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ENTITLED

Protectin: Smart anti theft System for Smartphones

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Abstract

The fact that phones have become an important part of our lives and their value increases over time also the risk of them being stolen increase, putting us at risk of losing all our personal information in addition to the financial cost of the phone. The question remains: how can we recover the phone in case it is stolen?, This study proposes **Protectin** application for mobile phones. Protectin works by automatically activating internet and *Global Positioning System* (GPS) after the system is activated via a text message,allowing it to retrieve phone information and phone's location through GPS, capturing a picture of the potential thief, and then sending it via email and *Short Message Service* (SMS) messages to pre-specified mobile phone numbers and email addresses.

Keywords: anti theft system; SMS Trigger; GPS; *Artificial Intelligence* (AI); Facial Recognition; Mobile ; application, Flutter , Dart , Tensorflow.

الملخص:

حقيقة أن الهواتف أصبحت جزءا مهما من حياتنا وقيمتها تزداد مع مرور الوقت، يزداد أيضا خطر تعرضها للسرقة مما يضعنا في خطر فقدان جميع معلوماتنا الشخصية بالإضافة إلى التكلفة المالية للهاتف. ويبقى السؤال كيف يمكننا استرجاع الهاتف في حالة تعرضه للسرقة؟. تقترح هذه الدراسة تطبيق **بروتكتين** القائم على الهاتف المحمول. حيث يعمل على تشغيل بيانات الاتصال ونظام تحديد الموقع تلقائيا بعد تفعيل النظام من خلال رسالة قصيرة واسترداد معلومات الهاتف وبيانات الموقع عبر نظام تحديد المواقع العالمي والتقاط صورة للسارق المحتمل ومن ثم إرسالها عبر الايميل والرسائل القصيرة إلى أرقام هواتف جوالة وعناوين بريد الكتروني محددة مسبقا.

الكلمات المفتاحية: نظام الحماية ضد سرقة الهواتف ؛ تفعيل باستخدام الرسائل القصيرة ؛ نظام تحديد المواقع العالمي ؛ الذكاء الاصطناعي ؛ التعرف على الوجه ؛ هاتف ؛ فلاتر ؛ تانسرفلو.

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List of abbreviations

GPS *Global Positioning System*

SMS *Short Message Service*

MMS *Multimedia Messaging Service*

SIM *Subscriber Identity Module*

1G *First Generation Mobile Network*

2G *Second Generation Mobile Network*

3G *Third Generation Mobile Network*

4G *Fourth Generation Mobile Network*

5G *Fifth Generation Mobile Network*

IMEI *International Mobile Equipment Identity*

Wi-Fi *Wireless Fidelity*

LTE *Long-Term Evolution*

BLE *Bluetooth Low Energy*

PIN *Personal Identification Number*

iOS *iPhone Operating System*

USSD *Unstructured Supplementary Service Data*

IoT *Internet of Things*

UML *Unified Modeling Language*

AR *Augmented Reality*

AI *Artificial Intelligence*

CNN *Convolutional Neural Network*

DL *Deep Learning*

CPU Central Processing Unit

RAM Random Access Memory

UI/UX User Interface/User Experience

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General introduction

Hardly you find someone who does not have a smartphone these days, since the phone plays an important role storing personal and sensitive data, according to Bankmycell stats [1]. By the end of 2024,there is almost 6.5 billion users have smartphones, which represent 80% of the world's population [2], and by 2025, more than 85% of people will only be using smartphones to access the internet.

With this comes the risk of losing the phone or having it stolen, which exposes all our private and important information to the risk of loss, this has led numerous developers to create apps that try to recover the phone in case its stolen, but they are filled with problems and weaknesses that prevent them from operating as efficiently as they should.

Using advanced tools and techniques, we have identified various defects and weaknesses that face most common applications, and based on that, we have developed an application, which enables you to protect your phone better and more effectively.

Motivation

People are increasingly concerned about the security of their mobile phones, which contain valuable personal information and sensitive data. The loss or theft of a mobile phone not only results in financial loss but also puts the user's privacy at risk. The impact of mobile phone theft extends to the emotional distress caused to the phone owners. So what are the main solutions to reduce the incidence of mobile phone theft, protect user data, and improve overall mobile security?.

Objectif

The main goal of this work is to propose an innovative solution to the problem of mobile phone theft by developing a robust anti-theft mobile application.

manuscript structure

This manuscript is divided into four chapters organized as follows: The first chapter introduces the mobile phones in general and why their security is impotent giving some famous solutions and their limitations and our proposed solution. The second chapter provides basic concepts and features in mobile phones that is useful in recovering the phone including fundamental concepts in security and user authentication. furthermore, the skills and tools needed in order to build an anti theft mobile system. In the third chapter, we present our approach for developing and implementing an advanced anti-theft mobile application. In the fourth chapter, We focus on examining its strengths and limitations. detailing the methodologies used and the effectiveness of our solution.

Chapter 1

Smart Phones

1.1 Introduction

Mobile phones evolved from being simply helpful communication tools to becoming an essential part of practically every aspect of life today. The early mobile phones were huge, heavy, and primarily used for voice communication. However, as technology has advanced and lowered the size of these devices throughout time, a vast range of functions have come up, changing the way people engage with mobile phones.

The field of mobile technology advanced rapidly in the late 20th and early 21st century. The 1990s saw the debut of SMS text messaging and a notable improvement in call quality with the switch from *First Generation Mobile Network* (1G) analog networks to *Second Generation Mobile Network* (2G) digital networks.[3] With the introduction of *Fourth Generation Mobile Network* (4G) networks in the early 2000s, people could now access the internet on their mobile devices and conduct online activities, send emails, and surf the web.[4]

The subsequent deployment of 4G *Long-Term Evolution* (LTE) networks improved connectivity and data rates even more, opening the door for the creation of advanced mobile services and apps.[5] Today, with the ongoing deployment of *Fifth Generation Mobile Network* (5G) technol-

ogy, mobile phones are ready to provide unimaginable speeds, reduced latency, and better connection, ushering in a new era of innovation in fields such as the Internet of Things *Internet of Things* (IoT), augmented reality *Augmented Reality* (AR), and artificial intelligence AI.

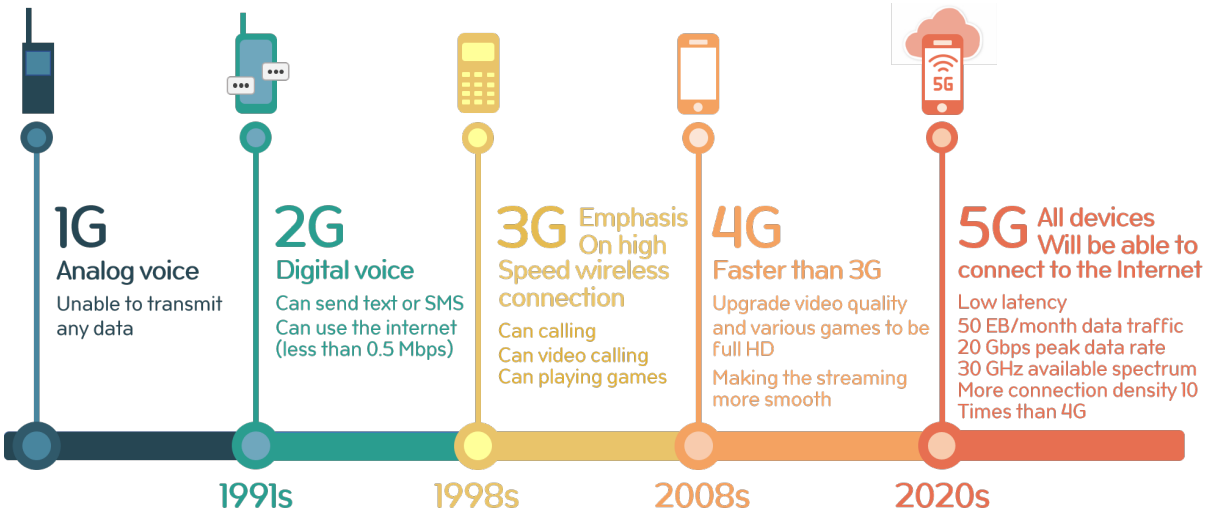


Figure 1.1: Evolution of Internet Generations

1.2 Uses and Roles of Smartphones

Smartphones are important in today's environment since they serve so many purposes. They are effective in many different areas, including productivity, entertainment, communication, information access, navigation, and health management.

- **Communication:** Mobile phones changed communication by enabling fast, worldwide connectivity. Modern smartphones provide a range of communication channels in addition to traditional voice chats, including SMS, multimedia messaging *Multimedia Messaging Service* (MMS), email, and instant messaging systems such as WhatsApp and Telegram. Furthermore, video calling and conference features provided by programs such as Zoom, Skype, and FaceTime have transformed both personal and professional interactions, allowing for real-time, face-to-face communication around the world.[6]

- **Information Access:** Smartphones provide exceptional access to information, functioning as portable windows into the digital world. Users with an internet connection may surf the web, read the news, conduct research, and use educational resources.

- **Productivity:** Smartphones important productivity tools, with features that promote business and personal organization. Email clients, calendar software that helps users manage their professional and personal responsibilities effectively.

- **Navigation and Travel:** Smartphones equipped with GPS technology help users navigate new areas, get directions, and locate nearby services. Navigation apps like Google Maps and Waze offer real-time traffic reports, route planning, and information about local businesses and attractions. Travel applications improve the travel experience by providing services like flight booking, hotel reservations, and itinerary management, making smartphones useful companions for travellers.

Figure 1.2: Smartphone Use Cases

1.3 The Importance of Smartphones Security

Given the importance of mobile phones in modern life, protecting these devices against loss or theft is important. The effects of losing a smartphone go far beyond the cost of replacement including the potential of losing all personal data.[7]

- **Personal Data Security:** Smartphones include plenty of personal information, such as contacts, emails, images, financial information, and critical documents. Unauthorized access to this data can result in identity theft, financial fraud, and privacy concerns. Ensuring mobile phone security is critical for protecting sensitive information from unscrupulous attackers.
- **Access to Essential Services:** Many individuals rely on their smartphones to access essential services such as banking, email, and social media accounts. The loss or theft of a phone can disrupt access to these services, causing significant inconvenience and potential delays in completing important tasks. Protecting their Smartphones ensures continuity in accessing these critical services without the risk of losing this data or getting to wrong hands.
- **Confidentiality and Privacy:** For business professionals, smartphones often contain confidential and sensitive information related to work. Unauthorized access to this informations can cause a huge damage.

1.4 The challenge encountered by the field

As the number of smartphone users grows, the phone theft rate also grows. In fact, it has started to become a nightmare for every smartphone user, especially those who have sensitive data. Unfortunately, there is currently no effective mobile phone anti-theft solution.

Many applications allow you to locate the phone and retrieve or delete data when its stolen. however, this method is ineffective in preventing the phone from being stolen because it requires both the use of GPS and mobile data in order to locate, send, and receive data from the phone. But This choice isn't often available, makes the question of how to keep smartphones from being stolen at all times remains unanswered.

1.5 Limitations of the Existing Solutions

Popular anti theft applications today try to reduce the impact of Smartphone theft. These apps often rely on GPS and mobile data to be activated in order to perform properly. However, they have disadvantages:

Table 1.1: Popular Anti Theft Applications

Name	**Description**	**Weaknesses**
Prey Anti-Theft	Prey is a comprehensive anti-theft app available for both mobile devices and computers.[8]	- Limited features in free version - Requires internet connectivity - GPS needs to be activated
Cerberus Anti-Theft	Cerberus is an anti-theft app for Android devices.[9]	- Only available for Android - Subscription-based - Requires GPS and internet connectivity
Avast Anti-Theft	Avast offers an anti-theft feature as part of its mobile security app for Android devices.[10]	- Some features may be locked behind a paywall - Can be disabled by advanced users - Requires GPS and internet connectivity
Lookout Mobile Security	Lookout Mobile Security in an anti-theft application.	- Some features are paid-only - Requires internet connectivity for real-time tracking - GPS needs to be activated
McAfee Mobile Security	McAfee Mobile Security offers anti-theft features along with antivirus.	- Can be resource-intensive - Some features require a premium subscription - Requires internet and GPS for accurate location
Norton Mobile Security	Norton Mobile Security includes anti-theft features as part of a broader suite of security tools for mobile devices.	- Requires a subscription for full functionality - Internet connectivity needed for real-time tracking - GPS needs to be activated

From the table 1.1 we note that each application has disadvantages that may stop the process of recovering the phone, but all applications depend on the Internet and GPS to be activated in order to work correctly which in most cases the Internet and GPS are not running making those applications useless, in addition to:

- **Dependence on Connectivity** Solutions that rely on GPS and network. if those services are disconnected or the thief turns off the phone, removes the SIM card, or disables GPS, these solutions become ineffective.
- **Power Dependency** Most anti-theft measures are rendered useless if the phone's battery is depleted or if the device is turned off. This dependency on the phone's power state limits the effectiveness of existing solutions.
- **Limited Preventive Measures** While current solutions focus on recovery and data protection, they do not actively prevent theft. There is a need for more measures that can determine theft or detect it early to enhance the chances of recovery.

1.6 Proposed Solution

This study provides an innovative anti-theft application for smartphones that goes beyond what existing anti-theft solutions provides currently on the market. The application has the ability to turn on GPS and network services automatically, saving the user from having to do it manually. This makes it more efficient in tracking down and recovering lost or stolen devices.

We used Flutter framework, which is well-known for its ability to produce natively built applications for both the iOS and Android platforms from a single codebase, which makes the application available for most smartphone operating systems.

1.7 Conclusion

In this chapter, we have explored the important role that Smartphones plays in our today lives and how their value has increased over time. Modern Smartphones store sensitive personal informations such as photos, Bank accounts, and other informations, making the security side important because when the phone is stolen or lost this could result in the loss of both personal information stored on the phone and financial cost of the phone itself.

Current solutions for Smartphones theft involve locating the phone and retrieving or deleting data, but these methods are often ineffective as they rely on GPS and mobile data to be turned on, which usually its not available, or just disabled by thieves.

This study provides a solution to all the drawbacks mentioned previously by designing **Protectin** application, which automatically activates the GPS and Mobile Data (NET), and then collects the device and location information, including a picture of thief's face.

Chapter 2

Basic Concepts and Tools

2.1 Introduction

In the previous chapter we covered the history of mobile phones and how they evolved into smartphones. We then discussed the phone's primary functions and what it has to offer. The risks of losing the phone and the limitations of the commonly available solutions which might not be enough to recover the phone.

Within this chapter, we will discuss the most important features and tools found in smartphones that we can rely on to design an anti-theft application.

2.2 Concepts About Smartphones

Mobile smartphones are multi functional devices equipped with advanced hardware and software capabilities, essential for the development of anti-theft systems, with the use of this components we can identify the thief and location of our mobile, the Key components and features include:

- **Hardware Components:**
  - **Central Processing Unit (CPU):** Responsible for executing instructions and managing tasks efficiently.
  - **Random Access Memory (RAM), and storage:** Provides temporary storage for running applications and permanent stor-

age for data. Commonly used types include LPDDR4X RAM, UFS storage.[11]

  - **Sensors (GPS, accelerometers, gyroscopes):** Enable functionalities like location tracking, orientation detection, and motion sensing. For instance, the device's GPS sensor is essential for real-time location tracking in anti-theft systems.[12]
  - **Cameras (front and back):** Integrated for capturing images and videos. Anti-theft systems can utilize camera feeds to identify potential thieves.[13]
  - **Connectivity modules (*Wireless Fidelity* (Wi-Fi), *Bluetooth Low Energy* (BLE), cellular):** Allow communication and data exchange with other devices and networks.[14] [15]

- **Operating Systems:**
  - **Android (Google):** Open-source OS widely used in smartphones.
  - **IOS! (IOS!):** Closed-source OS exclusive to Apple devices.
  - **Other proprietary systems:** Various manufacturers develop custom operating systems for their smartphones.

- **Software Capabilities:**
  - **Mobile applications:** Enable diverse functionalities through downloadable apps.
  - **Location tracking (GPS):** Provides real-time geographic coordinates.
  - **Data storage and management:** Stores personal data, including photos, contacts, and app-related information.
  - **Connectivity to networks:** Facilitates internet access and communication.
  - **Camera functionalities:** Supports photo and video capture, essential for security-related applications.

2.3 Technologies and Parameters in Smartphones

The anti-theft system is based on numerous tools and settings that is defualt in the phone, such as location identification, contact information, and the number on the *Subscriber Identity Module* (SIM) card, providing us with sensitive and critical information in the process of retrieving the phone, Which in the end will help us identify the thief and from those settings:

- **SIM Card Detection:** Changing the SIM card may cause issues during the phone recovery process, but by monitoring the network state and SIM card connectivity, we can perform counter actions that allow us to send information based on SIM card state.[16]
- **GPS Location Data:** The locating feature enables the system to send information about the device's location and a link to its location on a geographical map, allowing the relevant authorities to find the phone faster and more practically.[17]
- **SMS Communication:** SMS messages play a pivotal role in the process of retrieving the phone, as they are considered the primary means of sending and receiving messages, and in addition to that, they are among the triggers that are relied upon by the system to activate the anti-theft mode.[18]

  And this is done through sending alerts or data (e.g., GPS coordinates) via SMS to predefined numbers or servers.
- **Camera Integration:** Utilizing front and back cameras for capturing images or videos of potential thieves.[19]
- **Device Sensors:** Employing motion sensors (e.g., accelerometers) to detect movement or tampering, triggering theft alerts or activating anti-theft measures.[20]

2.4 Skills Needed to Achieve the System

The process of capturing images is similar to that of the human eye. An array of a large number

- **Mobile App Development Skills:** Knowledge of mobile app architecture, state management, and user interface design, crucial for creating responsive and intuitive interfaces.
- **Integration of Hardware Features:** Understanding how to access device features (e.g., GPS, camera) using Flutter plugins for seamless integration with the anti-theft system.
- **Security Concepts:** Familiarity with data encryption, secure storage, and permissions management to protect sensitive user information stored on the device.
- **Neural Networks:** Leveraging deep learning models for accurate and efficient face recognition tasks, trained using labeled datasets.
- **Algorithm Selection:** Choosing suitable algorithms for face detection, feature extraction, and matching based on performance and resource constraints of the mobile device.
- **Model Training and Deployment:** Training custom models using frameworks like TensorFlow and integrating them into the mobile application for real-time face recognition and verification.

2.5 Used Development Techniques And Tools

Developing the anti-theft mobile application demands proficiency in specific tools, technologies, and skills:

- **Flutter Framework:** A cross-platform UI toolkit developed by Google, used for building natively compiled applications for mobile, web, and desktop platforms.[21]

- **Dart Programming Language:** The language used with Flutter for developing applications, featuring asynchronous programming and UI design capabilities.[22]
- **Python:** A versatile programming language used for various purposes including back-end development, data processing, and scripting.[23]
- **TensorFlow:** An open-source machine learning framework developed by Google, utilized for implementing machine learning models and algorithms.[24]
- **Keras:** An open-source software library that provides a Python interface for artificial neural networks, acting as an interface for TensorFlow.[25]
- **Photoshop:** An Adobe software application used for image editing and graphic design, essential for creating visual assets for the application.[26]
- **Figma:** A web-based vector graphics editor and prototyping tool used for designing user interfaces and user experience workflows.[27]
- **Adobe XD:** A vector-based user experience design tool for web and mobile applications, used for wireframing, prototyping, and designing User Interface/User Experience (UI/UX) elements.[28]

2.6 Used AI Models And Algorithms

The anti-theft system incorporates AI techniques, particularly for face recognition and verification:

- **Facial Detection:**

  Utilizing Haar cascades and deep learning-based methods, such as those discussed in the study by Viola and Jones (2001) and recent advancements in deep learning frameworks, to identify faces in images and video frames.

These methods combine feature-based and neural network approaches to enhance detection accuracy, especially under challenging conditions.[29] [30]

- **Facial Recognition:**

  Leveraging *Convolutional Neural Network* (CNN) for facial recognition to identify individuals based on unique facial features. Inspired by studies on CNN and *Deep Learning* (DL) algorithms, these models provide a robust foundation for developing anti-theft systems through accurate individual identification.[31] [32]

  We were inspired by the working method and algorithms that allow us to perform facial recognition based on previous work by Professor G.Said [33]

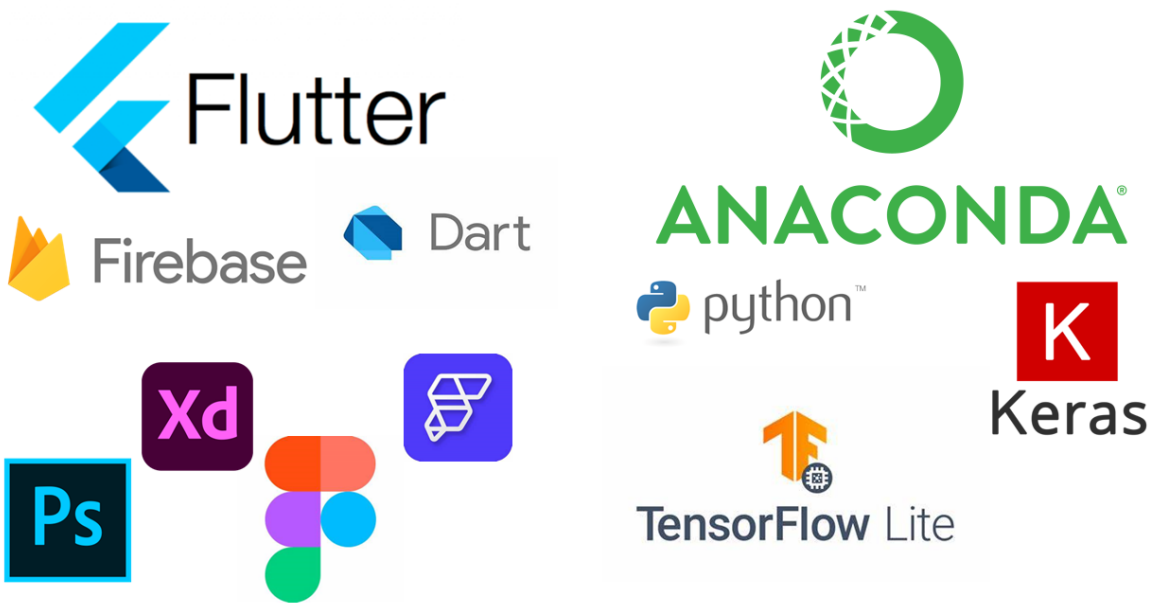


Figure 2.1: Used Softwares & Tools

2.7 Conclusion

By leveraging these technologies and skills, the proposed anti-theft application **Protectin** enhances smartphone security and offers advanced features beyond traditional solutions, Which is usually limited by several obstacles, such as the need to connect to the internet and the need for GPS to be activated.

By using the Smartphone features and hardware, such as the camera, GPS and SMS Messages, and the appropriate development tools for the implementation of this application (figure 2.1), We can collect the necessary information and send it, which will finally help us to identify the thief and recover the phone.

Chapter 3

Implementation of The Proposed System

3.1 Introduction

In this chapter, we will explain the steps followed to implement the system starting from the work background until the system is complete, With explanation for the steps taken to develop the application and how will We employ everything we discussed previously.

3.2 Work Background

The idea of the development of our mobile-based anti-theft system comes from the increasing dependency on smartphones in daily life.[34]

The existing solutions to safeguard smartphones largely focus on locating the device and securing data post-theft, typically using GPS and mobile data. However, these methods have significant limitations. They rely heavily on the phone being powered on, connected to a network, and having an active SIM card.[35] Additionally, thieves can easily circumvent these measures by turning off the phone, removing the SIM card, or depleting the battery.

Our approach to developing this anti-theft system is inspired by several previous projects and studies that highlight these limitations and suggest alternative strategies. One such project, detailed in the study by [36], ex-

plored the integration of biometric authentication methods to enhance security. This study revealed that incorporating fingerprint and facial recognition technology can provide a more robust security mechanism that does not solely rely on external factors like GPS or network connectivity.

Another influential study by [37] investigated the use of IoT (Internet of Things) devices in creating a more interconnected security system. Their findings suggest that leveraging IoT devices, such as smartwatches and connected home security systems, can offer additional layers of protection by enabling remote monitoring and control even when the smartphone is offline.

Furthermore, the research by [38] presented a machine learning-based approach to detecting unusual patterns of phone usage, which could indicate theft or unauthorized access. This proactive method aims to identify potential threats before they fully materialize, providing an early warning system to the user.

Building on these insights, our system aims to incorporate a multi-faceted security approach. By combining biometric authentication, IoT integration, and machine learning-based anomaly detection, we aim to create a comprehensive anti-theft solution that addresses the shortcomings of existing methods. This holistic approach ensures that even if one layer of security is breached, others remain active, thereby providing continuous protection for the user's smartphone.

The transition from the conceptual phase to the implementation of our anti-theft system requires us to define the problem, what are the basic reasons for which the system will work, and how can we realize it as an application.

3.3 Problem Identification

The core problem identified was the inadequacy of existing anti-theft solutions in preventing theft and ensuring data security under various scenarios where the phone might be disconnected.[39]

Among these possible events we have:

- Removing Battery: for phones with removable battery.
- Turn off the phone
- Turn off Mobile data and GPS
- Remove the SIM card

Therefore, in order to prevent losing the phone, we have eliminated everything mentioned in ways that we will explain later.

3.4 Design Phase

After completing the preliminary study of the anti-theft system, this chapter will move on to the design phase, which will enable us to determine how to implement and manage the system. UML will be used to analyze and document the key processes occurring within the system, as well as to illustrate its main components and how they interact with each other.

3.4.1 UML

While working on this project, UML is a standardized general-purpose modeling language in the field of software engineering. It provides a set of graphic notation techniques to create visual models of software-intensive systems. UML is used for specifying, visualizing, constructing, and documenting the artifacts of software systems, as well as for business modeling and other non-software systems.[40][41]

3.4.2 Use Case diagram

To guarantee that the system satisfies requirements, it is important to develop a use case diagram early in the application design process. Depending on the following relationships and functions we can create use case Diagrams for our system.

Actors:

- **User**: The owner of the phone who can manually trigger the anti-theft measures.
- **Thief**: The person attempting to steal the phone.
- **System**: The anti-theft system itself which performs various actions automatically.

Use Cases:

- **Detect SIM Card Change**: The system detects when the SIM card is changed.
- **Retrieve Location via GPS**: The system retrieves the current location of the phone.
- **Send Location via SMS**: The system sends the location data to pre-selected mobile numbers.
- **Capture Photos**: The system captures photos using the front and back cameras.
- **Send Photos via Email**: The system sends the captured photos to a specified email address.
- **Manual Trigger Activation**: The user can manually trigger the anti-theft system.
- **Automatic Activation**: The system automatically activates when suspicious activity is detected.

Relationships:

- The **User** can **Manually Trigger Activation**.
- The **System** can **Automatically Activate** upon detecting suspicious activities.

- The **System Detects SIM Card Change**.
- The **System Retrieves Location via GPS**.
- The **System Sends Location via SMS**.
- The **System Captures Photos**.
- The **System Sends Photos via Email**.

a). General Use Case Diagram

By those parameters we can create the General Use Case diagram below to improve the application's design and get a general idea of how the system works and the most important factors involved in it as shown in the following Use Case Diagram:

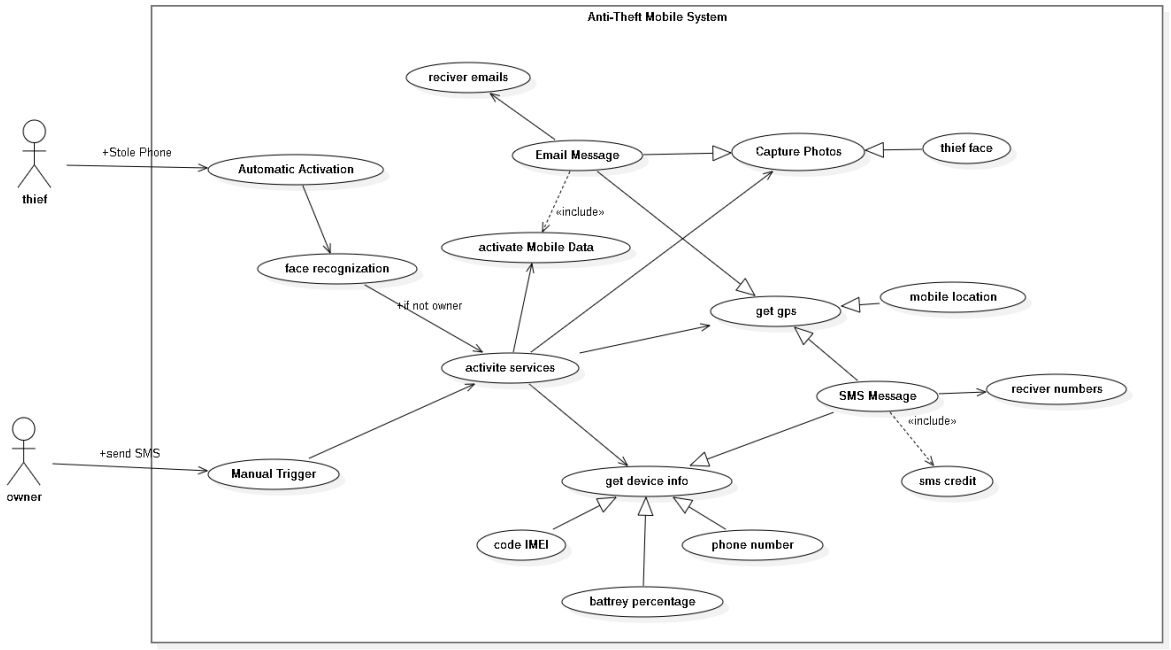


Figure 3.1: General Use Case Diagram

b). SIM Card Change Use Case Diagram

When a SIM card is replaced, this system recognizes it automatically and takes protective action to keep the device safe. The diagram on figure 3.2 highlights key features like location tracking, photo taking, and notification alerts as it describes the interactions between the user, the system, and a potential thief, guaranteeing complete protection against theft.

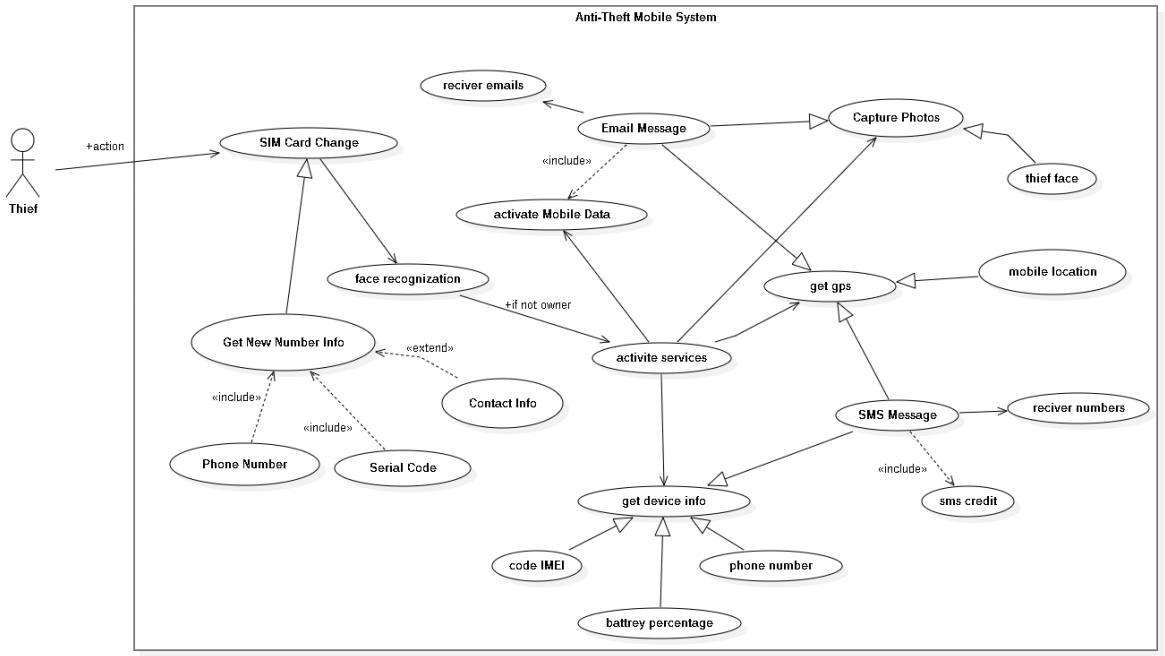


Figure 3.2: SIM Card Change Use Case Diagram

3.4.3 Flowchart Diagram

flowcharts provide a detailed visual representation of processes, making them valuable tools for understanding and communicating the dynamic aspects of a system and the sequence of actions within it.

demonstrates the system's dynamic aspects and the order in which the actions are performed. as well as mapping out the detailed steps within a process identified in use case diagrams.

By following the flowchart, we can trace the sequence of actions and decisions then designing sequence diagram, the flowchart of our system is represented in by the following:

a). Flowchart Steps

1. **Start**: The system is running and monitoring for any suspicious activity.
2. **Manual Trigger Activation**: The user can manually trigger the anti-theft system at any point using SMS code.
3. **Automatic Activation**: The system automatically activates when suspicious activity is detected.
4. **Retrieve Device informations & Location**: The system retrieves the current location of the phone.
5. **Send informations & Location via SMS**: The system sends the location data to pre-selected mobile numbers.
6. **Capture Photos**: The system captures photos using the front and back cameras.
7. **Send Photos via Email**: The system sends the captured photos to a specified email address.
8. **End**: The process completes its cycle and returns to monitoring.

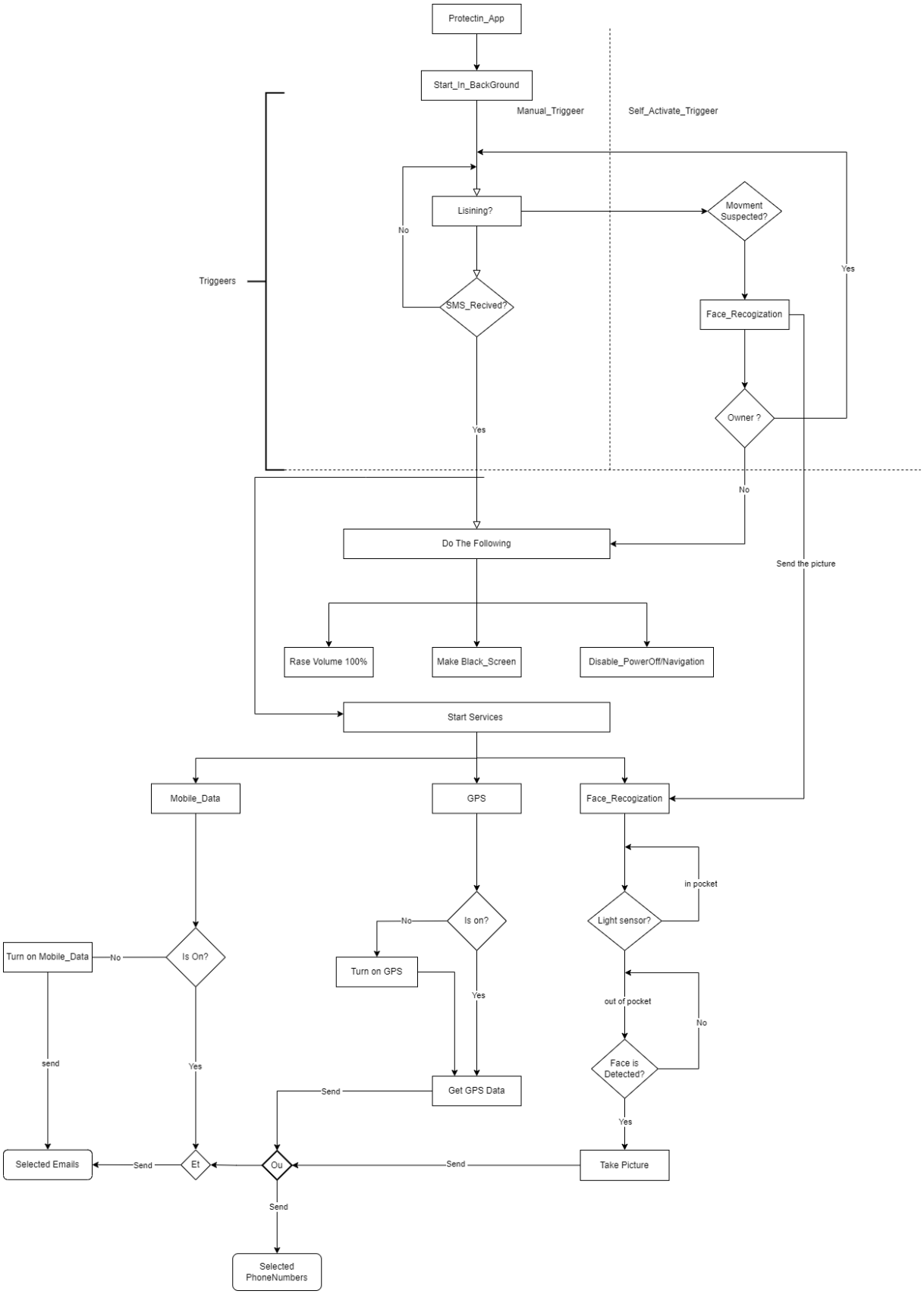


Figure 3.3: FlowChart Diagram

3.4.4 Sequence Diagram

Sequence diagrams are particularly helpful for simulating the dynamic parts of software systems because they offer an easily understood visual representation of the interactions between system components. messages sent and received between objects that help us understand how the system behaves.

Actors

- **Person**: The Person who sends the activation code to the phone(not necessarily the owner).
- **System**: The anti-theft system.
- **Thief**: The person attempting to steal the phone.

Main Flow

1. Manual Trigger by User
2. Automatic Trigger by System

a) Manual Trigger Sequence Diagram

1. User manually activates the system.
2. System activates mobile data.
3. System activates services:
    - Captures photos (front and back cameras).
    - Retrieves GPS location.
    - Gets device information (IMEI, phone number, battery percentage...).
4. System sends photos via email.
5. System sends location via SMS to pre-selected numbers.

The following sequence diagram describes how the system behaves when an SMS activation code is sent to the mobile phone:

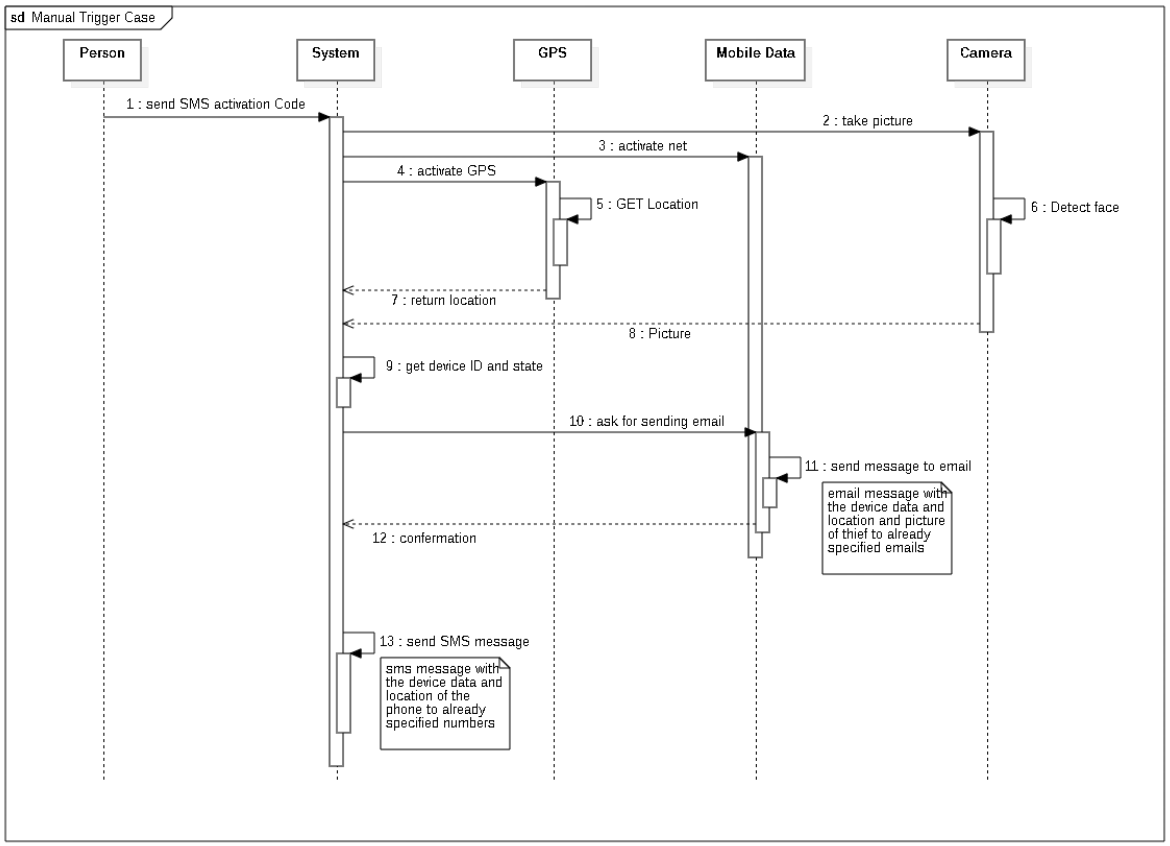


Figure 3.4: Manual Activation Sequence Diagram

b) Automatic Trigger Sequence Diagram

The automatic trigger is done through the following algorithm:

1. Thief interacts with the phone (e.g., changes SIM card).
2. System detects SIM card change.
3. System performs face recognition.
4. If the face is not recognized as the owner:
    - System activates mobile data.
    - System activates services:
        - Captures photos.

- Retrieves GPS location.
- Gets device information.

- System sends photos via email.
- System sends location via SMS to pre-selected numbers.

Which we can represent through the following sequence diagram:

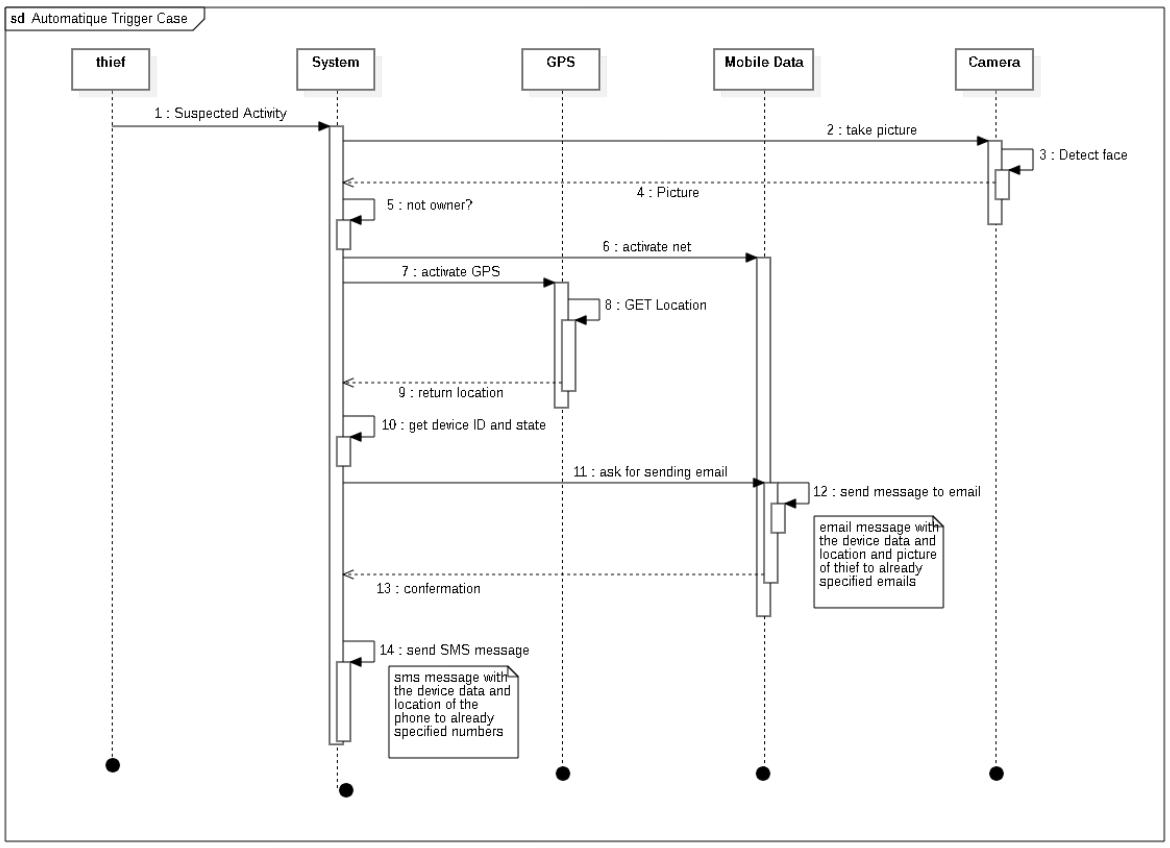


Figure 3.5: Automatique Activation Sequence Diagram

3.5 Class Diagram

To define the relationships between the classes in the Protectin application, we need to identify the associations, dependencies, and compositions among them, as it shown in the following class diagram:

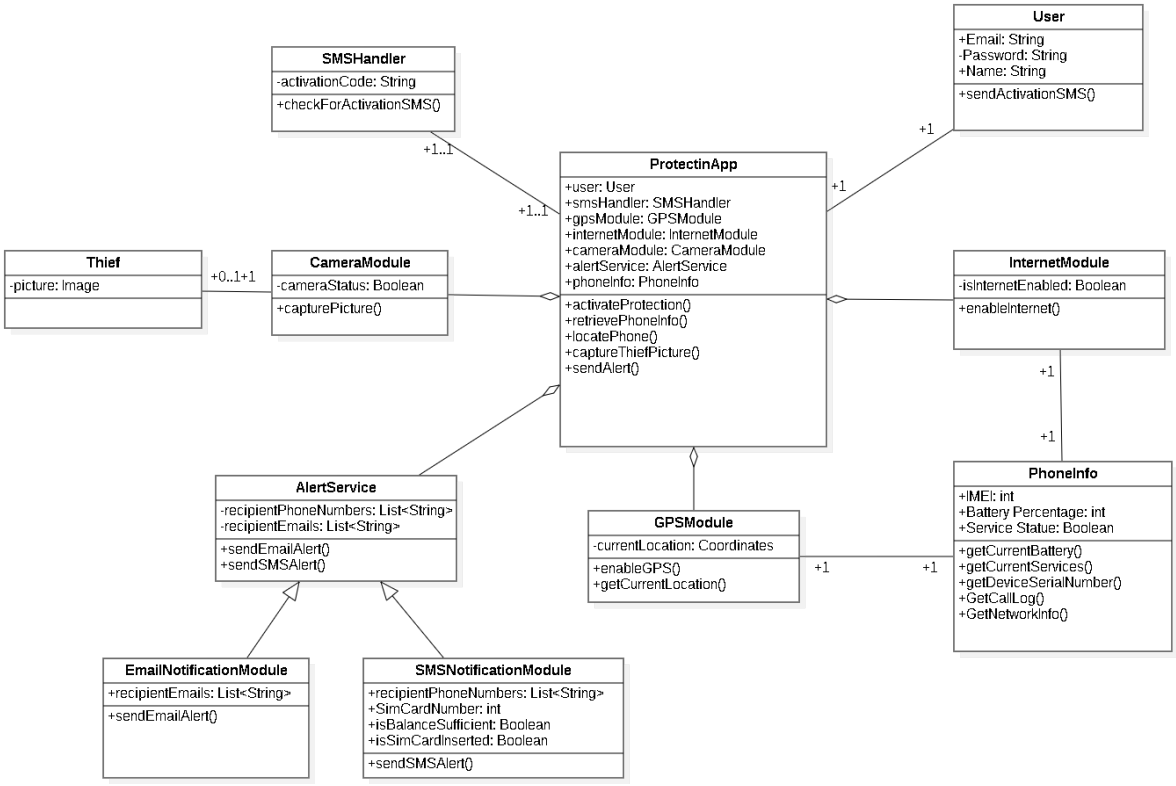


Figure 3.6: Class Diagram

3.6 Development Phase

We have divided the system's development phase into three sections for better understanding.

1. Triggers
2. Procedures
3. Restrictions

3.6.1 Triggers

When a system encounters specific conditions or events, it often responds by executing predefined procedures. These procedures serve various purposes, Triggers are the incentives for which the system moves to procedures, meaning it knows that it is in a state of theft, and they are classified into two primary types:

A. Manual Trigger:

It is done by the phone owner after sending an SMS message containing the password that was already set to the SIM card connected with the phone, the system starts the procedures immediately. as it shows in the following Flowchart :

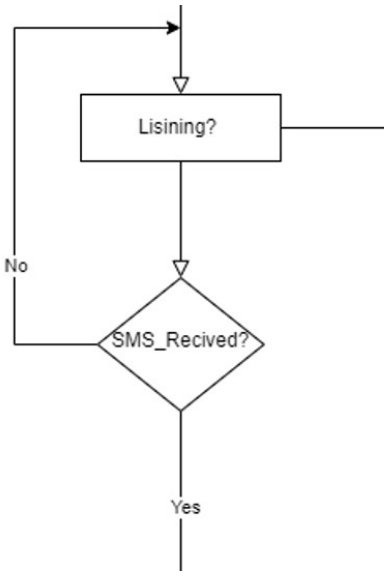


Figure 3.7: Manual Trigger Flowchart

SMS password is set by the mobile phone owner in the setup interface, which will be used by the owner to trigger the system. We must enter two SMS passwords. The first Password is to switch into anti-theft mode, triggering the phone to begin the procedures automatically. The second Password is used to turn off the anti-theft mode after the phone has been resorted. and this can be done in the setup interface as its shown bellow :

B. Automatic Trigger:

Automatic Trigger basically activates the system automatically if a suspicious change in the owner's speed or an unusual pattern in his movement is detected.

Movement tracking, SIM card removal, and error in PIN code are all

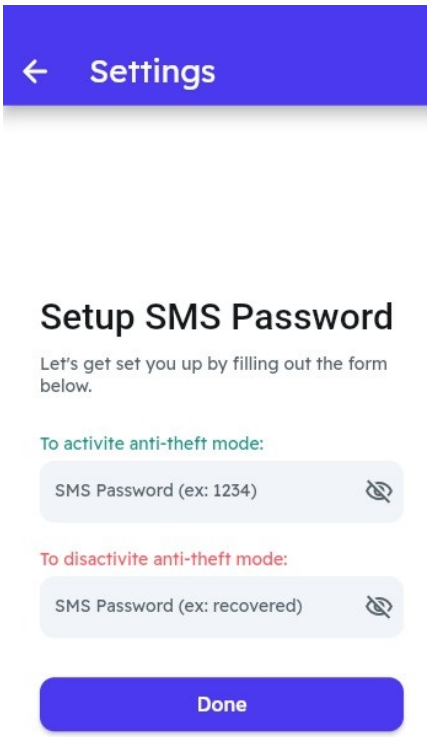


Figure 3.8: SMS Activation Code Setup interface

included as a automatic triggers for the system. In the following screenshot we can see the automatic features to trigger the system, automatic triggers is based on two features:

- **a). Movement Detection.**
- **b). Face Detection & Recognization.**

The FlowChart representation for the automatic trigger was shown in the bellow figure 3.9:

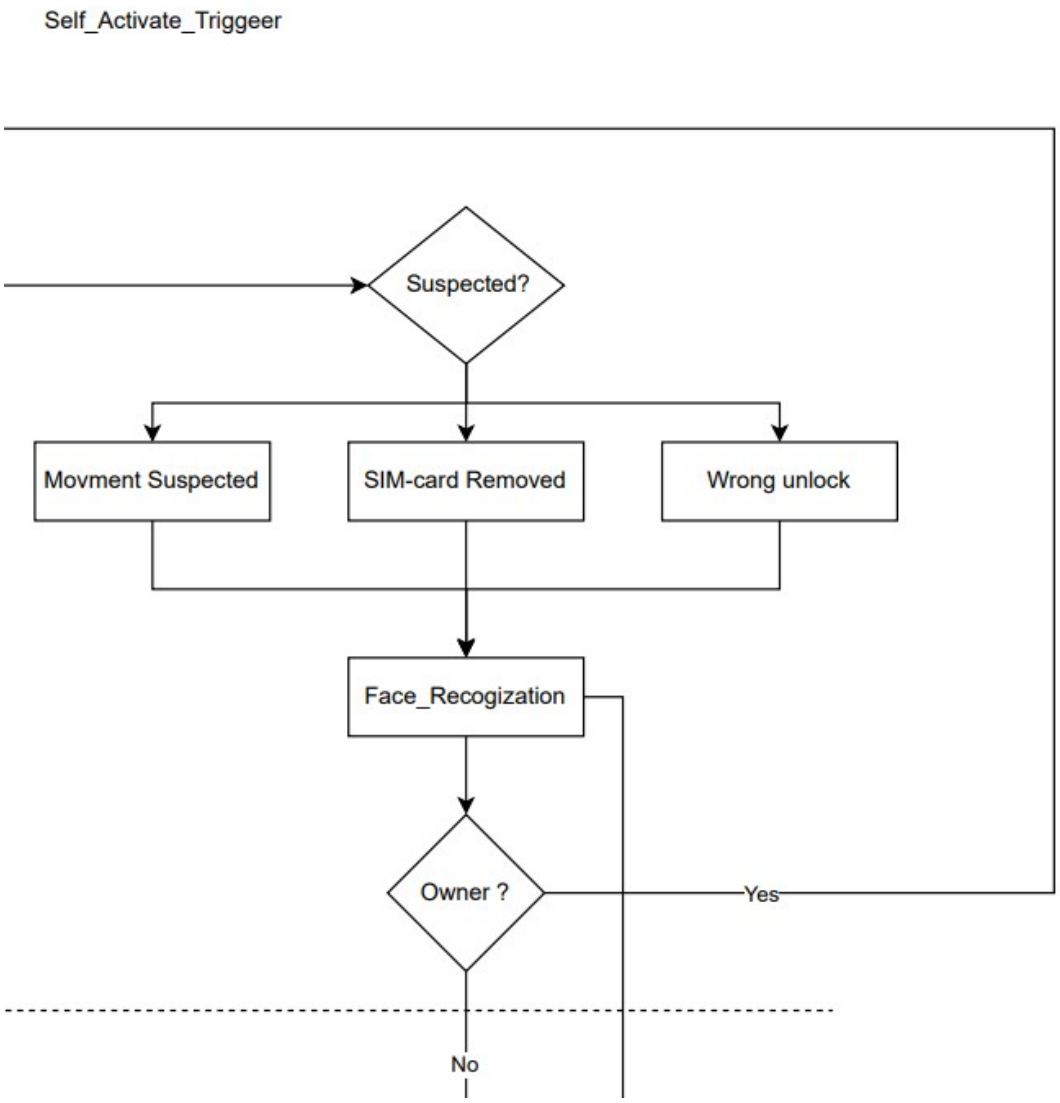


Figure 3.9: Automatic Trigger Flowchart

The system works in the background to monitor any suspicious behavior if there is any then the system activates facial recognition feature, which allows it to confirm if it is a false alarm or the phone is stolen.

a) Movement Detection:

Movement detection is the main trigger, and it detects suspected movement according to multiple factors. It is trained to recognize the intended movement using reinforcement learning by processing the phone movement in the background, We relied on previous research related to Parkinson's disease.[42]

With some adjustments, we were able to extract a unique movement pattern for each individual that sets them apart from the others, by removing the noisy data like jumping and driving a bike or car we get smooth data that will be the fingerprint for the owner, as it shown in the following graphs:[43]

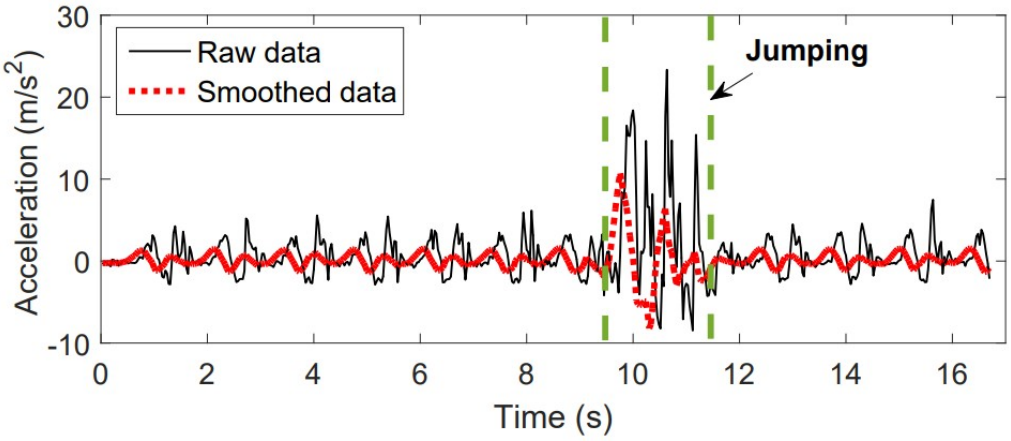


Figure 3.10: jumping

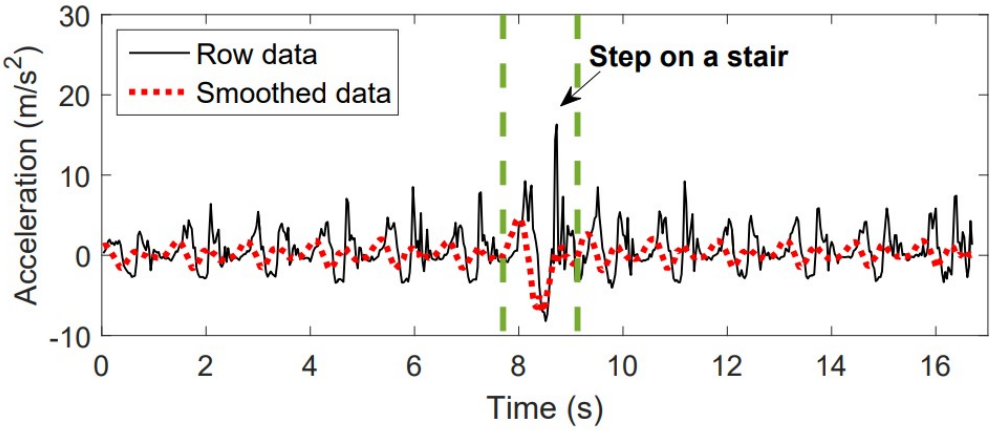


Figure 3.11: Step On a Stair

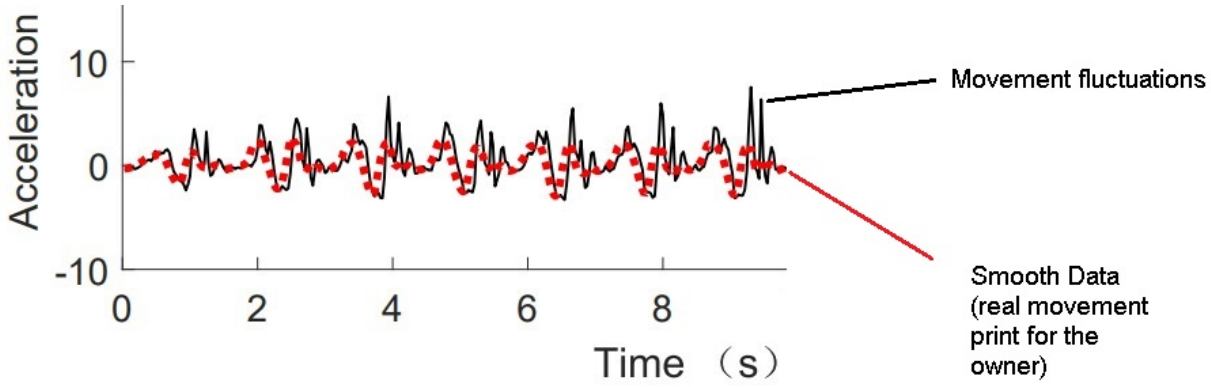


Figure 3.12: Smooth Data

The model we are currently working on was able to reach a 50% rate of recognizing the movement pattern when the phone user is different. This percentage is not considered an appropriate percentage to put the model into action, so we will work to improve it and make its performance better and more accurate.

This concept is being developed, remains to be studied, and will eventually be put into use in future updates.

b) Face Detection & Verification:

Face detection comes after automatic trigger is activated, where we can verify if it's the real owner of the phone or not. According to this result, the system decides whether to start the anti-theft mode or not. it was sufficient to use earlier studies because there are numerous facial recognition models accessible.
to achieve this purpose, we relied on andrew's research for the face verification model.[44]

3.6.2 Procedures

After the system is activated (it is in theft mode), the application performs a series of sequential actions, according to previously specified actions, It takes place through three basic and necessary stages to ensure the recovery of the phone.

- **Locking Phone**
- **Collecting Data**
- **Sending Data**

The first step is to lock the phone and its considered very important, which will hinder any external interference made by the thief, preventing any unexpected actions.

the application then activates phone services, then collects the necessary information that was previously specified in the application, and then sends them to the contacts previously registered on the application.

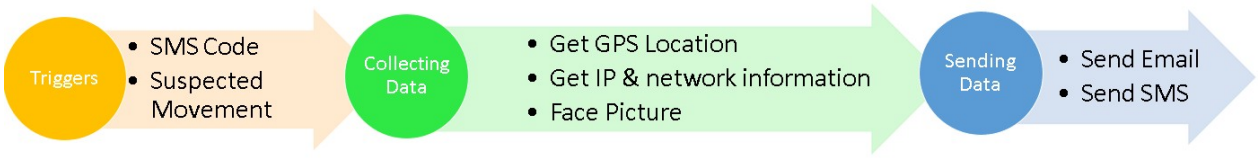


Figure 3.13: Procedures Sequence

A. Locking Phone:

Locking phone works to prevent the thief from using the phone and change its state Or/And delete data in the phone, and it works as the following:

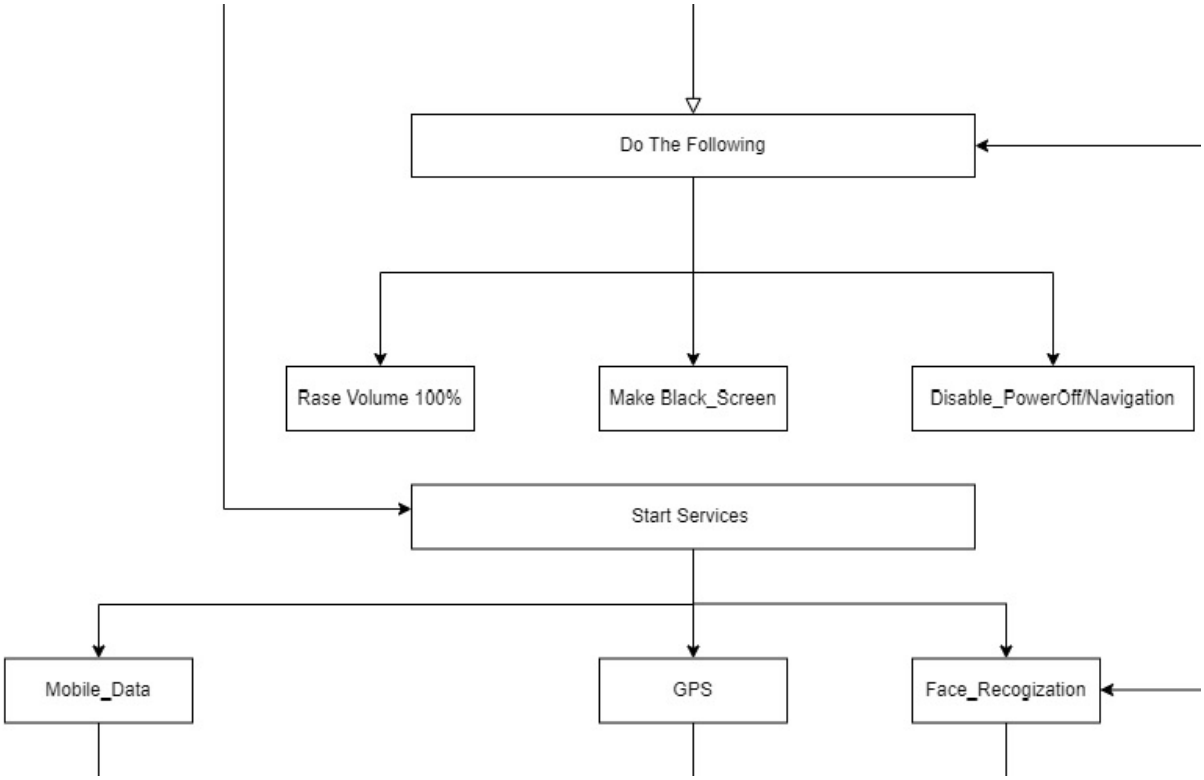


Figure 3.14: Procedures Flowchart

- Change brightness to 0% (Black screen).
- Lock the navigation bar.
- Lock power off button.
- Lock volume at 100%.
- Use SMS-Pass code to unlock the phone.

with this actions thieves can't control the phone or get access to the data inside the phone, allowing as to have the full control of data and the phone.

- **Lock the navigation bar:** In some cases even after the phone is protected by PIN Code or pattern the thief still can turn on/off mobile data and GPS and other parameters from the navigation bar, disabling it will eliminate the chance to control the phone.
- **Black screen:** allows us to make the phone looks like its powered off so the thief will not try to turn it off, and by sending the recovery code by owner the phone will go back to normal.
- **SMS-Pass code to unlock the phone:** we can specify the lock and unlock SMS-password codes in the setup page.
- **Lock power off button:** This step prevent the thief from turning the device off, allowing the system to keep working and collecting data.

B. Collecting Data:

In order to recover the phone, we decided to rely on collecting information that helps achieve this goal In this case, we collected two different kinds of data:

- **a). Internal information.**
- **b). External information.**

a). Internal Data:

The types of internal information typically gathered include:

- **Connected services (WIFI/NET...)**: These services can indicate the phone's connectivity status and can help in finding the phone's current location based on the available networks.
- **Geographical location GPS**: The phone's GPS data provides precise location information, which is helpful for finding the exact location of the device, wish will help us to find the phone.

- **Phone number and call log**: This data includes the current phone number assigned to the device and the recent call history, which can help identify recent contacts and potentially locate the phone through social connections.
- **Phone serial number & IMEI code**: The serial number and International Mobile Equipment Identity (IMEI) code are unique identifiers for the phone. These identifiers can be used to report the phone as lost or stolen and can aid in tracking and recovering the device through official channels, and sending it will make the procedures of finding the phone much easier.
- **Battery percentage**: Knowing the battery percentage is useful to estimate how much longer the phone will remain operational, which is crucial for timely recovery efforts.

and as we see in the following chart the main procedures that will be executed after the trigger are activated manually or automatically.

b). External Data:

external information is which we collect from the camera, voice recordings, or changes that occur on the phone, such as inserting a new SIM card, which can help identify the thief, and it is as follows:

- **Capturing Images of the thief**: These photos can give law enforcement visual proof, which will facilitate the suspect's identification and capture.
- **New SIM card detecting**: When a new SIM card is inserted, the system recognizes it and uses it to send information to the pre-specified numbers. In addition, it sends the new number with its call history, Which in the end will lead to find the owner of the number and recover the phone.

- **Audio recording**: Audio recording helps to identify the thief, as well as some important information that the thief can say, such as places, names of people, and phone numbers.

C. Sending Data:

After the collection of the necessary data, we send it in two formats. Firstly, the system transmits the phone's GPS location via SMS to a set of predefined emergency contact numbers. This ensures that the location information can be delivered even if the mobile data is disabled, providing a reliable way to track the stolen device. The use of SMS is particularly advantageous in areas with limited internet connectivity, ensuring that the critical location data reaches the intended recipients promptly and efficiently.

Secondly, the system captures images using both the front and back cameras whenever suspicious activity is detected, such as unauthorized attempts to unlock the phone or sudden movement indicating potential theft. These images are then sent to a pre-configured email address, accompanied by the device's location details. Sending images to an email address serves multiple purposes: it preserves visual evidence of the potential thief, aids in the identification process, and provides law enforcement with valuable information that can assist in the recovery of the stolen device.

Moreover, this dual-format data transmission ensures a multi-layered approach to security.

- **1. SMS Message**: for texture information like: battrey percentage,IMEI code ...
- **2. Email Message**: for media data like images and voice recordings...

a) Sending Data With SMS Message:

The recipients' phone numbers are determined in advance, those numbers will receive the phones informations Using SMS messages, like:

- battery percentage.
- phone's serial number, IMEI...
- geographical location if it is running.
- phone number and call log.

To do this, numbers are specified in their interface and we make sure that sms data sending is activated, as shown in the following figure 3.16:

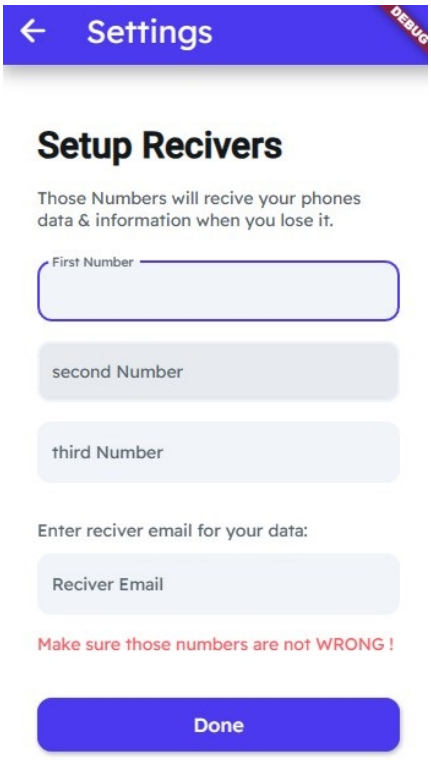


Figure 3.15: Receivers Numbers & emails setup interface

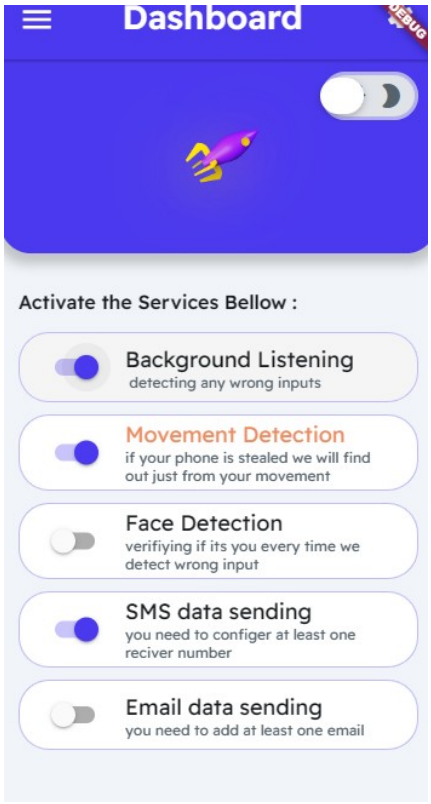


Figure 3.16: Services activation interface

b) Sending Data With Email Message:

As for visual information, such as images and audio recordings, it is sent via email to the email that was previously specified in the settings.

To achieve this, it is necessary to have Internet connection data or to connect to a nearby Wi-Fi network, If the two conditions are not met, the device will monitor any available Wi-Fi network without connection restrictions, and when connected to the Internet, all information will be automatically sent to the specified email account.

3.6.3 Restrictions

The restrictions aims to stop the anti-theft mode and occurs after the phone is found so that it allows you to return the phone to its original state, Whether it is a *Personal Identification Number* (PIN) code or an SMS message to disable the anti-theft mode.

Deactivating Anti-Theft Mode

Once the device is recovered, it is crucial to have a secure and user-friendly method to deactivate anti-theft mode. The following are common methods used:

a) PIN Code

A PIN code is a personal identification number set by the user during the initial setup of anti-theft mode. To disable the anti-theft mode using a PIN code:

1. After recovering the phone the PIN code interface will be shown.
2. Enter the predefined PIN code.
3. Confirm the action to disable anti-theft mode.

The simplicity and effectiveness of using a PIN code make it a popular choice for users.

b) SMS Message

In cases where the device owner does not have physical access to the phone, an SMS message can be sent to the device to disable anti-theft mode. The process generally involves:

1. Sending a predefined SMS command from a trusted phone number to the lost device.
2. The device receives the SMS and verifies the sender's number.
3. If the verification is successful, anti-theft mode is disabled automatically.

This method provides a remote and convenient way to regain control of the device.

3.7 Screenshots Form Protectin Application

using the Flutter environment to represent the system after relying on all of the earlier guidelines and procedures. Here are a few screenshots that illustrate the main layout of the application and its primary features in a more precise and understandable manner.

3.7.1 General Prototype

General prototype of the application and the relationship between different interfaces. and how do they communicate and pass parameters between each other.

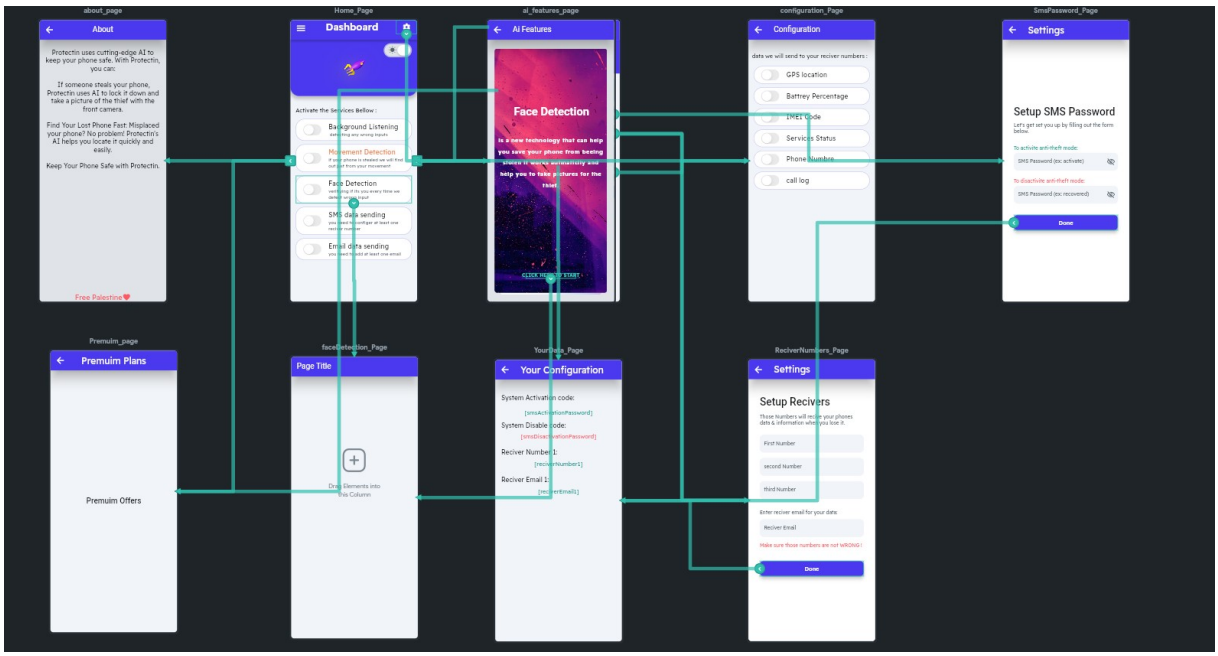


Figure 3.17: Prototype of the Overall System

3.7.2 Dashboard Interface

Dashboard represents the application main interface through which all the application features are accessed, and services can be activated and deactivated directly through this Dashboard interface.

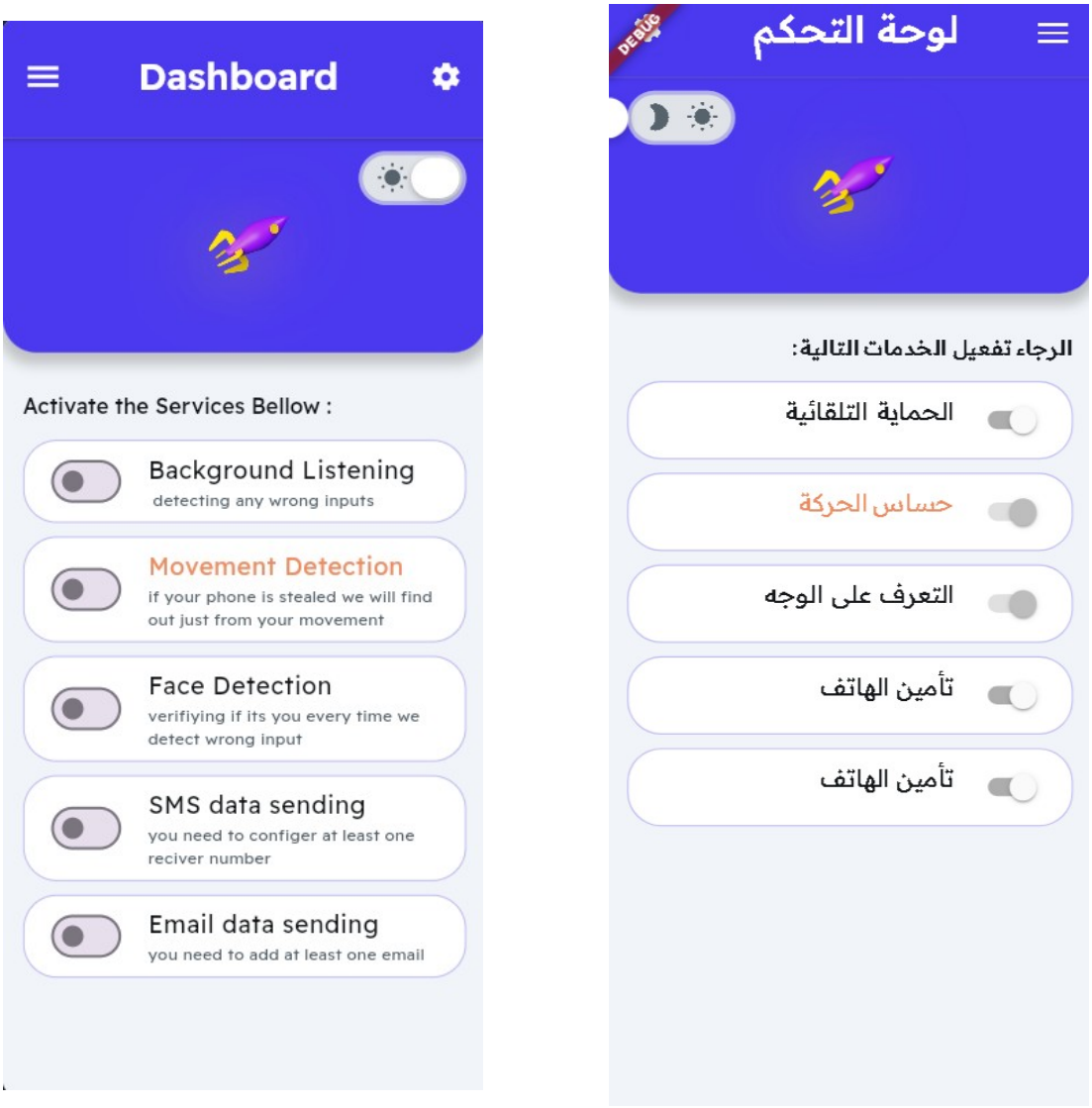


Figure 3.18: Dashboard Interface

3.7.3 Drawer Interface

The Drawer provides quick access to the application settings and facilitates the process of moving between the application interfaces. It also provides some features such as changing the application language, and contacting support team.

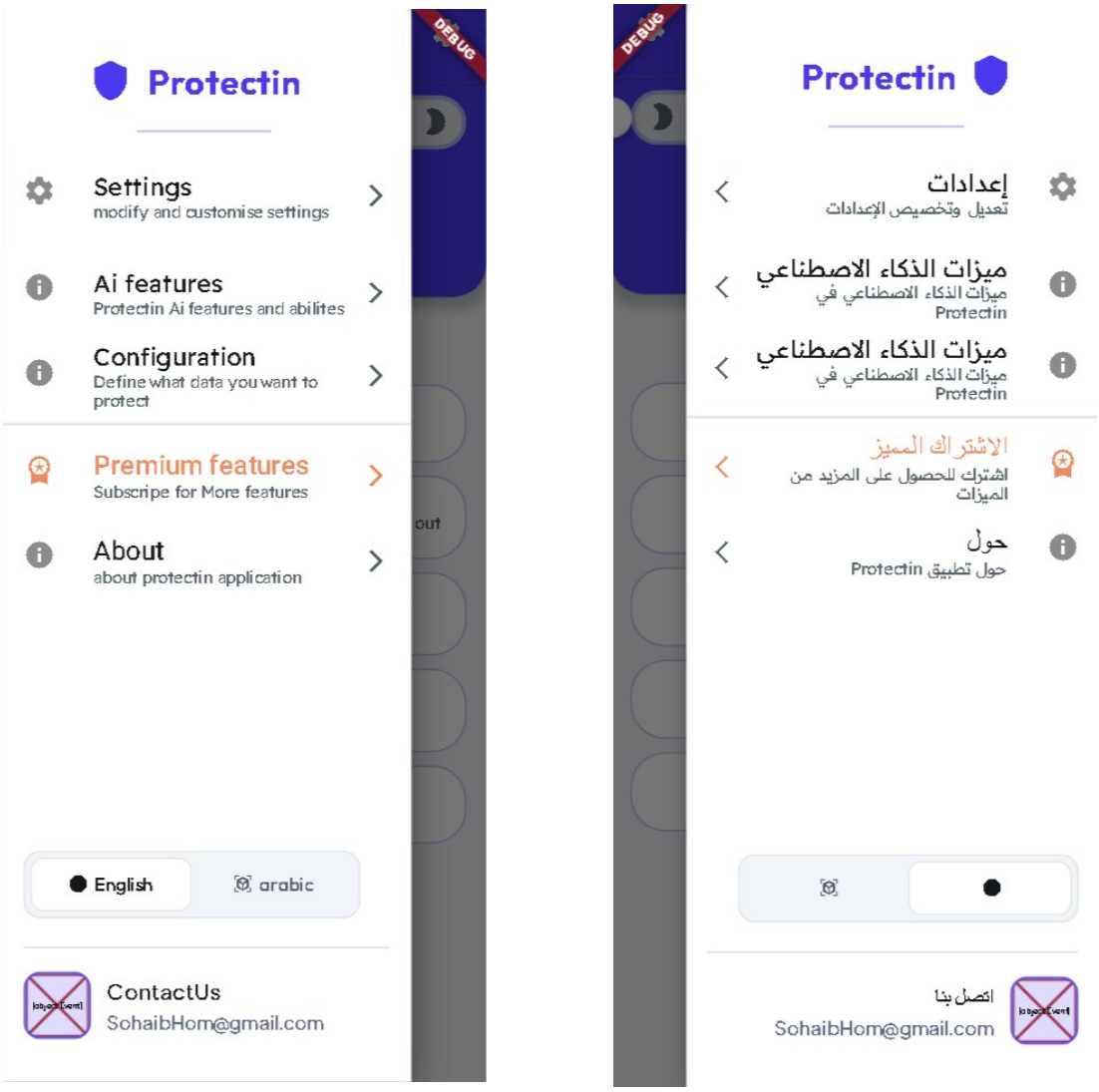


Figure 3.19: Drawer Interface

3.7.4 Settings Interface

The settings interface allows us to access the application settings and modify them as required.

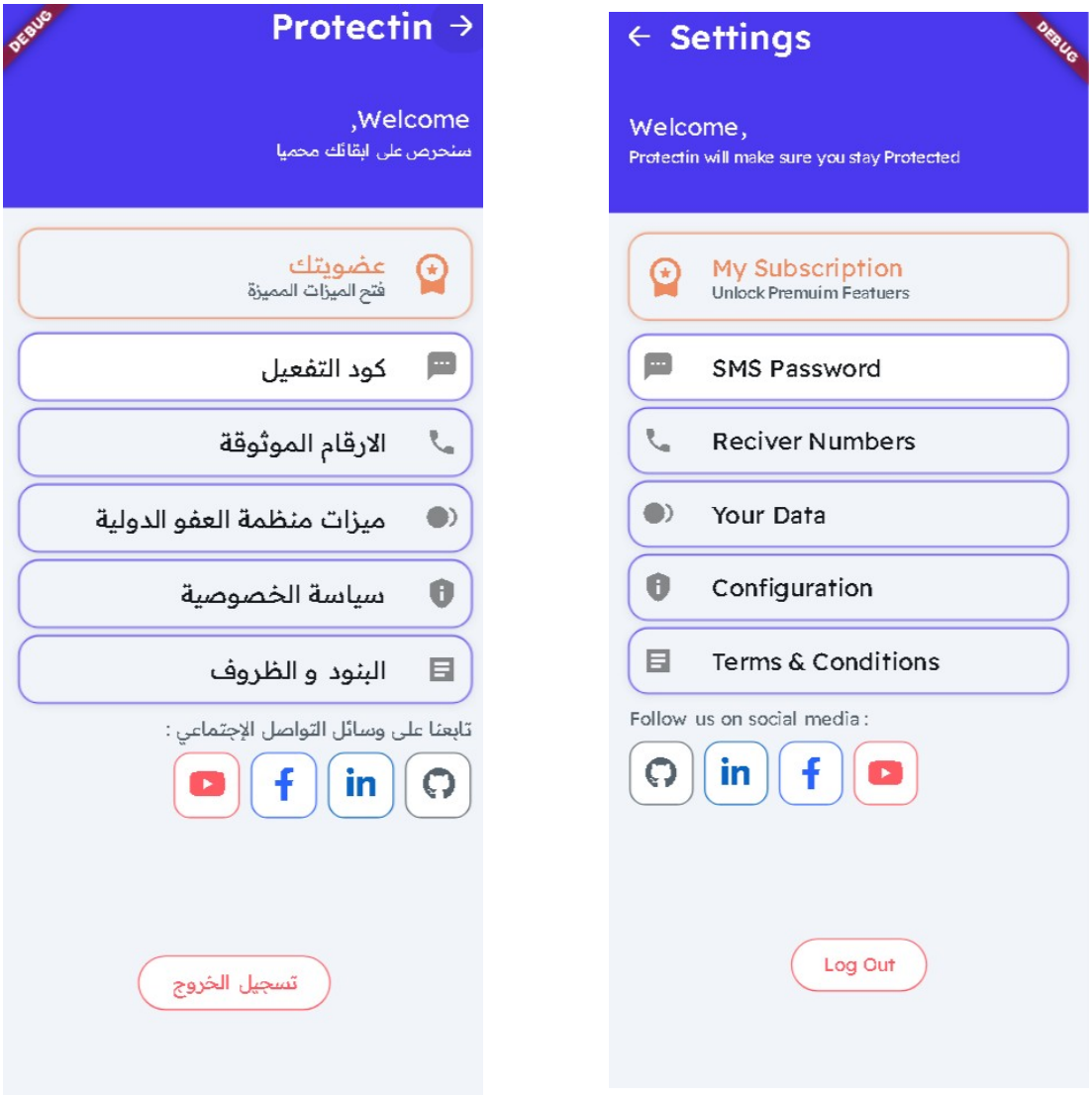


Figure 3.20: Settings Interface

3.7.5 Setup Interface

which in it we can setup the System activation/disactivation SMS code, and the receivers emails and numbers.

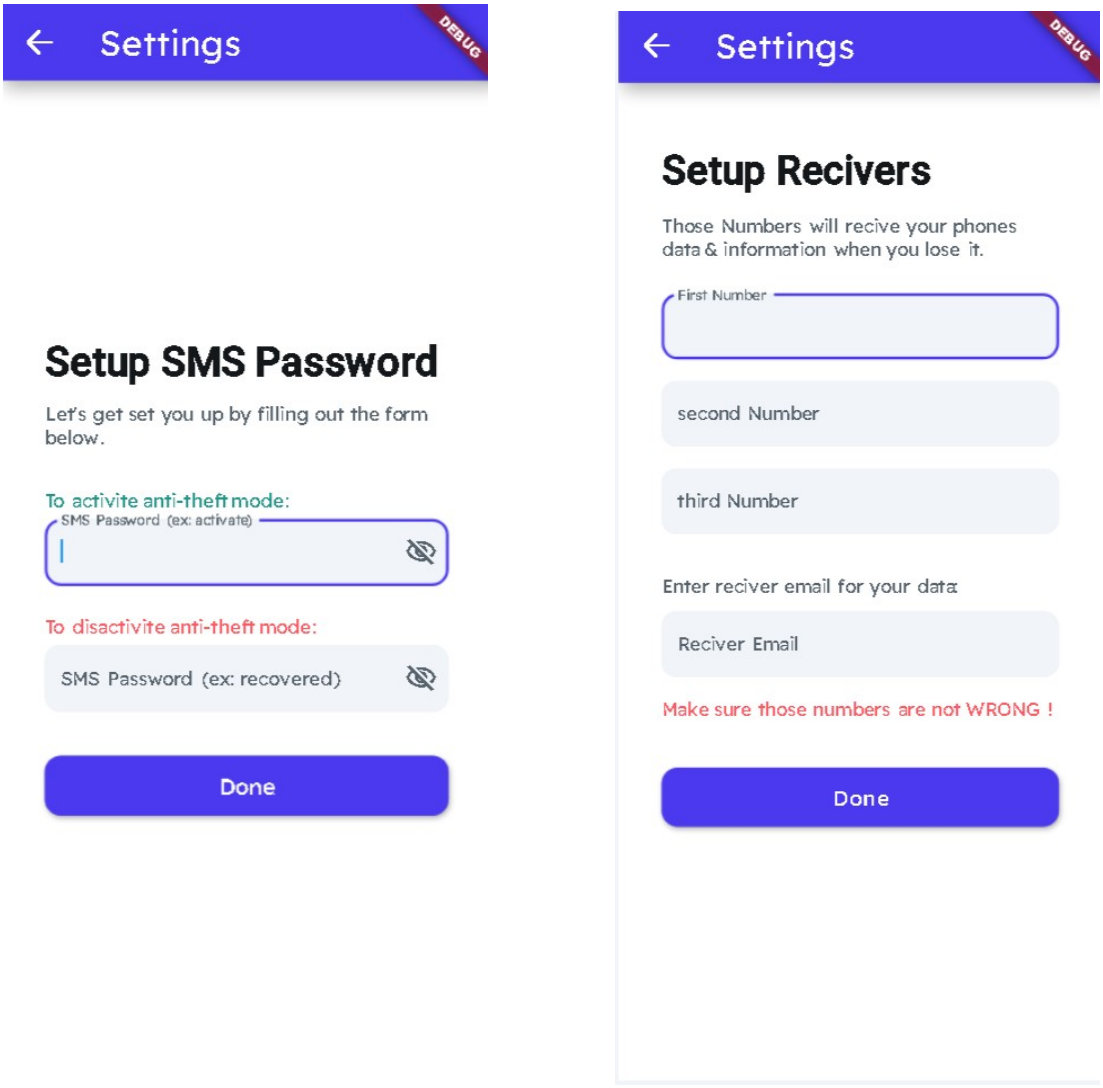


Figure 3.21: Setup Interface

3.7.6 Configuration Interface

Where we specify the type of information we want to receive in email and SMS Messages, in addition to that the interface allows us to view the information that we had previously entered in case we forgot it so that we can modify or change it.

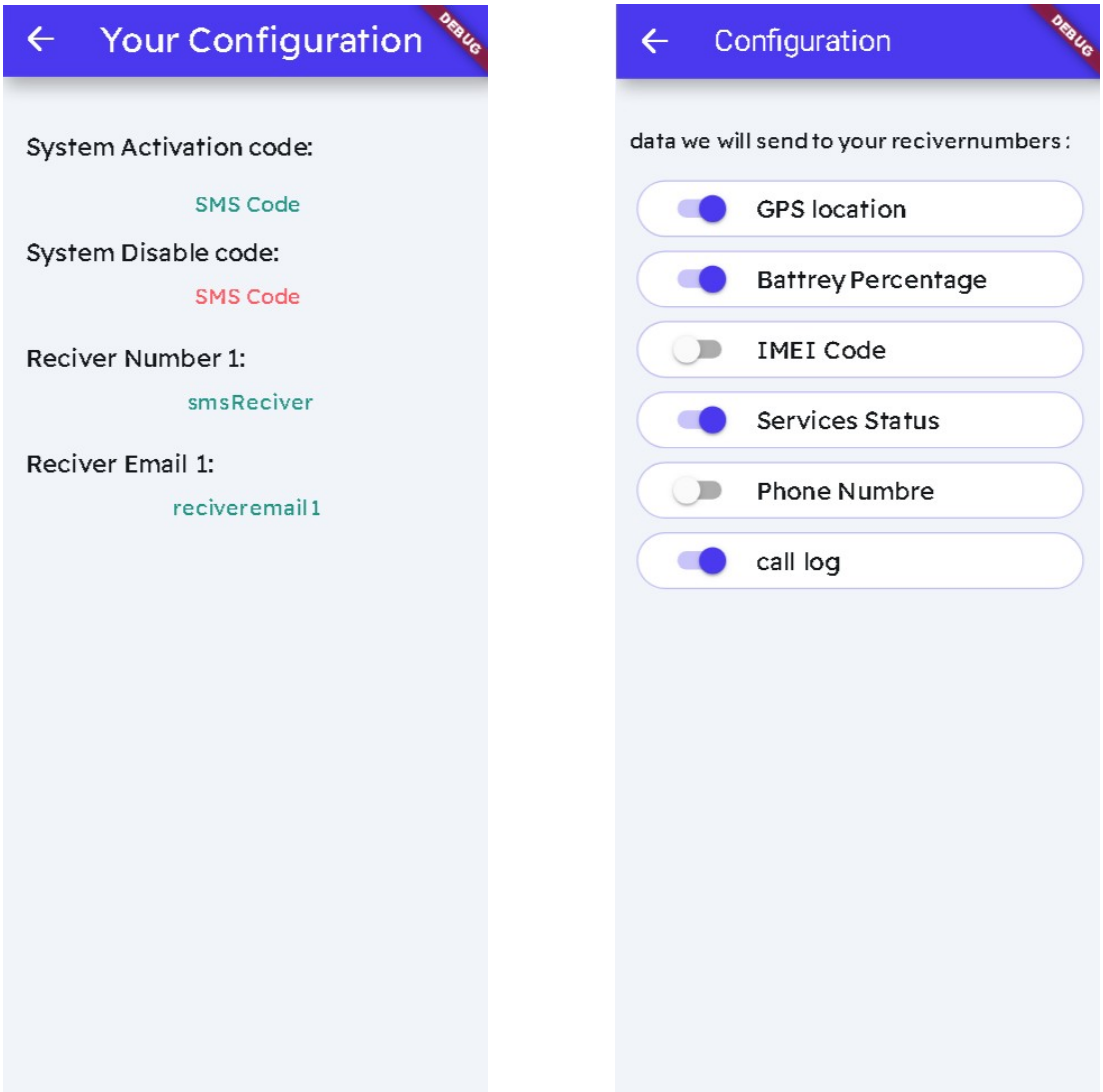


Figure 3.22: Configuration Interface

3.8 Conclusion

After laying the foundations for building the application and representing the theoretical side by designing use Case, Sequence and Flow Chart Diagrams, we have built the application using flutter environment, Dart language and Tensorflow and many other tools, furthermore Determining how the application will work, as well as the restrictions that stops the application, which in the end enabled us to produce **Protectin** anti theft application.

Chapter 4

Practical test and feedback

4.1 Introduction

In the previous chapter, we talked about the basics of designing anti-theft system, and we determined the dimensions of the application and work plans by designing each of the Use Case, FlowChart and Sequence Diagrams. In addition for that, We have developed the application with a view of some of the application's interfaces and the most important functions within it.

In order to test the system and determine its ability to achieve what is required, We conducted various experiments on the system We noted his accuracy in providing information and sending it to the required numbers, As well as taking pictures of the potential thief and sending them to the required emails.

4.2 Testing Methodology

To evaluate the system's performance, We conducted a series of tests focusing on accuracy, reliability, and response time. The testing included the following steps:

4.2.1 Trigger Testing:

We test the system's ability to activate when trigger is sent, first We configure the activation trigger to the (code : 1234) after We send the SMS activation code We notice that the system activated Mobile Data and GPS automatically.

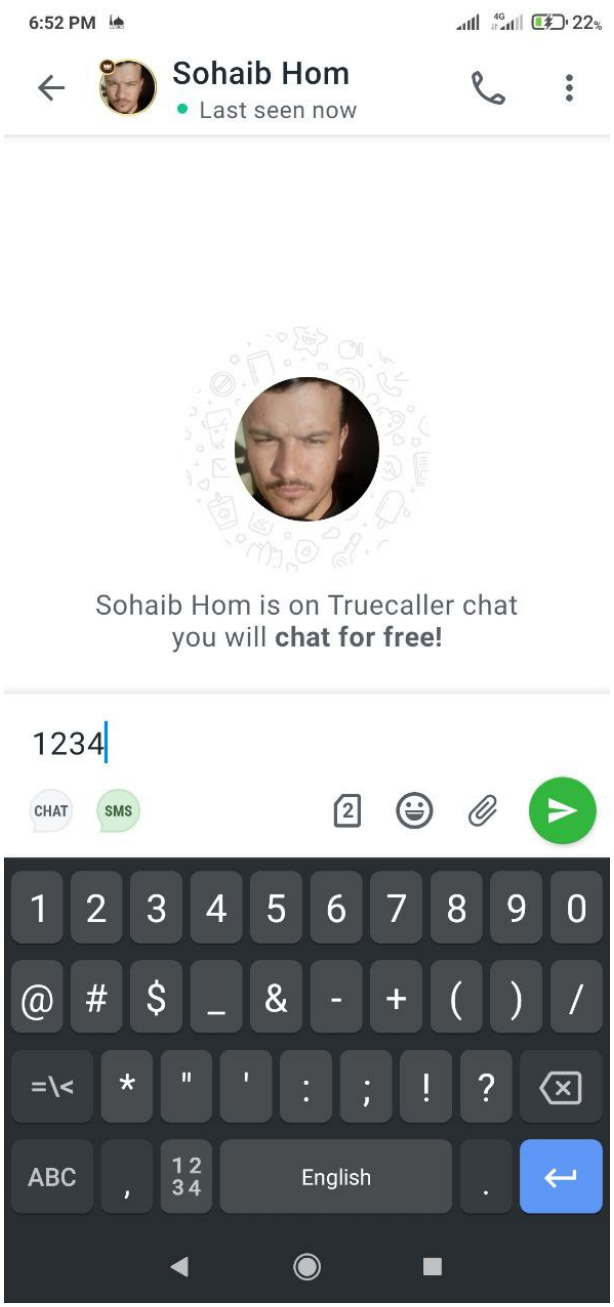
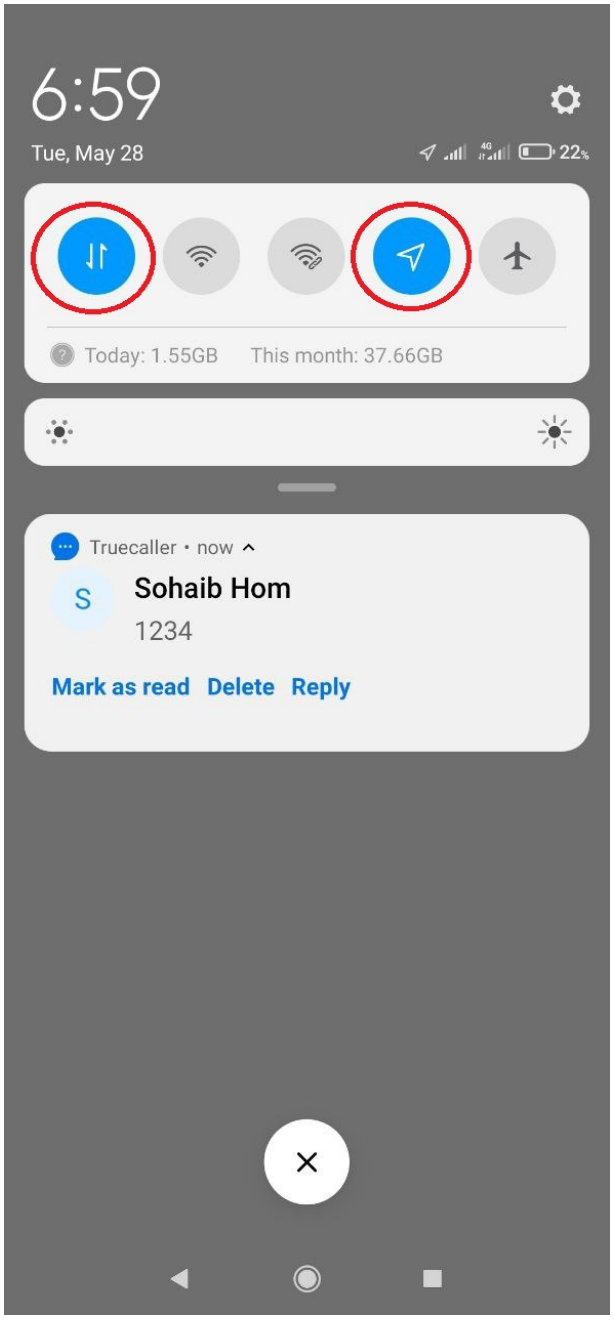


Figure 4.1: SMS Trigger Testing

4.2.2 Activating Services:

after the system is activated it starts the GPS and Mobile Data as it shown bellow:



4.2.3 Gathering Informations:

Protectin then starts geting the device data and a picture for the possible thief and then send it to the pre-defined emails and numbers.

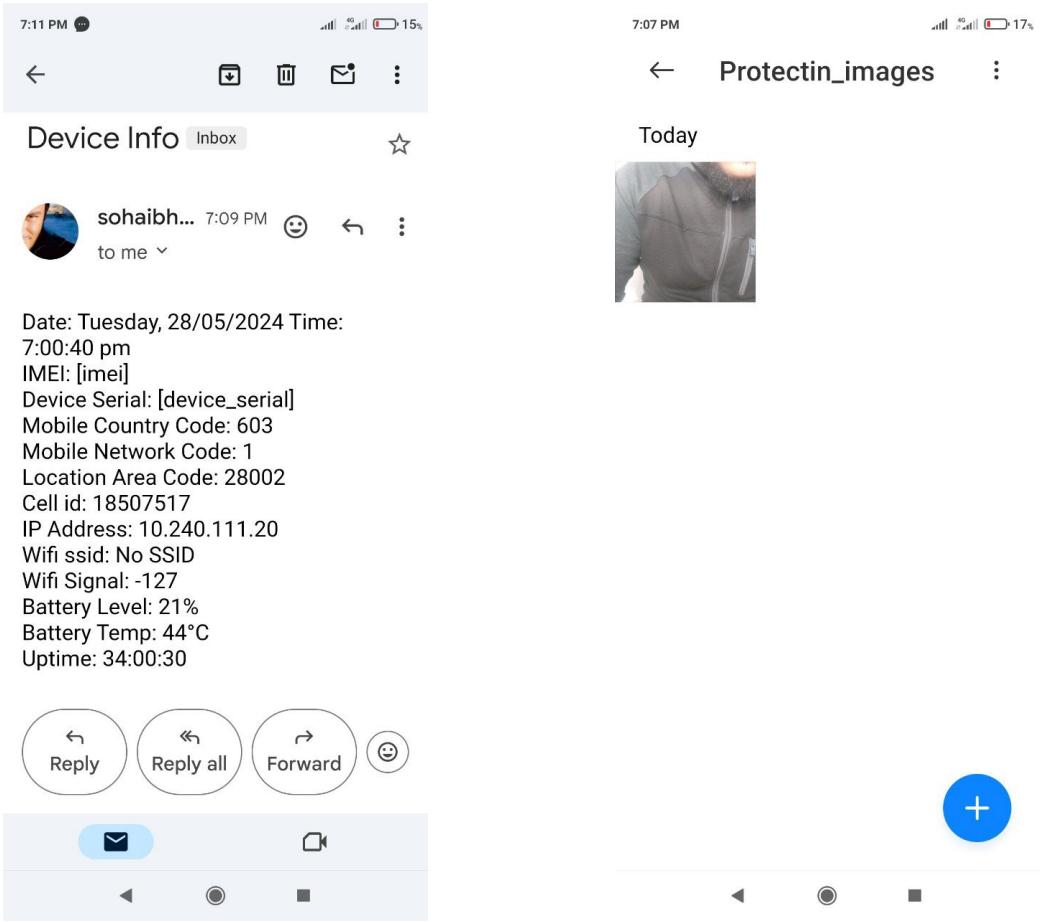


Figure 4.2: Activation of GPS & Net services

4.2.4 Sending SMS message:

We tested the timeliness and accuracy of SMS sent to predefined contacts, the length of time it takes to send the message.

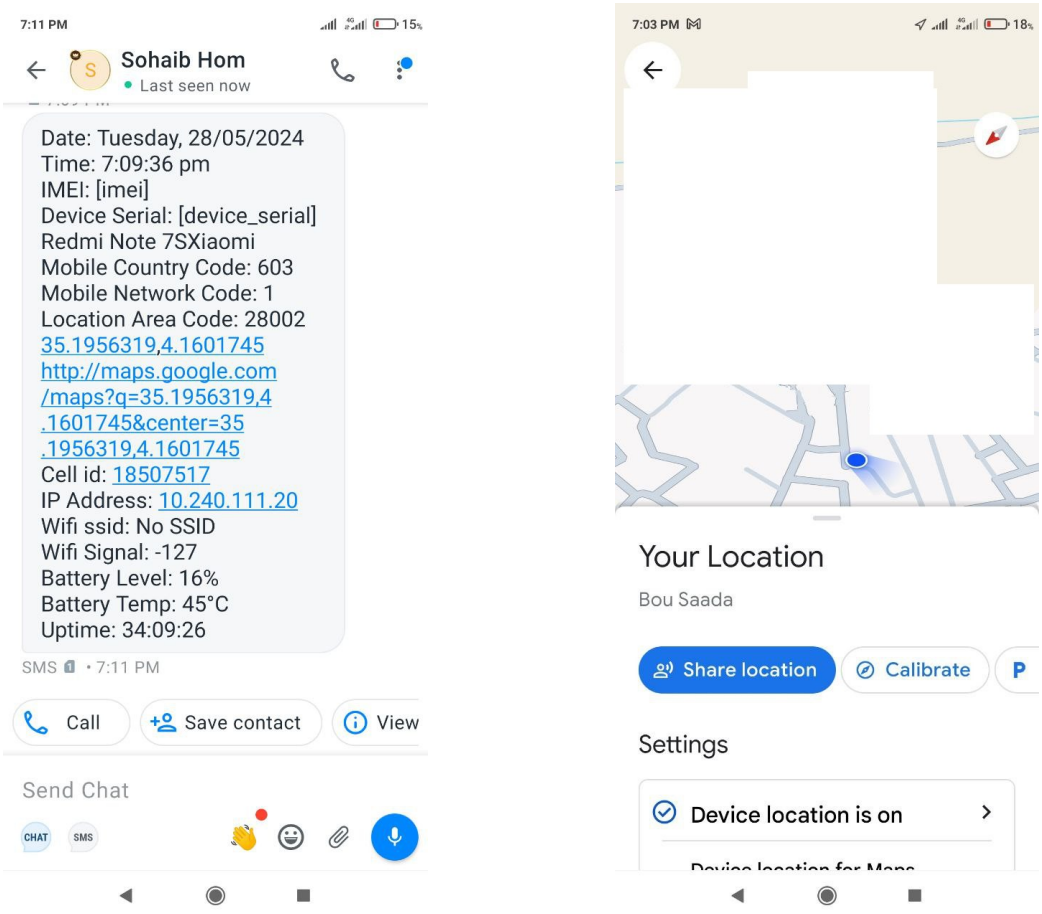


Figure 4.3: Sending SMS message

4.2.5 Snding Email message:

We evaluated the timeliness and accuracy of email sent to predefined contacts, for both location information and device information, as well as the photo taken of the thief.

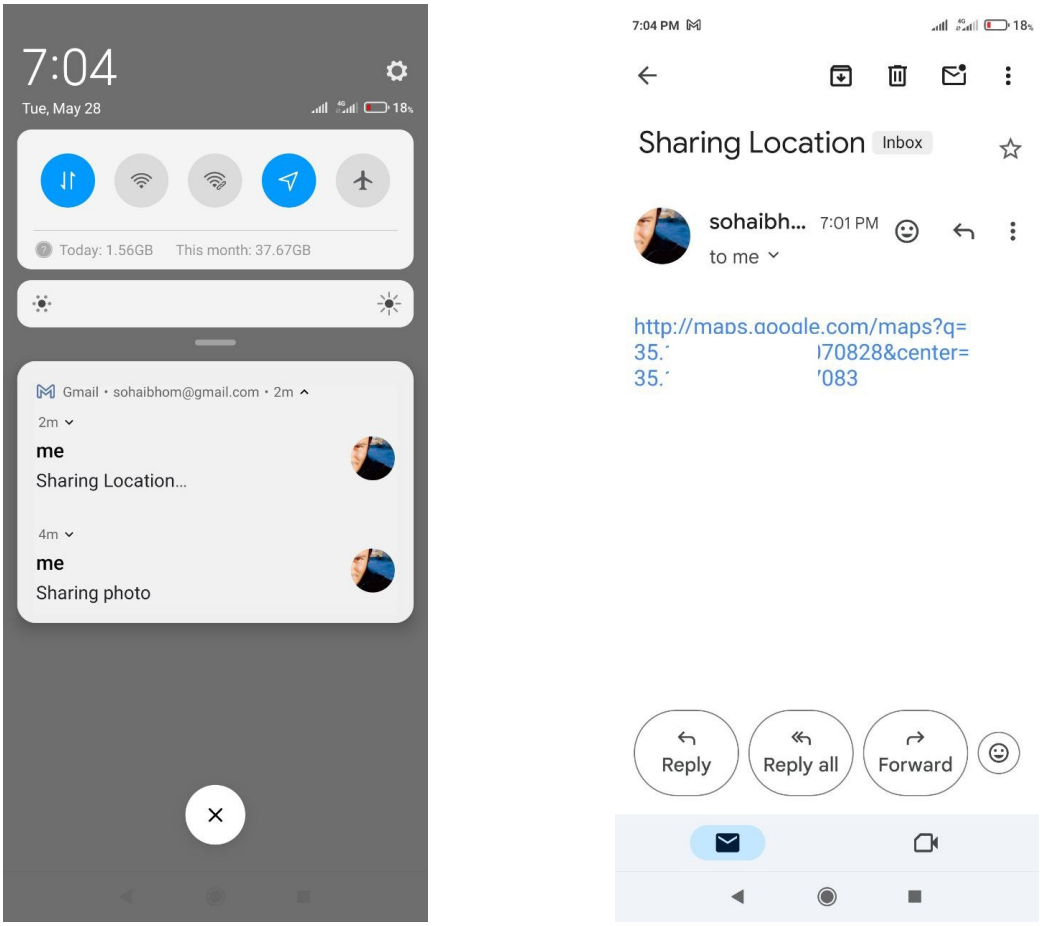


Figure 4.4: Sending Email message

4.2.6 GPS Accuracy:

The system's location retrieval capabilities were tested by moving the device to different locations and verifying the reported coordinates.

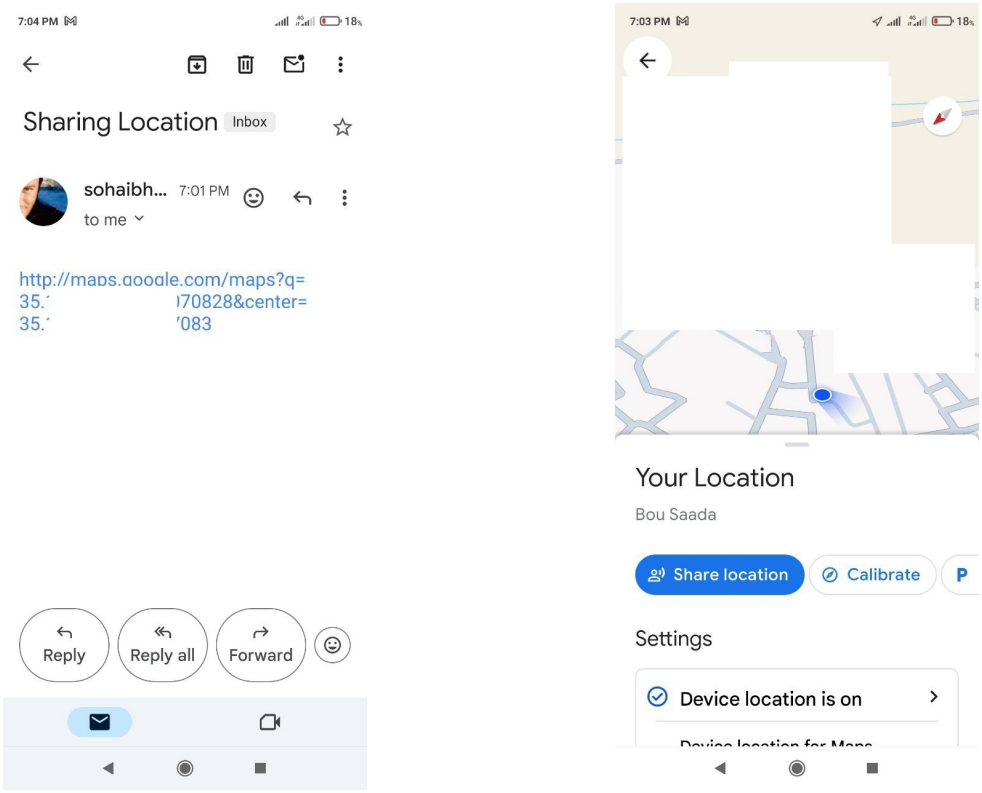


Figure 4.5: GPS Accuracy

4.2.7 Photo Capture:

The effectiveness of the front and back cameras in capturing clear images of potential thieves was tested under various lighting conditions.

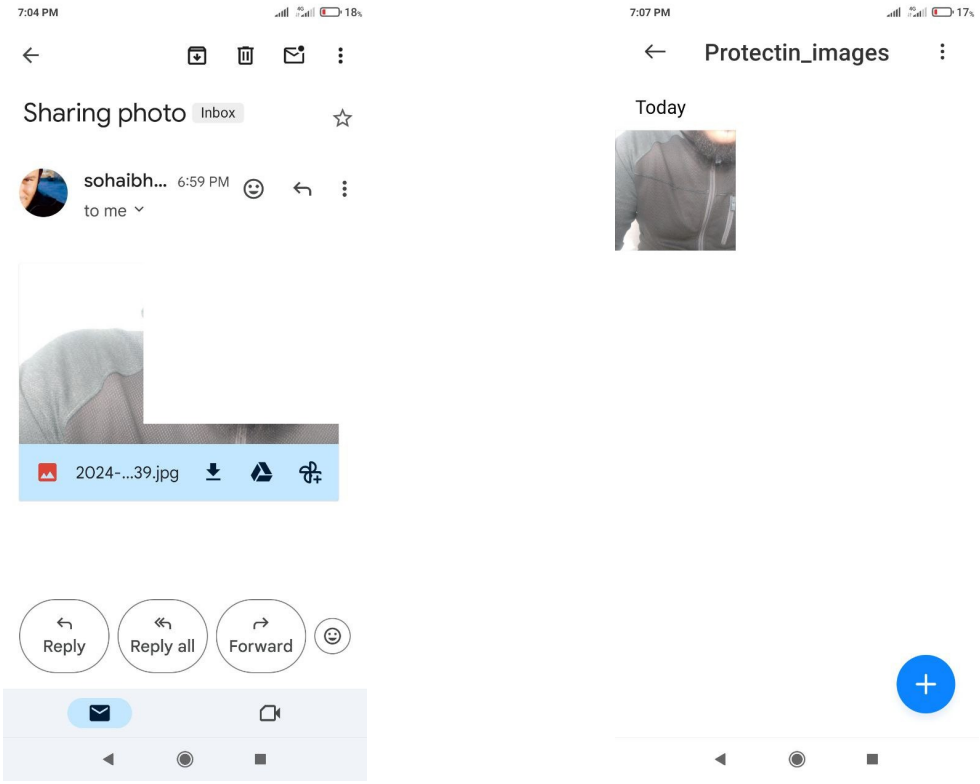


Figure 4.6: Photo Capture and Send to Email

4.3 Testing Results

The results of For 20 experiments, in different conditions (battery percentage, balance on the SIM card, etc.) demonstrated the following:

- **Trigger Activation:** The system consistently detected the trigger with a success rate of 100% .
- **GPS & internet Activation:** The system consistently activate the GPS and the internet with success rate of 100% .
- **GPS Accuracy:** Location data retrieved via GPS was accurate within 10 meters on average.
- **SMS and Email Notifications:** Notifications were sent within an average time between 15 seconds and 2 minutes after detection, with a success rate of 100% for both SMS and email, Assuming the is enough balance in the SIM card.
- **Photo Capture:** The camera successfully captured clear images in various lighting conditions, with a success rate of 90-99%.

The system provided information that can help to find the thief by 75-90% succession rate.

4.4 Barriers to the system's functionality

after what We achieved from the beginning of work until the end of testing, We encountered some weak points that could delay or disrupt the system's operation, however, We contained them to a small circle, Which is the following:

1. **Insufficient SMS balance:** If there is not enough SMS balance, the system will not be able to send information via SMS messages.
2. **Unavailability of internet credit:** If the Internet balance is not sufficient, the system will not be able to send the necessary information

as it should, whether it is pictures or information about the phone's location.

3. **Low phone battery:** If the phone completely loses its battery for any reason, this will prevent any application from working, so the phone must be turned on to ensure the system is working.

4.5 Comparison with Other Applications

When We compare **Protectin** with popular anti-theft applications in the market today like:

Table 4.1: Comparison of Anti-Theft Applications

Name	**Description**	**Disadvantages**
Prey Anti-Theft	Prey is a comprehensive anti-theft app available for both mobile devices and computers.[8]	- Limited features in free version - require internet connectivity
Find My iPhone / Find My Device	Apple's Find My iPhone and Google's Find My Device offer anti-theft features for iOS and Android devices, respectively. [45]	- Limited to *iPhone Operating System* (iOS) and Android ecosystems - Requires device to be online for accurate location
Cerberus Anti-Theft	Cerberus is a powerful anti-theft app for Android devices with a wide range of features.[9]	- Only available for Android - Subscription-based - require GPS and internet connectivity
Avast Anti-Theft	Avast offers an anti-theft feature as part of its mobile security app for Android devices.[10]	- Some features may be locked behind a paywall - Can be disabled by advanced users - require GPS and internet connectivity

We can see that none of the mentioned applications in the table 4.1 can activate the GPS or mobile data automatically, unlike what **Protectin** application provides. It also acts completely automatically and does not require any intervention or modification to work.

General conclusion

Protectin efficacy in identifying and reacting to theft scenarios has been validated by real-world tests. These tests confirmed an accurate understanding of the system's capabilities by including a range of real-world conditions and theft scenarios. The system's strength in real-time tracking and monitoring is demonstrated by its high accuracy in reading SMS activation triggers and retrieving precise GPS location data as it captures a picture of the thief. Furthermore, the system's data sharing mechanisms guarantee that users are immediately getting those data in both SMS and email messages.

This project provided a wealth of new information and abilities that raised our level of practical and scientific understanding. We learned many new skills that we used in the project, such as design, Photoshop, programming phone applications with Flutter, and connecting artificial intelligence systems with mobile phone applications using TanserFlow Lite. We also discussed many new concepts in various fields of telephones, artificial intelligence, and the nature of human thinking. which, in the end, made many new things clear to us and educated us in areas we were unaware of.

Future improvements will enhance the system's performance for instance, Including machine learning algorithms for identifying more theft scenarios. Improving the user interface of the system to make it more intuitive and user-friendly. Furthermore, increasing the system's compatibility with a wider range of hardware and operating systems would increase its user base.

Finally, **Protectin** offers a strong and dependable way to secure smartphones. Its extensive features lessen the financial and psychological effects of smartphone theft in addition to protecting private data. Improvements to the system over time will guarantee that it stays a useful and practical in protecting personal information and prevent Smartphones theft.

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Appendice Part

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي و البحث العلمي

جامعة محمد بوضياف - المسيلة

عنوان المشروع:

تطبيق ذكي لحماية الهواتف الذكية في حالة السرقة

مشروع لنيل شهادة مؤسسة ناشئة في اطار القرار الوزاري 1275

صورة العلامة التجارية

Protectin

الاسم التجاري

PROTECTIN

بطاقة معلومات:

حول فريق الاشراف وفريق العمل

1- فريق الاشراف:

فريق الاشراف	
(01): المشرف الرئيسي البروفيسور: قادري السعيد	:التخصص اعلام الي
(01): المشرف الرئيسي	:التخصص .....
:المشرف المساعد	:التخصص .....

2- فريق العمل:

فريق المشروع	التخصص	الكلية
الطالب: هوام صهيب	هندسة برمجيات ونظم معلوماتية	الرياضيات والاعلام الالي
الطالب:		
الطالب:		
الطالب:		

1. فكرة المشروع (الحل المقترح)

- ✓ **مجال النشاط :** يعمل التطبيق على توفير نظام يعمل على حماية الهاتف في حال فقدانه وذلك بتزود الجهات المعنية بالمعلومات الكافية حول الهاتف والسارق.
- ✓ **كيف بدأت الفكرة وكيف تطورت ؟** بدأت فكرة التطبيق عندما لاحظنا ان اكثر من 80% من سكان العالم يستخدمون الهاتف الذكي ورغم اهميته في حياتنا اليومية لما يحتويه من معلومات حساسة ومهمة الا ان التطبيقات التى توفر خدمة حماية واسترجاع الهاتف في حال تمت سرقته او فقدانه غير عمليه في اغلب الاحيان وتتطلب اشتراكات بمبالغ مرتفعه, ماجعلنا نقوم بتطوير تطبيق يقدم ضمان حماية أفضل للهاتف في حال فقدانه.
- ✓ **ما الذي سوف تقوم به؟** سنعمل على التطوير في كفاءة التطبيق ومراجعة اداءه وتحسينه ونشر على المتاجر الالكترونية والتسويق له في مختلف المنصات.
- ✓ **كيف سيكون ذلك؟** سيكون التطبيق سهل الاستخدام وعملي ويوفر للمستخدمين مجموعة متنوعة من الخيارات التي تتناسب مع احتياجاتهم.
- ✓ **من الذي سينجز ذلك؟** سيعمل على تطوير التطبيق و تحسينه فريق من مختصي المجال من مطورين ومصممين كما سنعمل على توظيف مسوقين موظفي خدمة دعم العملاء.
- ✓ **أين سيتم إنجازه ؟** سيتم تطوير التطبيق في الجزائر ونشره على المتاجر الالكترونية ليكون متاحا بشكل عالمي كما انه يدعم تعدد اللغات ويخدم مختلف أنواع الهواتف العالمية.

2. القيم المقترحة

يقدم تطبيق **بروتكت ان** قيما ومميزات للمستخدمين والعملاء تتمثل في:

- **الحداثة:** يعتبر هذا التطبيق سابقا في مجاله لما يقدمه من تقنيات للذكاء الاصطناعي التي ليس هنالك مايماثلها في السوق كما اننا نهدف دوما للتطوير والابتكار باستمرار .
- **الأداء:** بعدما قمنا بتجربة أولية للتطبيق فنحن نثق ثقة كاملة أن التطبيق يقدم أداء أعلى من توقعات المستخدمين كما أنه فعال وسهل الاستخدام.
- **التكييف:** سيكون التطبيق مرنا ومتكيفا مع التغيرات والتطورات التي تحدث في مجال التكنولوجيا واحتياجات المستخدمين المتغيرة كل يوم.
- **إنجاز المهمة:** نؤمن بأن تطبيقنا سيكون نظاما أساسيا يعتمده المستخدمين لحماية واسترجاع هواتفهم والحفاظ على معلوماتهم الحساسة والبالغة الاهمية في أمان.
- **التصميم:** تم تصميم التطبيق بشكل عملي وسهل الاستخدام مع مراعات قواعد التصميم والالوان. كما نعمل على مراعات تجربة المستخدمين والعمل على التحسين في التطبيق ليتناسب مع تطلعاتهم.

- **خفض التكاليف:** بتوفير امكانية استرجاع للهاتف الذكي فنحن نعمل على ضمان حماية معلومات المستخدم والتي قد تكون احيانا مكلفة مثل: (معلومات بنكية, وثائق ...) كما سيضمن استرجاع الهاتف وبتالي قيمته المادية.
- **الحد من المخاطر:** باستخدام تطبيقنا فان المستخدم يضمن حماية افضل لهاتفه وامكانية استرجاعه في حال تعرضه للسرقة او الفقدان. كما نعمل على ان نكون مصدرا للثقة والامان.
- **سهولة الوصول:** سنعمل على توفير التطبيق في مختلف المتاجر الالكترونية والتسويق له على منصات التواصل الاجتماعي مايسهل من وصول المستخدمين له كما نعمل على اتاحة الوصول للتطبيق لجميع مستخدمي الهاتف الذكي باتاحته لكل من انظمة ال **IOS** وال **Android** والاجهزة اللوحية.
- **الملاءمة/سهولة الاستخدام:** الى جانب الاداء وفعالية التطبيق فنحن نعمل على توفير واجهة بسيطة وسهلة الاستخدام تخدم الغاية وتوفر تجربة استخدام اكثر مرونة وسلاسة.

3. فريق العمل :

- ✓ **يتكون الفريق من:** سيضم فريق العمل مبرمجين ومطورين ذوي كفاءة وخبرة في المجال وكذا مصممين ومسوقين للتطبيق كيما يضم أيضا موظفي خدمة دعم العملاء للوقوف على حسن سير التطبيق وكسب ثقة الزبائن.
- ✓ **طرق التفاعل والتواصل مع المستقلين:** سنعمل على التواصل بمختلف الوسائل الالكترونية والحضورية لضمان حسن سير العملية كما سيتم توزيع ادوار على المستقلين واعطائهم المهام المطلوبة وفق الحاجه وفق اجندة معدة مسبقا.

4. أهداف المشروع

- **توفير تطبيق يضمن حماية معلومات وبيانات أصحاب الهو اتف الذكية.**
- **تزويد الجهات الامنية بجميع المعلومات اللازمة لاسترجاع الهاتف.**
- **توظيف تقنيات الذكاء الاصطناعي في التعرف على صاحب الهاتف وحالات السرقة المحتملة.**
- **توفير تطبيق بواجهة بسيطة وسهلة الاستخدام.**
- **توفير تطبيق بنسخة مجانية متاحة للجميع.**
- **توفير تطبيق امن وموثوق.**
- **توفير تطبيق مبتكر ومتطور باستمرار.**

5. جدول زمني لتحقيق المشروع :

الأشهر

			2-1	4-3	5	6	7	8	9	10
		التطوير في التطبيق	✓	✓						
		الشروع في الاختبارات المبدئية وتصحيح العيوب		✓	✓					
		تجريب النموذج الأولي			✓	✓	✓			
		جمع الاراء والتعليقات والتعديل على النموذج			✓	✓	✓			
		الحصول على وسم المشروع المبتكر						✓		
		تسجيل براءة الاختراع من اجل الحصول على رقم الإيداع والحماية الصناعية							✓	
		متابعة عملية الحصول على براءة الاختراع وتصحيح ملاحظات الممتحنين.								✓

الأعمال

6. عرض القطاع السوقي :

✓ **السوق المحتمل:** يستهدف التطبيق جميع مستخدمي الهاتف الذكي عموما حيث يقدر عدد مستخدمي الهاتف الذكي في العالم باكثر من 80% من نسبة سكان العالم , كما يهدف التطبيق لخدمة رجال الاعمال واصحاب المشاريع الذين لديهم معلومات مهمة في هواتفهم , كما تم العمل على توفير التطبيق في مختلف انظمة الهواتف الذكية بما في ذلك IOS/Android

✓ **السوق المستهدف (الشريحة):**

- جميع مستخدمي الهواتف الذكية.
- الجهات الامنية.
- اصحاب الشركات والمؤسسات.

✓ **تم اختيار السوق المستهدف للأسباب التالية:**

- سوق كبير ومتسارع النمو.

- التوجه نحو استخدام الهواتف الذكية حيث فاق نسبة 80% من سكان العالم.
- احتواء الهواتف الذكية اليوم على معلومات حساسة ومهمة.
- الخوف من فقدان الهاتف وعدم القدرة على استرجاعه.
- نقص المنافسة وعدم وجود تطبيقات فعالية بشكل كافي.
- الطلب القوي على تطبيقات من هذا النوع.

✓ **إمكانية ابرام مع الزبائن المهمين:** ستتاح الفرصة للعملاء المهمين لامكانية اعادة تصميم التطبيق ليتناسب مع توجهات المؤسسة الشخصية وكذا اضافة انظمة مخصصة تلبي احتياجاتها سواء كانت مؤسسة تجارية او حكومية او حتى عسكرية.

7. قياس شدة المنافسة :

✓ تتفاوت نسبة المنافسة اعتمادا على المنطقة ففي الجزائر يعتبر تطبيق **Protectin** الوحيد من نوعه, أما بالنسبة للسوق العالمية فنجد تطبيقات مثل **Google Find My Device** و تطبيق **Where Is My Droid** و **Cerberus Anti-Theft.**

✓ نظرا لما يقدمه التطبيق من خاصيات مميزة عن غيره فان عدد المنافسين في هذا المجال قليلا, مايجعل من الحصة السوقية كبيرة , وللتطبيق القدرة على الاستحواذ على حصة كبيرة من السوق نظرا لكثرة الطلب وقلة التطبيقات المنافسة.

✓ **تتمثل نقاط قوة التطبيقات الموجودة اليوم:** في السوق في انها مدعومة من طرف شركات عملاقة مثل **Google** و **Avast** وتوفر الحلول الاساسية بشكل مجاني.
بينما تتمثل نقاط ضعفها: في انها لا تلبي الاحتياجات المطلوبة لاسترجاع الهاتف بل في اغلب الاحيان تكون غير عملية نهائيا اضافة الى تكلفتها المرتفعه في النسخ المدفوعه.

8. التكاليف والأعباء :

✓ **التكاليف الثابتة:**

- **نشر التطبيق:** تكلفة نشر التطبيق على مختلف المنصات.
- **دعم العملاء:** النفقات المتغيرة لتقديم خدمات دعم العملاء الفعالة لكل مستخدمي التطبيق والمؤسسات او الشركات المتعاقد معها.
- **كتاليف الاجهزة والمعدات.**

✓ **التكاليف المتغيرة:**

- **رسوم بوابات الدفع:** الرسوم المطبقة عند ادفع بالبطاقة الالكترونية وتختلف تتغير حسب نوع خدمة الدفع المستخدمة.

- **تطوير التطبيق:** تكلفة صيانة وتطوير التطبيق.
- **التسويق للتطبيق:** للتسويق للتطبيق عبر مواقع التواصل الاجتماعي والمتاجر الالكترونية ومختلف القنوات.

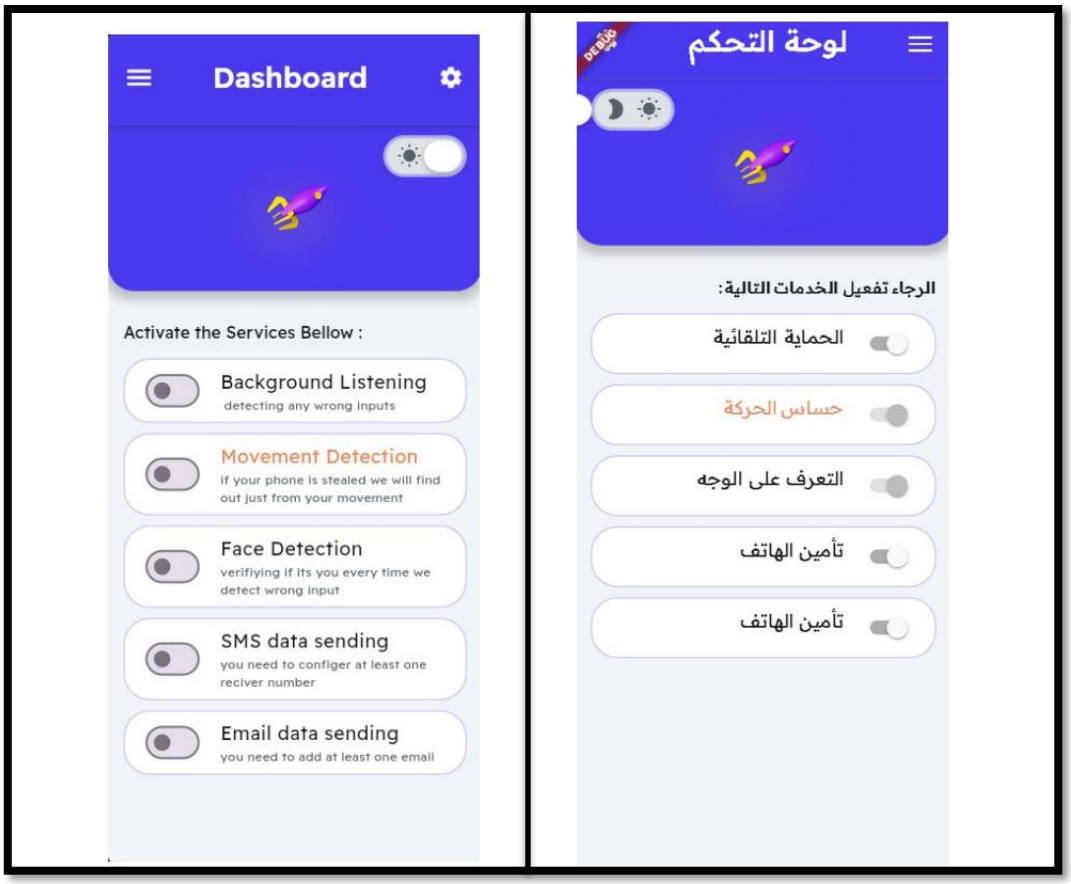
9. رقم الاعمال:

- ✓ سيتم انشاء معدل رقم اعمال التطبيق من خلال الاشتراكات المدفوعة للتطبيق والشراكات مع المؤسسات والشركات الخاصة.
- ✓ **الاشتراك الشهري** في التطبيق ب 600دج / الشهر, بينما السنوي 4999دج / السنة (-32%).
- ✓ تخصيصات التطبيق للمؤسسات الخاصة والشركات والقطاعات الحكومية ستكون متغيرة على حسب الطلب.

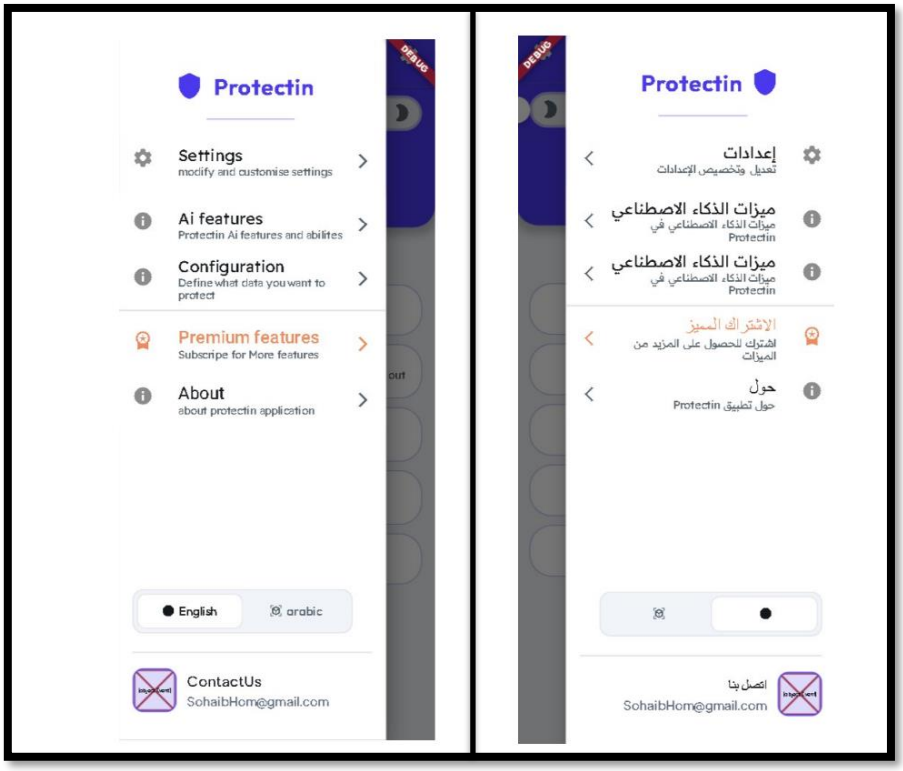
10. النموذج الاولي التجريبي

سنعرض صورا للشكل العام للتطبيق وبعض الواجهات الخاصه به ثم نعرض مثال تجريبي عن التطبيق في حالة العمل:

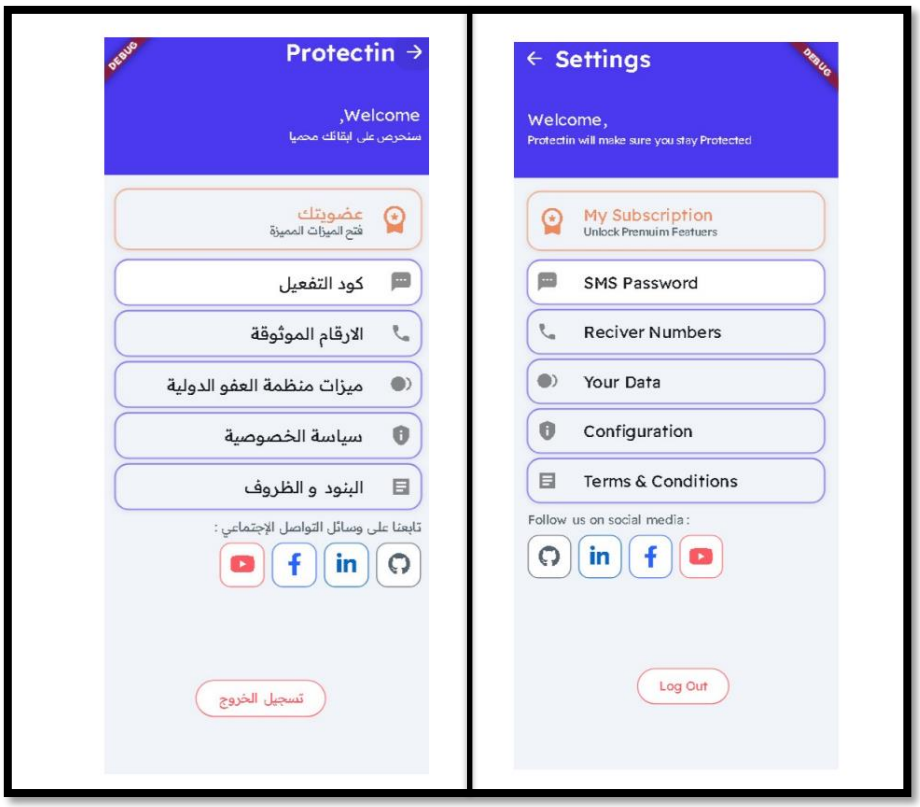
1- الشكل العام للتطبيق:



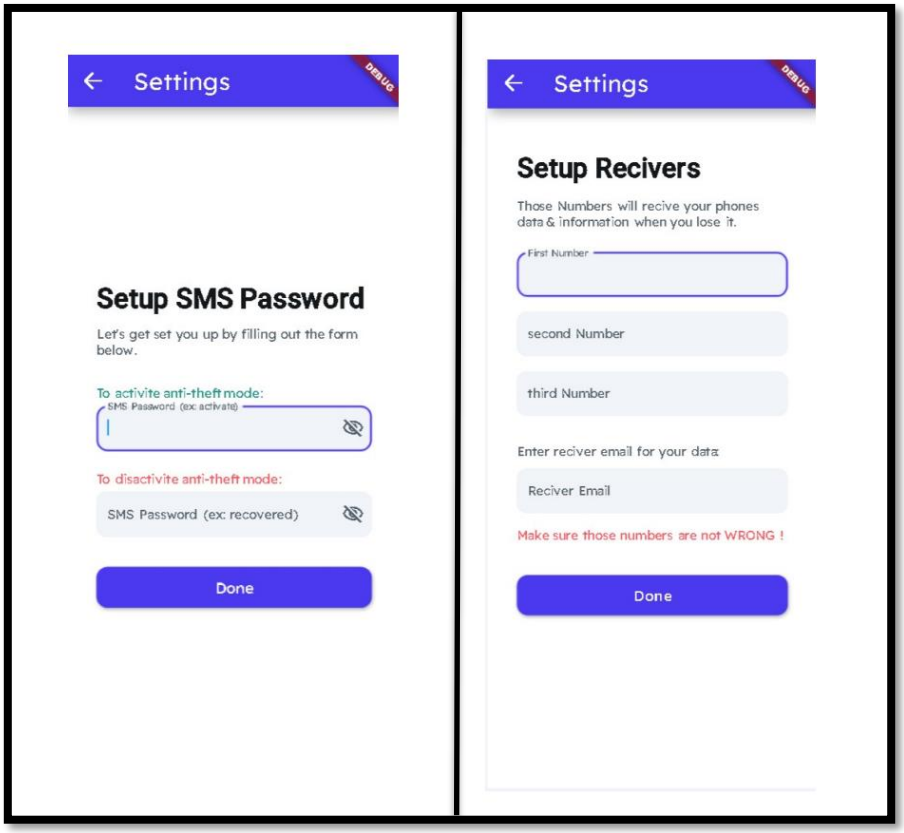
الشكل1: واجهة لوحة التحكم



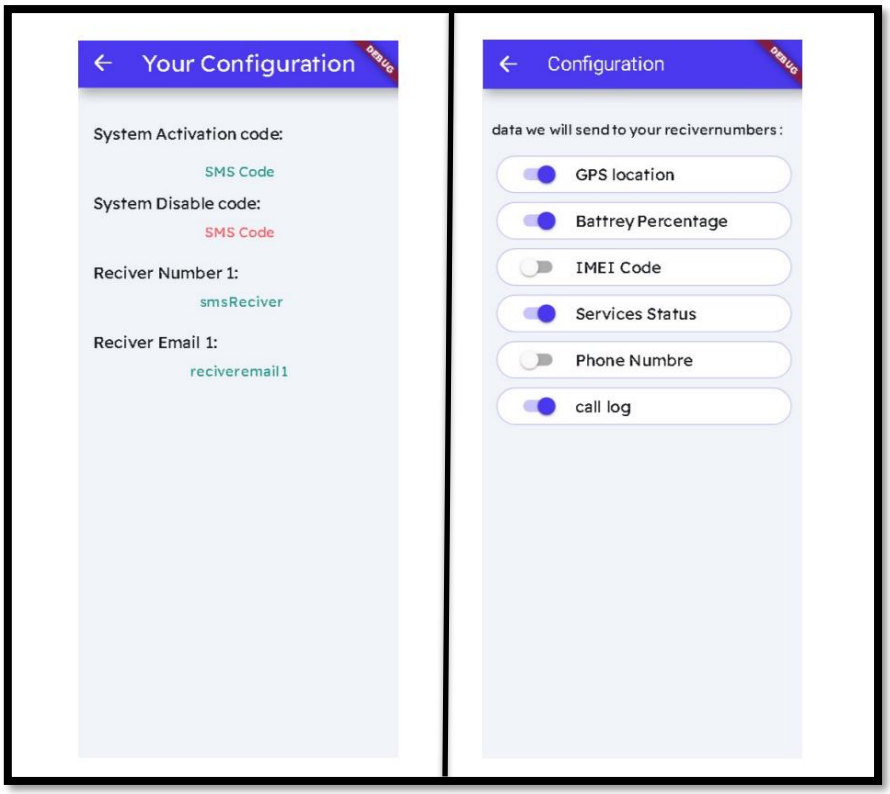
الشكل 2: قائمة الوصول السريع.



الشكل 3: واجهة الاعدادات.



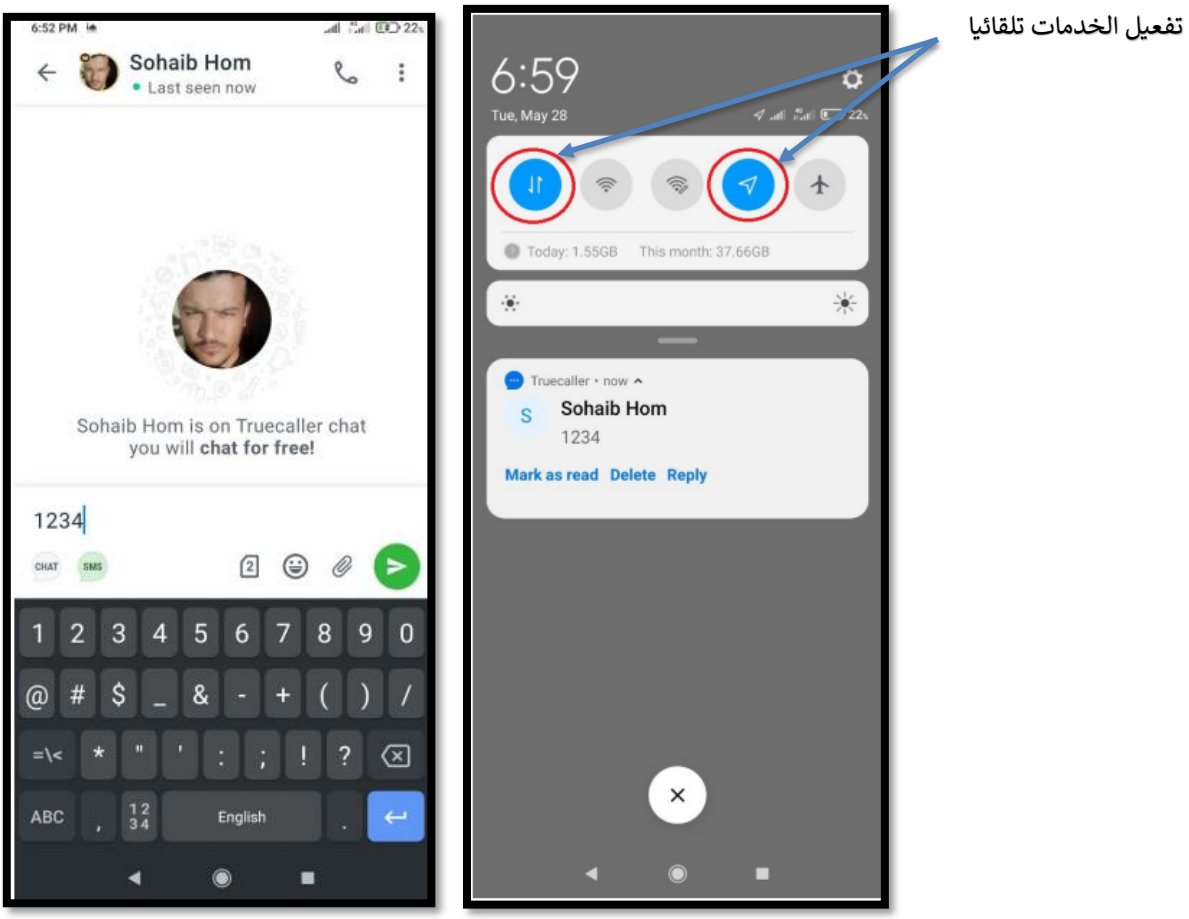
الشكل 4: واجهة اضافة كلمة السر لتفعيل النظام.



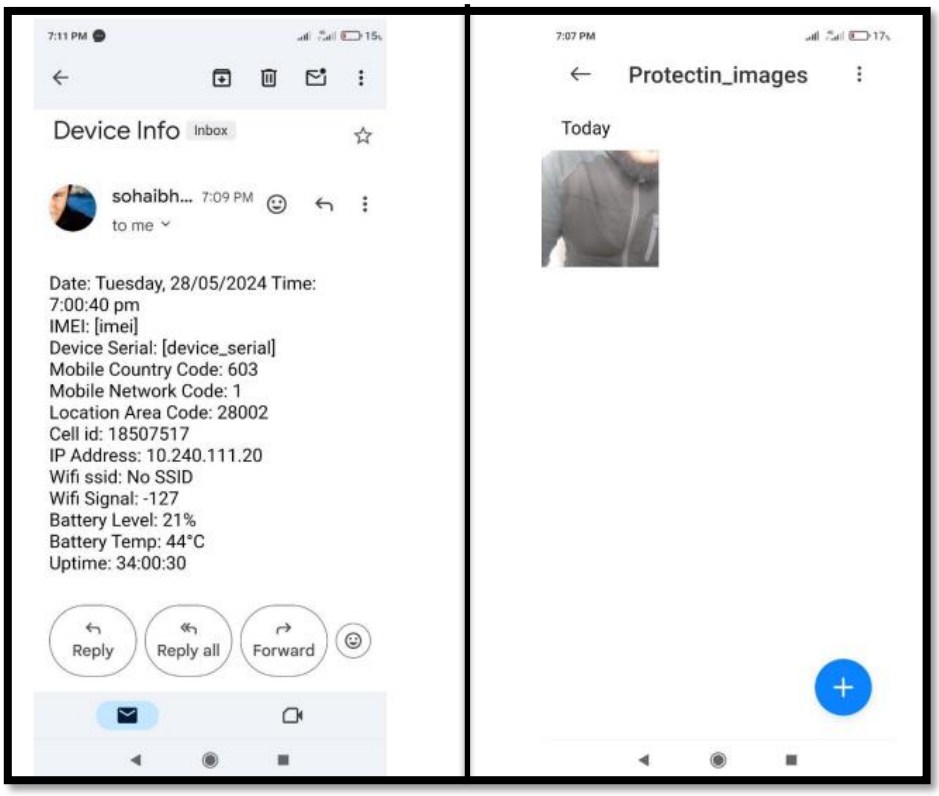
الشكل 5: قائمة الخصائص

2- تجربة عملية للتطبيق:

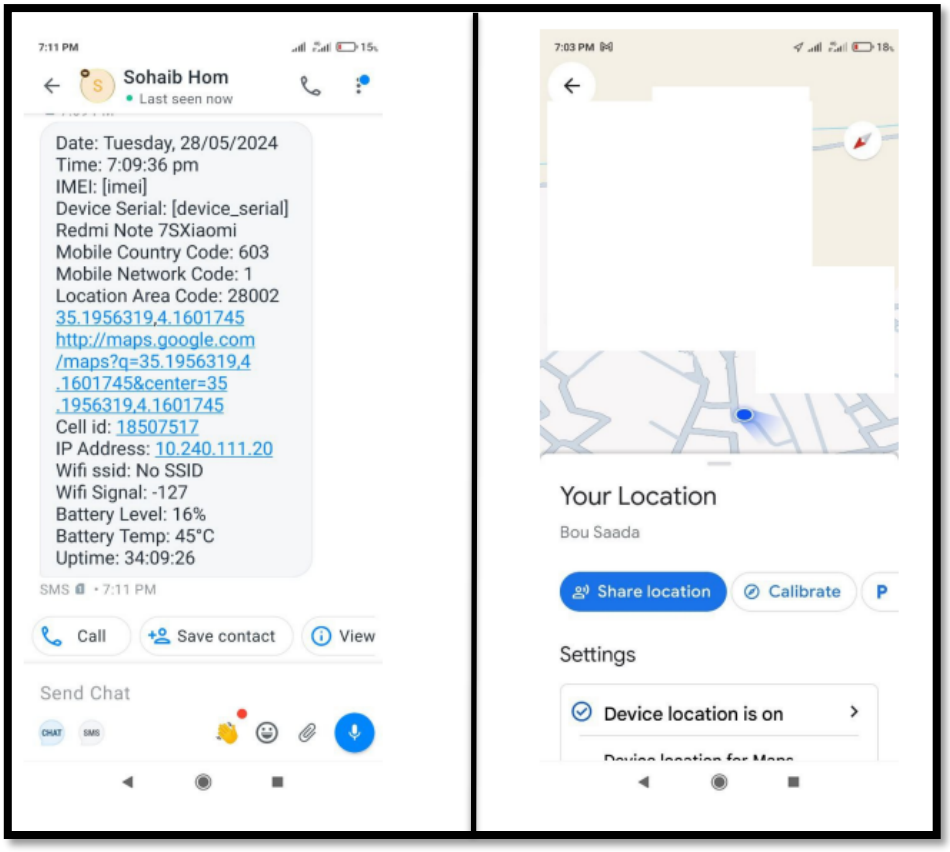
حيث نقوم باستعراض كيفية عمل التطبيق والاجراءات المتبعه في تسجيل المعلومات التي ستعين في عملية استرجاع الهاتف المفقود.



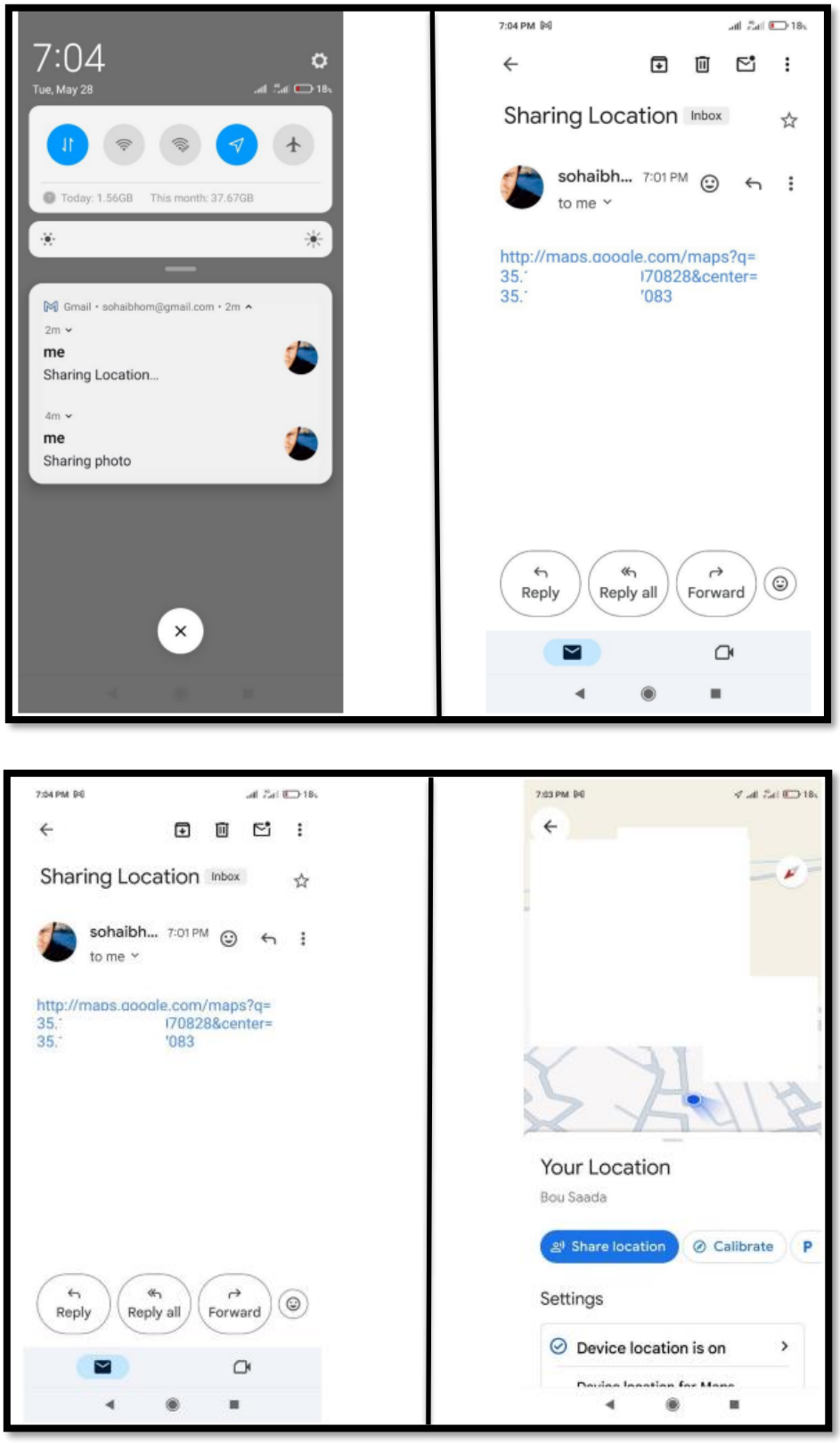
الشكل 6: ارسال رمز تفعيل النظام (تفعيل وضع السرقة)



الشكل 7: جمع معلومات الهاتف والموقع والتقاط صورللسارق.



الشكل 8: ارسال معلومات الهاتف والموقع الجغرافي الى ارقام محددة مسبقا داخل التطبيق



الشكل 9: ارسال معلومات الهاتف والموقع الجغرافي بالاضافة الى صورة السارق المحتمل على البريد الالكتروني المحدد مسبقا.

شهادة توطين/ تحضين مشروع مبتكر ضمن القرار 1275

INCUBATEUR
UNIVERSITE DE M'SILA

الجمهـوريـــــة الجـزائريـــة الديمقراطيـــة الشعبيـــة
وزارة التعليم العالي والبحث العلمي
جامعة محمد بوضياف بالمسيلـــة
حـاضنـة الأعمـــال

الرقم: 150 / الحاضنة/2024

شهادة توطين / تحضين" مشروع مبتكر ضمن القرار 1275 "

أنـــا الممضـي أسفلـه ,السيـــد : زيـد أيمن .
مدير حاضنـة الأعمـال : لجامعـة المسيلـــة .
المقر الاجتماعي /العنوان :جامعة المسيلة القطب الجامعي شمال .
رقم علامـة الحاضنـــة : 0804213017 .
تـاريخ تسليم العلامـــة : 2021/04/12.
اشهد أن الطالب / الطلبة التالية أسمائهم :

الاسم و اللقب	الطور الدرامي	التخصص	الكليـة
هوام صهيب	ماستر 02	إعلام آلي	الرياضيات و الإعلام الآلـــي

تحت إشراف الأستاذ/الأساتذة التالية أسمائهم :

الاسم و اللقب	الرتبـة	التخصص	الكليـة
قادري السعيد	استاذ محاضر (أ)	الذكاء الاصطناعي	الرياضيات و الإعلام الآلـــي

تم احتضانه على مستوى حاضنة الأعمال لجامعة المسيلة بمشروع تحت اسم :

Smart Anti-theft System For Smart phones

خلال السنة الجامعية 2024/2023.

سلمت هذه الشهادة بطلب من المعني(ة) للإدلاء بها في حدود ما يسمح به القانون .

حرر في المسيلة بتاريخ: 2024/05/26

مديـر الحاضنـة

مدير حاضنة الأعمال
جامعة المسيلة
الدكتور: ايمن زيد

مخطط نموذج العمل التجاري: PROTECTIN تطبيق ذكي لحماية الهواتف الذكية في حالة السرقة.

شرائح العملاء

- جميع مستخدمي الهاتف الذكي.
- الجهات الامنية.

العلاقات مع العملاء

- توفير تطبيق سهل الاستخدام.
- يوفر التطبيق خدمة عملاء لكل مستخدمي التطبيق.
- مع ضمان حماية معلومات المستخدمين من خلال تقديم نظام حماية عالي المستوى.

القنوات

- الاعلانات عبر مواقع التواصل الاجتماعي.
- التسويق للتطبيق والخصائص التي يقدمها.
- نشر التطبيق في متاجرتطبيقات الهاتف الالكترونية.
- التحسين من ظهور التطبيق في محركات البحث.

القيمة المضافة

- يوفر التطبيق حماية للهواتف الذكية خصوصا لأصحاب الشركات والمؤسسات الكبرى.
- يوفر معلومات مهمة وحساسة في حال فقدان الهاتف مثل تحديد مكان الهاتف ومعلومات السارق للتسهيل من عمل الجهات الامنية .
- التعرف التلقائي على الوجه وتفعيل خدمات الاتصال وخدمة الموقع الجغرافي تلقائيا.

الأنشطة الرئيسية

- البحث والتطوير.
- تقديم خدمة دعم العملاء.
- التحديث والتطوير الدوري للتطبيق.

الموارد الرئيسية

- **موارد مالية:** قرض ASF.
- **موارد بشرية:** مطورين ومسوقين وموظفي خدمة العملاء.
- **الموارد المادية:** الاجهزة والمعدات.
- **الموارد الفكرية:** براءة اختراع/ الملكية الفكرية.

الشراكات الرئيسية

- سيشترك التطبيق مع متاجر التطبيقات الالكترونية .
- شراكات مع بوابات الدفع.
- تأسيس شراكات مع الشركات المؤسسات الصغيرة والكبيرة.
- الشراكة مع حاضنة الاعمال لجامعة المسيلة.
- الشراكة مع صندوق التمويل الجزائري ASF.

مصادر الايرادات

- **الاشتراكات المميزة:** 600DA / الشهر أو 4999DA/ السنة (-32%).
- **العروض الخاصة بالشركات:** <150000DA/الشهر (يتم تحديد التسعيرة حسب متطلبات الشركة).
- **تخصيص نسخة من التطبيق للشركات الكبرى:** <350000DA (يتم تحديد التسعيرة حسب متطلبات الشركة).

هيكل التكاليف

1. **التكاليف الثابتة:**
   - **تكلفة النشر:** 15000DA تكلفة نشر التطبيق على منصتي Google Play/Apple Store.
   - **تكلفة خدمة الدعم للعملاء:** 30000DA/الشهر تكلفة تقديم خدمة الدعم للعملاء.
2. **التكاليف المتغيرة:**
   - **تكلفة صيانة التطبيق:** 35000DA/ السنة تكلفة صيانة التطبيق سنويا.
   - **تكلفة التطوير:** 150000DA تكلفة التطوير والتحسين.
   - **تكلفة التسويق:** 10000DA/الشهر تكلفة تسويق التطبيق على المتاجر و مواقع التواصل الاجتماعي.

الجمهورية الجزائرية الديمقراطية الشعبية
REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIR
وزارة التعليم العالي و البحث العلمي
MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET DE LA RECHERCHE SCIENTIFIQUE
جامعة محمد بوضياف بالمسيلة
UNIVERSITE MOHAMED BOUDIAFDE M'SILA
كلية الرياضيات و الإعلام الآلي
Faculté des Mathématiques et de l'Informatiques
جامعة محمد بوضياف - المسيلة
Université Mohamed Boudiaf - M'sila

رقم : 126/ ق.إ.آ/2024 المسيلة في :2024/06/05

إلى السيد : مدير المؤسسة العمومية رزيق البشير ببوسعادة

الموضوع:مساعدة الطلبة في إجراء تربص ميداني

في إطار ربط الصلة بين الجامعة والمحيط الإقتصادي يشرفنا أن نلتمس من سيادتكم اتخاذ الإجراءات اللازمة لتمكين الطالب المذكور أدناه من إجراء تربص ميداني بمؤسستكم

الرقم	الاسم و اللقب	تاريخ ومكـــان الازديـــاد	رقم بطاقة الطالب
01	هوام صهيب	2000/09/16 ببوسعادة/المسيلة	181935090240

مدة التربص:30 يوم

المؤسسة المستقبلة

ع/ رئيس القسم

الجمهورية الجزائرية الديمقراطية الشعبية
République algérienne démocratique et populaire
وزارة التعليـــم العالـــــي والبحث العلمي
Ministère de l'Enseignement supérieur et de la Recherche scientifique
جامعة محمد بوضياف – المسيلة
Université Mohamed Boudiaf - M'sila
مركز دعم التكنولوجيا والابتكار
Centre d'Appui à la Technologie et à l'Innovation (CATI)

رقم: 42/م.د.ت.إ/2024 المسيلة في: 08جويلية 2024

شهادة ايداع ملف براءة اختراع

يشهد مسؤول مركز الدعم التكنولوجي والابتكار لجامعة المسيلة الدكتور **يوسف بريك**، بأن الطالب: **هوام صهيب** ، قد أودع ملف (01) طلب براءة اختراع على مستوى المركز في انتظار دراسته يحمل المعلومات التالية:

عنوان براءة الاختراع:

« Télécommande sans fil avec un système intelligent pour protéger les smartphones contre vol »

مسؤول مركز الدعم التكنولوجي والابتكار

الدكتور يـــوسف بريـــك

مركز دعم التكنولوجيا والابتكار، حاضنة أعمال جامعة المسيلة، القطب الجامعي الشمالي، جامعة محمد بوضياف بالمسيلة
رقم الهاتف: 035133849
الإيميل: cati@univ-msila.dz