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Innov'IT

2018 edition

Technology and innovation at the service of society

"Angel Eyes"

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Thanks

        We would like to thank the organizers of the INNOV'IT competition in particular AUSIM Morocco for this opportunity offered to young students in order to implement their innovation projects.

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IT department for their support.

summary

"Angel Eyes" is a mobile application for the visually impaired and blind. This application
can be used by these people in delicate and confusing situations such as
find the right path in the street or look for an object in the house,… etc.

The advantage of "Angel eyes" is that it involves voluntary users to provide help
to blind people and thus strengthen social solidarity between members of the same community.
In this sense, "Angel Eyes" aims to respond immediately to the needs of the blind by offering
give these users the opportunity to make a video call with volunteers interested in
support and guide them, who are also registered as users of the application. This last
also offers a premium service which consists in giving blind people the ability to have a
artificial intelligence as a guide, that is, by filming their surroundings constantly, a voice
communicate with them, alert them to potential obstacles, or help them recognize an object
in its proximity as well as its location. This application will be handled through the voice of no
seeing.

Chapter 1: General framework of the project

1. Introduction

This project is part of the INNOV'IT competition organized by austral (the association
users of information systems in Morocco).
In this chapter we start with a presentation of the competition in its 10th edition.
Then we will introduce the general framework of the project. Then we will move on to present the
methodology and formalities adopted for work planning.

2. Presentation of the INNOV'IT competition

Innov'it is a competition organized by the AUSIM (Association of Systems Users
of Information in Morocco), open free of charge to training establishments with a sector
IT, carrying an innovation project in Information Technology with value
added, all areas combined. The project should stand out from the existing solutions
by his disruptive approach to:
    - IT innovation: Originality, creativity, quality and use.
    - The user experience: ease of use, user-friendliness.
    - Putting into production: real need, Business Plan, technical and economic realization.
The theme of this edition is "technology and innovation at the service of society".

3. Presentation of the project and specifications

3-1.Problématique

Quality of life is an asset sought by everyone, unfortunately people who have
specific needs cannot often have an ease of daily life.

In this sense, blind people can find themselves in situations that
are confusing, as if to detect the right path, the inability to cross the road in
security or in situations where their hearing and sense of touch is ambiguous.

Due to this visual handicap, the blind person is unable to handle objects
delicate or tiny, especially in this era where all objects are getting smaller and smaller and
more complicated. In addition, in places she does not usually frequent, she will not be able to
recognize or target objects in its surroundings. External help by sighted people
normal is therefore necessary but unfortunately not always available, since many
blind people cannot be accompanied all the time and people from the same community

are not always united towards each other. Hence the increased need to be the most independent
possible. Indeed, a qualitative study on a sample of 60 blind people divided
on the kingdom has shown that 90% of people have the will and the need to be more

self-employed without having recourse to their families and relatives.

As a result, new technologies come to make life easier for humans in general and those
with specific needs in particular. In this sense, blind people need to
have an application adapted to their capacity that can facilitate their daily life to the extent
of the possible.

3-2.Stakes and objectives

Several solutions can exist for this problem in general, but none is suitable
to respond immediately to the needs of the blind.

Our solution is a mobile application called **"Angel Eyes"** , it aims to help
blind when in difficult situations, allowing them to make a video call
with volunteers interested in supporting them, who are also registered as users of
the application, to show them through this live video call their situation and surroundings, and
expect advice or direction from these volunteers. Another service will be
offered in premium, that is to say paid by subscription, this service consists in giving to the blind
the ability to have an artificial intelligence as a guide, that is, by filming their surroundings
constantly, a voice will communicate with them warning them of obstacles in the road, or
will help him to recognize an object in its proximity as well as its location. Since the non
seeing is unable to handle a touch screen, our application then offers him a manipulation
easy through voice.

"Angel Eyes" fits perfectly with the theme of this edition of the competition
INNOV'IT relating to "Technology and innovation at the service of society". The advantage of our
application is that it involves voluntary users to bring help to the blind
and thus strengthen social solidarity between members of the same community.

The application will have as a source of income the premium service that the blind would pay.
A second source of income is targeted advertising: Non-profit organizations
lose a lot of money in finding and prospecting volunteers capable of
support their causes, a very small percentage being interested in volunteering in
our society. Users of our app sharing a common trait, which is a sense of
solidarity to help other people in need, they will be a very targeted population to which
we can advertise and promote other volunteer requests as well,
social and purpose organizations are customers of our service.

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3-3.The target of the project

Our targets are divided into three categories:
  ❖ A blind person having difficulty identifying and handling small objects in
     its surroundings, and to recognize its path and make decisions in situations that

are confusing. This person either could not get help from another person at normal sight, or she simply wants to be independent. The blind must have or be able to buy a Smartphone and have an Internet connection.

❖ A volunteer who wants to volunteer to help blind people
   in trouble. He thus devotes a few moments of his time to guide a blind person by difficulty through a video call. This person may also be interested in wearing volunteer in other social activities. Like the blind, she must have a Smartphone and an Internet connection.

❖ A non-governmental organization, generally not-for-profit, wishing to recruit
   volunteers or volunteers for social activities, or simply announce a social event that may interest them.

3-4. International

This application targets the blind in all corners of the world, but as we will launch the application initially only in Morocco, it will be at the start in two languages: French and English. French being the language used in Europe and Africa, and English being a universal language.

The blind will have simple and specific voice commands that they will use to handle the application, and they will be reminded of it regularly.

Ihab Bendidi will be responsible for the translation into English and French. In a second step, we will translate into other languages other countries with a high rate of volunteers or blind. The translation will be done by freelancers.

Moroccan data use standards prohibit the sale of data personal or their external sharing. They nevertheless allow the use of this data for perform quantitative studies, thus allowing the reuse of this data in the midst of the app for a more personalized experience. By spreading our services to other countries, we will target in priority the countries having this minimum degree of freedom in the use of data.

3-5. Mediation

To be able to acquire our targets and users, we will establish a social movement promoting mutual assistance and cooperation in society to solve the problems of the blind. This movement will be created through events that explain the importance of mutual aid for

solve the challenges of our society, as well as the needs of blind people. This will be achieved through a partnership with associations for the visually impaired and blind, as well as student social clubs for awareness events and support movements social, to promote the use of our app and similar help apps social. This will be in the banner with media coverage in social networks (facebook, instagram, twitter, pinterest, snapchat), as well as in the advertising banners of other likely sites to attract our targets (Aisec, etc ...)

3-6. Project team

3-7 Functional specifications

We will invoke in this part the specification of our application. This step is a necessary step to organize the development of an application.

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3.7.1 Tree structure

3.7.2 -Functional scope

3.7.3 Provisional planning

In this section we present the project roadmap as a GANTT diagram.

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3.7.4 Deliverables

The stages of our project gave rise to several deliverables with well-defined deadlines
and respecting the deadlines set:

Sending the theme to the commission scientist	December 10, 2017
Sending the project description to develop (Specifications application)	January 10, 2018
Sending team files and test platform	April 08, 2018

3.7.5 Graphic design

Meaning of the logo:

The logo consists of two parts: the eye is the main object of this project hence the choice of name
Angel Eyes, (in French "Angel eyes" which means a sighted person watching with these eyes
angel on others). The cut rectangle that surrounds the eye represents the technology of
the artificial intelligence used.

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graphical charter

3.7.6 Content overview

An idea of the general structure of the application:

3.7.7 Budget

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4. Methodology and formalities adopted

4.1 Introduction

A development process defines a sequence of steps, partly ordered, which
contributes to obtaining a software system or to the evolution of an existing system, to produce
quality software, which responds to users' needs in time and cost
predictable.
Although there are a multitude of software development methodologies, choosing a method
for a given project is a crucial decision. Because often the end product does not match
not always as specified.

4.2 Unified processes

The methodology chosen for the development of our application is the "unified process", which
is a process built on UML (*Unified Modeling Language*). Unified processes are the result
of the unification, not of the processes, but more precisely the best practices of
object development.
A unified process is distinguished by the following characteristics:

- ✓ **Iterative** : The software requires a progressive understanding of the problem through successive refinements and develop an effective solution incrementally by multiple iterations.
- ✓ **Risk-driven** : the major causes of software project failure must be ruled out in priority.
- ✓ **Centered on architecture** : the choice of software architecture is made during the first software development phases. The design of the product components is based on this choice.
- ✓ **Driven by use cases** : the process is guided by user needs presented by use cases.
- ✓

5. Conclusion

Throughout this chapter, we have generally approached our project by presenting the general context, the problematic addressed, the stakes and the objectives, the population concerned and targeted by our project and finally the work team which is made up of motivated students from INSEA.

First, we presented the INNOV'IT competition in which this project participates as part of an inter-school competition that brings together innovation projects that can be used the society. Then, we introduced our project as well as the needs leading to its realization and the goals he's trying to achieve. We then presented the methodologies of development more precisely our methodological and conceptual choice.

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Chapter 2: Study of the Project

1. Introduction

After presenting the problematic and the objectives of our project, we evoke them in this second chapter the new features brought by our solution. Finally, we justify through a study carried out, our choice of technical solutions adopted for the realization and the implementation of our project.
We will then present the criteria that led us to make the different choices techniques.

2. The criteria for choosing the Android system

2.1 Flexibility of the platform

Like Apple's Apple Store, Google opened its Google Play, allowing developers applications to publish their applications without any restrictions.

Unlike the Apple Store, Google Play will not have restrictions on the development of third. In the United States, AT&T had acquired the rights to sell the Apple iPhones for the five next years from the date of his release. And in the case of the BlackBerry, it is not a device entirely independent of the operator, since most of the sale goes to

through its various media, all over the world.

This approach had left people frustrated, tied to a mobile monopoly operator, regardless of their willingness to choose another operator. But, as Android is a open source operating system it could take advantage of the independence benefits of the apparatus and independence of the service provider.

2.2 Ease of development

Although consumers could benefit from a low cost of Android Smartphones, the developers have had unrestricted customization rights. From a point of view of developer, Android has several advantages, we can cite:

❖ The entire application platform can be reused and replaced by elements selective.

❖ The DALVIK virtual machine reinforces the power of management systems.

❖ Support for 2D and 3D graphics (OpenGL ES 1.0), so many projects for animation developers.

❖ Reinforced data storage (using the SQLITE platform)

❖ Support for GSM, EDGE, GPRS, UMTS 3G, HSDPA, HSUPA, LTE, Wi-Fi network applications (Depends on the material)

❖ Android development environment includes an emulator, a debugger and a plug-in for the Android Studios IDE.

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2.3. Growth in the Smartphone market

Nothing seems to be able to hinder the overwhelming dominance of Android: with a market share of 78.6% in 2013 (+9.6 points in one year), it crushes the competition. IOS still limits the Breakage and monopolizes the high end. Behind, BlackBerry is gradually disappearing (1.9%), overtaken by a Windows Phone (3.3%) used mainly by Nokia (89.3%).

Figure 1- Breakdown by OS of worldwide smartphone deliveries (millions of units)

More than a billion Androphones in 2015 **-** Android has benefited from market growth global smartphone market (+ 9.8%). Between 2011 and 2015, the number of androphones rose from 243.5 to 1016 million units. Android's market share increased over the same period by 30 points, leaping from 49.2% to more than 81% in 2015.

Android benefits from the entry level. However, and despite a comfortable advance, the Android ecosystem is experiencing some changes. Due to the strong slowdown of Samsung in 2014, the growth in smartphone deliveries is now based more on manufacturers of smaller size. Korean remains the number one market in the world.

Behind Android and iOS, only Windows Phone still seems to exist. "Rather than a battle for the 3rd ecosystem behind Android and iOS, 2014 led to skirmishes, with Windows Phone ahead of BlackBerry, Firefox, Sailfish and the rest, but without any of these does not register the progress necessary to challenge the first two "commented end IDC analyst Melissa Chau.

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But this year's results are not encouraging for Microsoft. "Despite all efforts Microsoft put into launching Windows 10, IDC does not expect that the share of Microsoft's smartphone OS market will grow significantly over the next few years " decides in December 2015 the cabinet.

Figure 2- Global market share of smartphone OS in 2012 and 2015 (%)

3. Open Tok and WebRTC

3.1 Presentation of WebRTC

WebRTC (Web Real-Time Communication, literally "real-time communication for

the web ") is a JavaScript [programming interface](#) (API) developed within the W3C and the [IETF](#) . It is also a software canvas with early implementations in different browsers [web](#) to allow real-time communication. The purpose of WebRTC is to link applications like [voice over IP,](#) peer-to-peer file sharing by eliminating extension modules owners previously needed.

The WebRTC API is based on a triangular and then peer-to-peer architecture in which a central server is used to connect two peers wishing to exchange media streams or data which then exchange without any other relay.

3.2 Presentation of Open Tok

Open Tok is a platform developed by Tok Box for the integration of communications interactive audio-video in real time using the WebRTC API in web and mobile applications, allowing to increase the capacities of WebRTC to have communications between web and mobile applications including client libraries for the Web, iOS, Android and Windows, as well as server-side SDKs and a REST API.

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3.3 Advantages of the Open Tok platform

- ✓ **Security:** encryption of connections with HTTPS, Secure RTP and http technologies authentication and many others, encryption of streams with 128-bit AES algorithms and AES-256.
- ✓ **Personalization of audio-video streams:** adding other media to the session without interruption of communication, manipulation of video and audio and use of filters and many other things.
- ✓ **Fallback Audio:** Dynamically **prioritize** audio in response to network quality user and react automatically to network conditions in real time to ensure continuity of communication which is crucial in our case.
- ✓ **Firewall traversal:** allow users to connect and make calls in different network environments, either firewalls or IP blockers.

3.4 Ease of integration and operation

The operation of the platform is based on two components:

- ➢ **The Client:** the client-side code that runs on a browser or a mobile application as it is the case for "Angel eyes", configured using client-side libraries offered by the platform for Android; and it is this side that manages the majority of open Tok features.
- ➢ **The Server** : which is a firebase database which stores identifiers and email addresses of different users.

Each Audio-Video Conversation occurs within an e session hosted on the "cloud Open Tok "and which manages the different user connections and the different audio-video streams.

Each session is associated with a **unique ID** , and so that users can communicate between they just need to log in to the same session using the same session ID.

4. TensorFlow and Inception

4.1 Presentation of TensorFlow

TensorFlow is an open source machine learning tool developed by Google. The source code was opened on November 9, 2015 by Google and published under Apache license on Git hub. It is based on the DistBelief infrastructure, initiated by Google in 2011, and has an interface Python.

It uses data flow graphs to build models. It allows to create large-scale neural networks with many layers. It is mainly used for :

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➢ classification,
➢ perception,
➢ understanding,
➢ discovery,
➢ the prediction
➢ creation.

4.2 Benefits

TensorFlow is the most used tool for different areas of AI, namely:
✓ "Voice / Sound Recognition"
✓ Image Recognition
✓ Video Detection.

5. Conclusion

In this chapter we presented the different technological choices that we adopted to realize our application and the reasons behind it. In the next chapter we will start the specification and needs analysis part.

Chapter 3: Specification and analysis of Needs

1. Introduction

Following the presentation phase of the project framework, we will invoke in this part the specification of our application. This step is a necessary step to organize the development of an application. It constitutes the starting point for our work. She allows to define the different functionalities it is likely to achieve to achieve the objectives of the project. So, we will present the different services and features that the application must provide to the user. We start with a general description of the application, before present a detailed description of the sections making up the application. Then we will establish a functional analysis that can then be modeled using the use case diagram.

2. Specification of requirements

This part takes care of the descriptive part of the needs expressed. These needs will identify the features that will need to be implemented in our application.

2.1 Functional needs

A functional specification for the system allows the description of its different functionalities for its realization.

Through the UML language use case diagrams, we will present the main features that the system must provide, as well as the list of actors that interact with. A use case makes it possible to highlight the functional relationships between the actors and the system studied.

Use case diagram to visually represent a sequence of actions performed by a system, producing a result on an actor, called main actor, and this regardless of its internal functioning.

. An actor, in the UML sense, represents the role of an external entity (human user or not) interacting with the system.

2.2 Non-functional requirements

In addition to the functional requirements, a set of non-functional requirements must be verified. This will decide the quality of response of our application and the degree of satisfaction of the user.

- **Ergonomics and Flexibility:** Our application must offer a user-friendly interface and user-friendly ergonomic, considering all possible interactions with the Android Smartphone.

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- **Reliability:** We also have to check the reliability of our application which can be performed throughout the working hours without errors.
- **Security:** Our application must guarantee the security of the data exchanged.
- **Extensibility:** Our application is extensible. It allows the addition of new modules and functionality in the future.
- **Compatibility:** One of the most important points when developing an application on a mobile environment, it is to ensure its compatibility with any version without forgetting its compatibility with third-party applications and elements (such as web services).

3. Analysis and design

3.1. Identification of actors and use cases

➢ **The blind:** This actor is the main user of the application. He has access to the modules following:
  - o **Make video calls: make** a video call by voice request with the keyword " **up** ".
  - o **Launch the AI service:** Launch the AI service which allows the detection of objects in time real, by asking it vocally by the keyword " **down** ".

➢ **The volunteer:** This actor is the volunteer who uses the application to help the blind by accepting their calls or helping by accepting the volunteering offers on offer. He has access to the following modules:
  - o **Accept video calls:** accept the video call from a blind person asking for help.
  - o **Consult the offers:** consult the volunteer offers offered on the application by our partners.

3.2 Use case diagram

The general use case diagram gives us a global view of the different services offered by our application. It sets out a general vision of the functions provided by our system vis-à-vis the user. The following figures illustrate the use case diagrams information relating to the actors:

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Figure 3-Global use case diagram

• **Details of the "make video calls" use case:**

Case number	01
Case name	Make video calls
Actor	The blind
Description	Launch the AI service which allows the detection of objects in real time, by requesting it by voice with the keyword " **down** "
Pre-condition (s)	Installation of the Application on a mobile or tablet. Internet connection is available
Post condition (s)	The "Video call" interface is displayed
Scenario	1. The blind person launches the application. 2. The system displays the home interface of the application. 3. The blind person says the word "up" and the interface "video call" appears 4. The system checks the availability of Internet access 5. The system is looking for a volunteer online and available for him

exceptions   1a- The system displays "Internet connection problem".

Table 1: "Make video calls" use case scenario

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• **Details of the "Use the AI service" use case:**

Case number	02
Case name	Use the AI service
Actor	The blind
Description	Allows the storekeeper to consult the group of depots, its categories, families under families and articles
Pre-condition (s)	- Installation of the Application on a mobile or tablet. - Smartphone accounting. - The purchase of the "AI" pack containing the various objects.
Post condition (s)	- The "AI" interface is displayed - The System returns vocally what is around in real time (every 10 ms).
Scenario	1. The blind person starts the service by saying the keyword " **down** " 2. The system starts the object detection service. 3. The system launches the detection interface and the camera. 4. The system vocally returns the objects detected each 10 ms.
exceptions	Display an "empty list" message.

Table 2: "Use the AI service" use case scenario

• **Details of the administrator use cases:**

Figure 4-Diagram of use cases "offer management"

This is not a case of direct use of the application, and the user "admin" is not a
direct user of the application but it plays an important role and it affects other use cases
namely the use of AI service, and volunteer offers.

The purchase of the "AI pack" is actually done with a member of the "Angel Eyes" team, and for the offers
volunteering the company with which we have partnerships sends us their offers and according to our
criteria we approve them and we publish them or not.

Following the specification and needs analysis phase, we will invoke in this part the
design of our application. This phase helps us understand our system, clarify it and
eliminate ambiguities by specifying its structure and behavior.

To do this, we will start with the design of our application which was carried out using the
UML (Unified Modeling Language) which is an object oriented modeling approach
used to design software. We offer a detailed design composed of:
class diagram and sequence diagram.

3.3 Sequence diagrams

Sequence diagrams can be used to describe use cases. They allow to
model the dynamic aspect of the system and present a temporal dimension which emphasizes
on the chronology of the sending of messages between objects.

For our modeling, we present a sequence diagram for use cases
of the "blind" actor.

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Figure 5- Sequence diagram of the "blind" use cases

3.4 Class diagram

A class diagram gives a static view of the system. He is considered the most important of object oriented modeling. It mainly contains classes. A class contains attributes and operations. It allows you to define the components of the final system and to structure the development work very efficiently.

Figure 6- Class diagram

4. Conclusion

During the exploration phase, we highlighted the requirements of the players in the system. These requirements have been translated through the modeling of UML use cases. These models allowed us to clearly define the functional needs and define the scenarios users. The identified use cases guided us subsequently to the detailed design and the implementation of our project.

Chapter 4: Technical study and implementation artwork

1. Introduction

This chapter makes it possible to achieve the objectives and the solutions requested. We start with a presentation of the work environment in terms of hardware and software. Then, we
let us evoke the practices adopted during the programming. Finally we detail what we have developed.

2. System architecture

The architecture of our system is illustrated by the figure, it is shared between:

- **The ANDROID client:** Application container and resource requester.
- **The server part:** which is composed of the open Tok cloud in which the different sessions containing the different streams, and the "firebase" database which contains the IDs of the different users of our application.

Figure 7- System architecture

3. Work environments

The working environment is essential for the realization of the requested solutions.

3.1 Physical environment
During the project, we used:

- ✓ COMPAQ laptop: Intel Core i5 processor
- ✓ HP laptop: Intel Core i3 processor
- ✓ Lenovo / DELL laptop: Intel Core i3 processor
- ✓ Operating systems: Microsoft Windows 10, Ubuntu Linux.

3.2 Software environment
To make our application a reality, we used a set of technical tools. The table above includes these tools:

Table 3 - software used

Tools	Logo	Description
Android Studios		**Android** studios is an environment free integrated development, expandable, universal, versatile and multiplatform.
Adobe photoshop cc		**Photoshop** is editing software, processing and drawing assisted by computer edited by Adobe. It is mainly used for treatment digital photographs.
Firebase		**Firebase** is a set of services accommodation for any type of application. It offers to host in No SQL and in real time databases data, or services, such as a time communication server real.
SQLite		**SQLite** is a library written in C which offers a basic engine relational data accessible by the SQL language.
StarUML		**StarUML** is modeling software UML, sold as open source by its editor, at the end of its exploitation commercial, under a modified license of GNU GPL.

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4. Implementation and operation of the "video calls" part

4.1 Implementation

The implementation of the video part using the Open Tok platform is based on both following components:

➢ The Client: the client-side code that runs on our mobile application configured using client-side libraries offered by the platform for Android.

➢ The Server: which is a "firebase" database which stores the IDs of the visually impaired and email addresses and IDs of volunteers.

Figure 8 - the content of the database / server-application side

Each Audio-Video Conversation occurs within a session hosted on the "cloud Open Tok "and which manages the different user connections as well as the different audio streams-videos.

Figure 9- an Open Tok session containing the different streams

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Each user is associated with IDs and when they launch a video, for each of them a Stream will be created (Stream MV for the visually impaired and Stream Vo for the volunteer) and will be added in StreamsMV and StreamsVO. On receipt of a Stream for the visually impaired, its function "OnstreamRecieved" will look for the ID associated with the Stream VO received, check it in StreamsMV,

register and finally communicate with him.

4.2 Operation

As soon as a volunteer authenticates he receives a unique ID which will be registered in the database.
system data with its email, and as long as it is online it is added to a volatile database
or online voluntary users are classified by the number of points they have (number of
points increases after each video call made with a visually impaired person) with an "email2 and
a boolean "call"; And the system chooses the one with the highest number of points (this corresponds
to the one who helps a lot) with the empty "email2" field to make the call.

When the volunteer receives a video call, if he accepts the "email2" field he associated with him
receives the ID of the visually impaired and the "call" field receives "yes" and this allows it to integrate the same
session that the sighted person in need, and if he refuses it or he does not respond within 15
second, the system goes directly to the 2nd available volunteer and ready to receive the call.

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Figure 10- operation of the "video call" part

5. Implementation and operation of the "AI" part

5.1 "Object Detection AI" implementation

To be able to recognize objects located around the blind, our artificial intelligence
was based on a public object detection model developed by Google, SSD_MobileNets, which
was re-trained on the DATASET COCO which has 80 object classes, which are the most likely
to be encountered in everyday life. This convolutional neural network has been used in
in conjunction with an API model to transfer images to it for inference. In parallel, the telephone
mobile processes the images taken at each moment by the camera, and transforms them into a tensor
adequate recognized by the neural network, this with extreme speed to guarantee a
instant feedback. The neural network then sends a tensor as output, which is then
automatically transformed into an image with recognized objects (Note that it is possible to
recognize up to 100 objects in the same image), and then a tracking system is activated to
track and track the movements of each object (This only works in compiled APKs
using the Bazel tool, not Gradle. Look at the attached installation file for more
details). At the same time, the results are transformed into words, which through an algorithm
that we have developed, are formed into syntactically correct sentences for any situation so
to provide ease of use and comfort for users. We were also able to space the
speaking periods dynamically for at the same time having a waiting time almost
nonexistent and also not having very quick feedback.

The code has been implemented to make it easier to add new templates.
recognition, to offer more packs to the blind, and at the same time was extremely
optimized, so that the final size of the APK is up to 5 times less bulky than any other
application offering object recognition, without losing any speed in the
recognition of our artificial intelligence or the accuracy of its results.

5.2 Operation

When the visually impaired starts the service either by voice with the keyword **"*down*"** or by touching the lower part of the screen, the system launches the camera and every 10 ms the processing shown on the diagram of Figure 11 repeats.

The system starts the java activity "Detector" which uses the "tensorflow object detection API" which is the pre-trained neural network and "Roudered image with recognition" to be able to identify the objects in the photo with a slightly high degree of certainty, the identify with colored rectangles with their name on the photo and return them in a table so read them through another activity that turns text into audio.

5.3 "Audio Recognition AI" implementation

For the recognition of the audio which will allow you to control and use the application by voice commands, we used for this a pre-trained Tensorflow model which allows recognize the following 10 keywords: "yes", "no", "up", "down", "left", "right", "on", "off", "stop", and "Go".

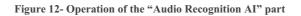Angel Eyes   INSEA

This model uses the convolutional neural network "CNN for Small-footprint Keyword Spotting "which is characterized by its simplicity, speed and ease of training to recognize other words in the future.

5.4 "Audio Recognition AI" operation

Figure 12- Operation of the "Audio Recognition AI" part

6. Tutorial for using the application

6.1 "Visually impaired" mode

After the launch of the application by the service "google go" on asking "open Angel Eyes", the home interface (see figure 13) is displayed.

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The language of the application will be either French or English depending on the language of the system, and the function 'tts: text to speech' runs automatically welcoming the user and showing them the instructions allowing you to access the application functionalities by voice:

" ***Welcome to Angel Eyes, if you are a Visually impaired please say yes".***

If the blind says "yes", the system displays the following interface containing the menu the application (Figure 13).

Figure 14 - application menu

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Right after the display of this interface, the "tts: test to speech" function is still executed in showing the visually impaired the instructions which can use, i.e. either the AI service or passed a video call with a volunteer: " ***for video call say up, for AI Service say down".***

• If the visually impaired pronounces the word **"down",** it means that they want to launch the AI service, the AI interface appears.

Figure 15 - IA interface

Right after the display of this interface, the " **tts: test to speech** " function is still executed here by saying verbally that the AI service is launched, every 10 ms the **tts** function returns the detection results, for the example in Figure 15, the sentence: **" *One person, one laptop and one cup* "** is pronounced.

6.2 "Volunteer" mode

After launching the application, the home interface is displayed (Figure 13), as soon as the volunteer click on the ***"I am a volunteer"*** button **,** the connection interface is displayed if it is not connected on application (see Figure 16):

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Figure 16 - "connect" interface

If the user does not have an account, he creates an account by clicking on the *"register"* button , as soon as he click on the button, the register interface is displayed (see figure 16). And if the user has an account, the *"home user"* interface is displayed (see figure 17):

Figure 17 - Home user interface

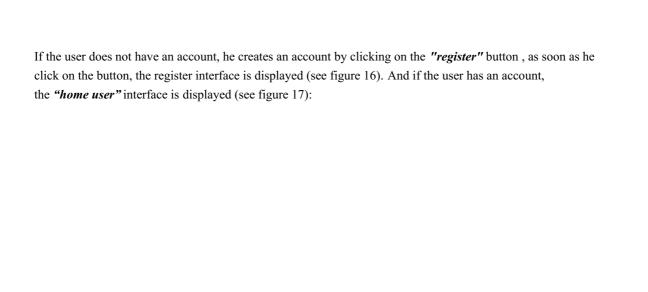Angel Eyes   INSEA

If the volunteer receives a video call from a visually impaired person, if he accepts it, the "video" interface is displayed:

Figure 18 - "Video" interface

Conclusions and perspectives

Throughout this report, we have tried to present the different stages that we have carried out to achieve the realization of our Android application.
We started this report with a study of the project context and a needs analysis functional and non-functional while developing use case diagrams for the system, as well as its different parts. Once the design is worked out, we move on to the part realization while presenting the different stages of the development of the application mobile.
And as prospects we hope in the near future to increase the detection capacity of the service AI to be able to detect even more objects, allow the improvement of performance of the application and finally the addition of the Arabic language to the application in order to guarantee a better user experience.

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