kivy framework, which is considered a cross-platform, as it can work with several platforms such as Android and iOS. In addition to using the TensorFlow library that helps machine learning and artificial intelligence, which focuses on deep neural networks. As well as a direct database to give direct updates to the current site and the last site in case the system is not connected to the server. Figure 1 outlines data flow, communication, and an overview of the system.

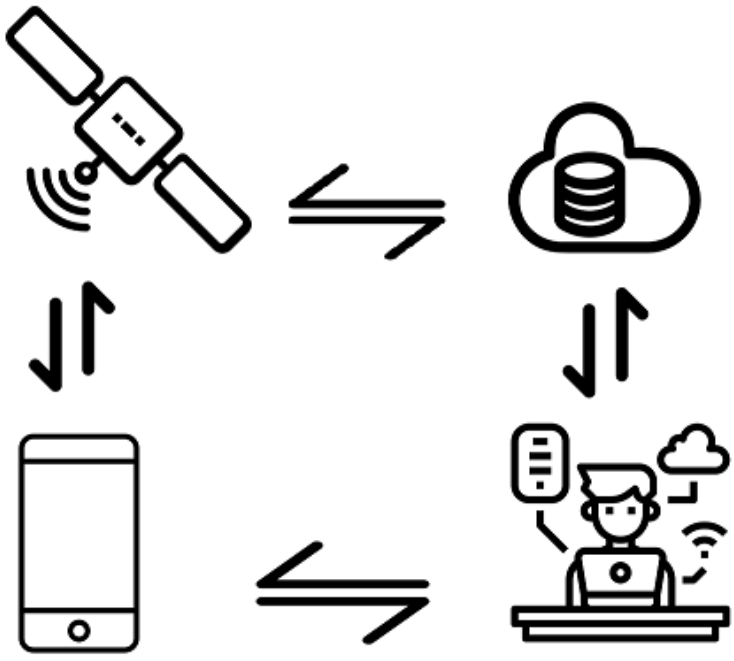


Figure 1. Overview of the system

Software and Hardware Components and Tools

The software and hardware used are the same that are available to the average user because of the importance of the system, as it was designed to be immediately available to the user. Also, this project uses spiral methodology, which helps to update the software and hardware periodically to be compatible with the average user.

Software – Application and Model Features

The system will be based on the Python programming language and its Kivy framework, where the system will be developed using PyCharm, which is an integrated development environment, as this environment provides the possibility of linking to the database, as well as testing and debugging the software as required. The model will be developed with a convolutional neural network algorithm, so that this algorithm will be used to identify the level of body moisture through the face and send this data to the responsible authorities. This is done by calling the Tensorflow library which is an open-source library that implements neural network models. The application will contain the following features

- Recording flight data
- Recording trip members data
- Record the initial hydration rate
- An SOS button for notify authorities of any emergency
- Edit current trip data button
- View previous trip data button

Data Container – Firebase Database

The model will be trained through the integrated development environment and the Python programming language, but when this model is tested, it will be by sending the image from the user's phone, then to the Firebase database, and then to the model. The Firebase database is a NoSQL database. Figure 2 is for reference purposes only. Where the adventurer or traveler and his trip data will be linked to a report on his current trip as well as his previous trips, and the form for knowing the percentage of hydration will be linked to the trip report of the adventurer or traveler.

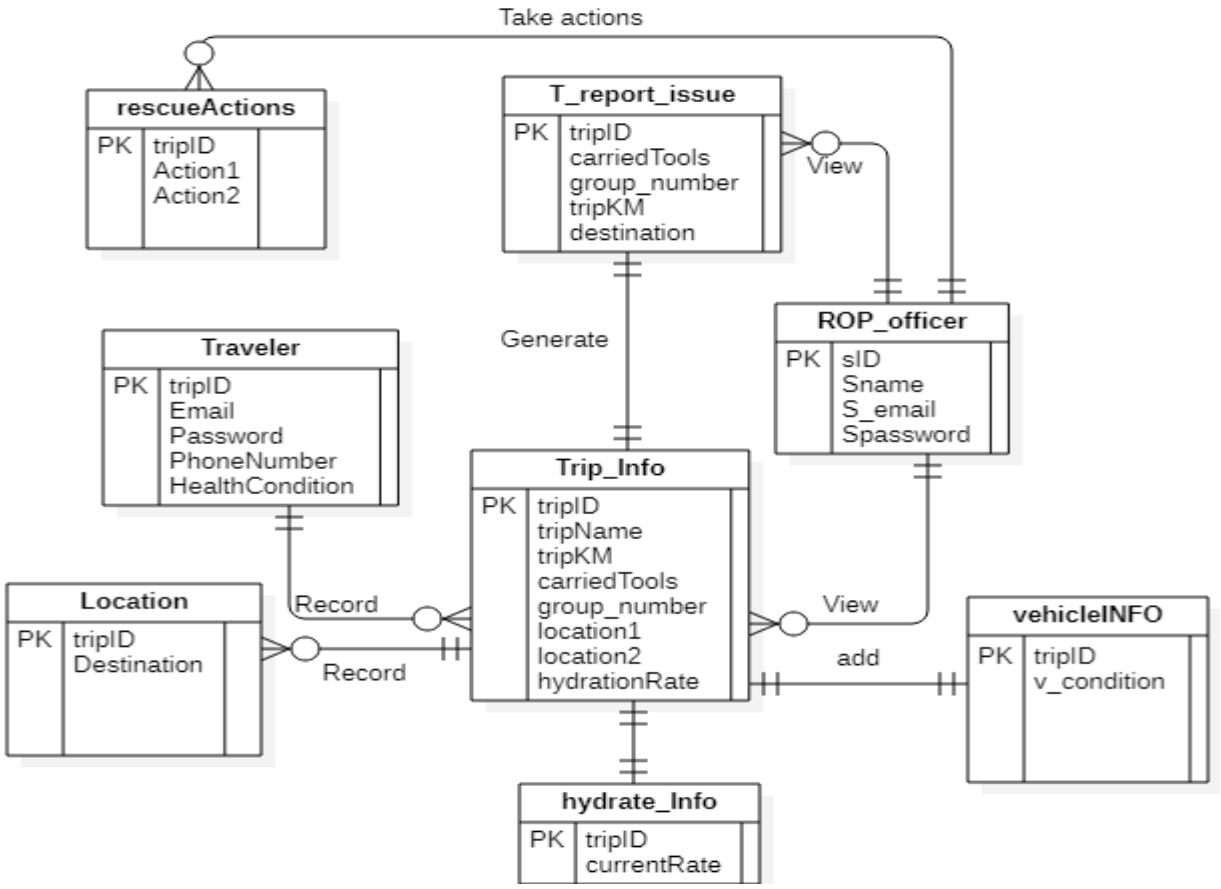


Figure 2. Entity relationship diagram

Hardware – Hardware Components

The devices used in the system are the usual devices such as the mobile phone, which is usually associated with people at the present time, and the database is an online database, it is browsed and all features are controlled through the website, as it requires a computer to give preference to the system.

Future Work

Other models can be developed with artificial intelligence and also integrated into the same application, such as creating an integrated model in the system that helps the competent authorities in predicting the best solution to help the adventurer or traveler based on the history of his previous trips and what action is taken towards the traveler or adventurer, as the system is based on the previous actions taken by predicting the best solutions that help more, faster, and with less damage.

It is also one of the future plans to convert the system into a system that can be installed in wearable electronic devices and also in car entertainment systems, as this step is able to help in an integrated manner. As the presence of the system on wearable devices will help a larger segment of society such as the elderly and children, where the application can be developed so that the data is previously filled in for children and the elderly, and by pressing the help button, the person will be reached through his location on the map and opening the camera for help on it. These features can be summarized as follows:

- The model for predicting the most appropriate solution to help the adventurer

- Developing the application to suit wearable devices
- Developing the application to suit car entertainment systems
- The development of the application to suit the elderly and children

Recommendations

This paper provides a structural design of "An integrated mobile framework to support desert travellers in Oman using AI techniques". The system hopes to help adventurers and travelers across the wilderness and between the sands, especially in remote, rugged, and devoid of population areas. The system also provides tracking of the location of the adventurer or traveler as well as his health condition. It is also able to reassure him/her and provide assistance through direct communication with the rescue authorities. Specifically, the system is designed specifically for travelers and adventurers who like to travel in small groups or individually. The application is also an important factor to help in emergency situations.

At this stage, the system is intended for adventurers, travelers, and wild hobbies, but it can be developed to be more comprehensive from a societal point of view. It is also possible to develop the system in addition to another model that helps the other side, which is the authorities concerned with assistance, such as the police and civil defense.

References

fgad, ahmed. (2020, March 4). *NumPyCNNAndroid*. NumPyCNNAndroid. https://ahmedfgad.github.io/NumPyCNNAndroid/

Johnson, D. (2019, June 29). *What is TensorFlow? Introduction, Architecture & Example*. Guru99.com. https://www.guru99.com/what-is-tensorflow.html

PracticalRush7. (2022, September 2). *Firebase on a Kivy project*. Reddit. https://www.reddit.com/r/kivy/comments/x49f5y/question_on_authentication_of_firebase_on_a_kivy/

Sharma, A. (2017, December 1). *Convolutional Neural Networks in Python*. Www.datacamp.com. https://www.datacamp.com/tutorial/convolutional-neural-networks-python

What is Kivy? (2020, January 28). GeeksforGeeks. https://www.geeksforgeeks.org/what-is-kivy/