2021 年臺灣國際科學展覽會
優勝作品專輯

作品編號　**190043**

參展科別　**電腦科學與資訊工程**

作品名稱　**THE BLIND'S SHINE**

國　　家　**Tunisia**

就讀學校　**ATAST - The Tunisian Association For the future of Sciences and Technlogy**

指導教師　**Mr Hatem SLIMANE**

作者姓名　**Chaima ZAKHAMA**

Nessrine Karmani

Tesnim Ben BRAHIM

關鍵詞　**Braille、API、Translate**

作者照片

Chaima ZAKHAMA

Nessrine Karmani

Tesnim Ben BRAHIM

I-Abstract:

Nowadays, all blind people are able to read any type of text thanks to The Braille system, which is a system of reading by touch. The Braille system provides a good and important help to blind people but it's not enough. They try to integrate into society, try to read and write the same as those blessed with sight.

However, only 18% of people can actually write in Braille and doing so takes a lot of effort. While Braille techniques have existed for many years now, there isn't one that takes advantage of the comfort and easiness of modern technology.

To be fair and give more chances to the blind people, and with all the available technologies nowadays, we must find solutions and innovative ideas to fulfill this objective. And this is how our project was born. To be honest, it's not just a project, for us it's a dream. Our focus in this project is creating an automatic machine based on transforming our language to their language and transforming this new invention to assist the blind in writing whole texts through speaking. It will be easier than the traditional way. This part of the project will help us print Braille on paper automatically in the cheapest, fastest and easiest way, unlike the traditional method that not only takes a lot of time but also needs a professional. Our printer will only cost approximately 250$ compared to regular printers that cost 6500$!

the principles of the code of the speech recognition are voice pickup in all languages as first step, second speech recognition, then speech translation, after that speech analysis and finally translation into Braille and printing it.

As for the future, we will work on face, object and image recognition as a scanner to make the visually impaired people read the name of the object and recognize people's faces like anyone else.

II- General Introduction

The world is constantly evolving in an ever-increasing pace. The more Man initiates the progress of scientific and medical research, the more he can live easily and more comfortably. Unfortunately, the disabled people do not always benefit from this progress and have much fewer opportunities of success than ‘’normal people’’.

Blind people for example, still face many problems in terms of literacy. They try to integrate into society and try to read and write the same as those blessed by sight, but this no easy task for them.

Nowadays, most blind people are able to read any type of text thanks to Braille; a system that allows people with blindness and visual impairments to read and write by touch . The system, created by Louis Braille, was useful, even for the inventor himself. But even though Braille techniques have existed for many years, there isn’t a single method that takes advantage of the opportunities modern technology offers.

So, and after finding out that only 18% of blind people can write in Braille and not effortlessly, we decided to look into this matter. This means that an Arabic blind person that speaks Arabic and doesn’t understand Latin alphabets can never understand Braille because the system can translate Latin alphabets only.

III- Problematic:

The common problem that we have found is the high percentage of blind people that reaches in our country more than 100.000;

3, 5 thousands per million population in America and 7, 3 thousands per million population in Africa. They try to integrate into society, try to read and write the same as those blessed with sight. Braille gives them the opportunity to read. Make them use their other senses like the sense of touch to read a normal alphabet text. It helps and gives them the chance to read like all the normal people. Braille offers a good and important help to blind people but we find that only 18% of them that can write using Braille and doing so takes a lot of efforts. While Braille techniques have existed for many years now there isn’t any method that takes

advantages to the easiness of the modern technology. This means that an Arabic blind person that speaks Arabic and doesn't understand Latin alphabets can never read and write with Braille because Braille can translate only Latin alphabets. The majority of blind people about 73% can't use Braille embosser because it's expensive ... It costs approximately 7500$. Blind people find difficulty to communicate with another visually impaired person that doesn't speak the same language. With all the technologies nowadays, we must find solutions and idea to realize this purpose and to allow blind people overcome their handicap and make up for their missing sense.

IV- Purpose:

The purpose of this project is to create an automatic and easy device to use. A device that directly prints vocal messages to Braille and thus also solve one of the different problems that face blind people, as well as having the capacity to potentially make people's life easier.

The Braille printer will be able to transform tap writing to Braille writing, thus, visually impaired people will have the same chances as those who are blessed by sight.

The system has to also be able to detect voice information from any language and give a voice translation in English, as well as being able to convert it to Braille writing as a second step.

We aim at making the printer user friendly, meaning it is easy to use by any disabled person without help, thus making it easy to manipulate by anyone who needs it.

V- Survey:

1. Questions:

1/ Do you use the Braille writing system?

Yes ☐ No ☐

2/ If Yes: Do you use Braille for reading or writing?

Reading ☐ Writing ☐ Both ☐

3/ Do you find any difficulty to write using Braille?

Yes ☐ No ☐

4/ Have you ever used the Braille embosser?

Yes ☐ No ☐

5/ If No: What is the main cause of not using the Braille embosser?

Do not know about it ☐ expensive cost ☐ other ☐

6/ If Braille embossers were cheap and easy to use, would you buy one?

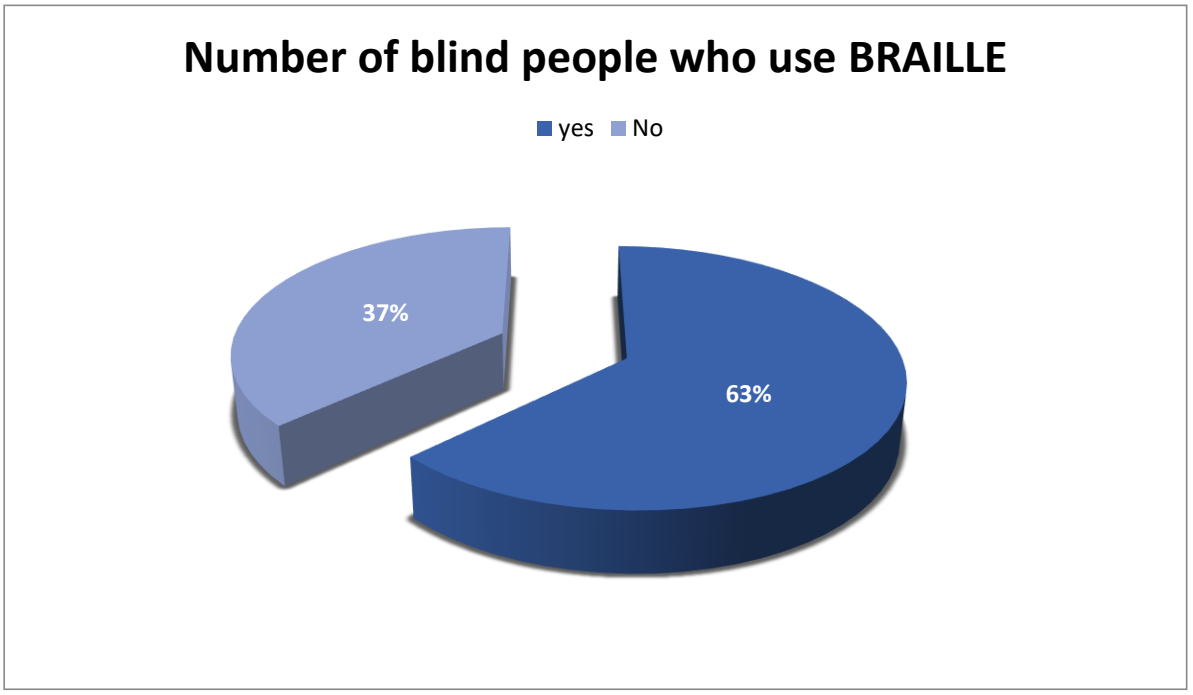
Yes ☐ No ☐

7/ Can two visually impaired persons who speak different languages actually write to each other?

Yes ☐ No ☐

2. Results and Data Analysis:

We've done a survey in order to figure out if blind people use Braille or not. We have found that 63% of the people asked said that they do use Braille language, while only 37% do not use it.

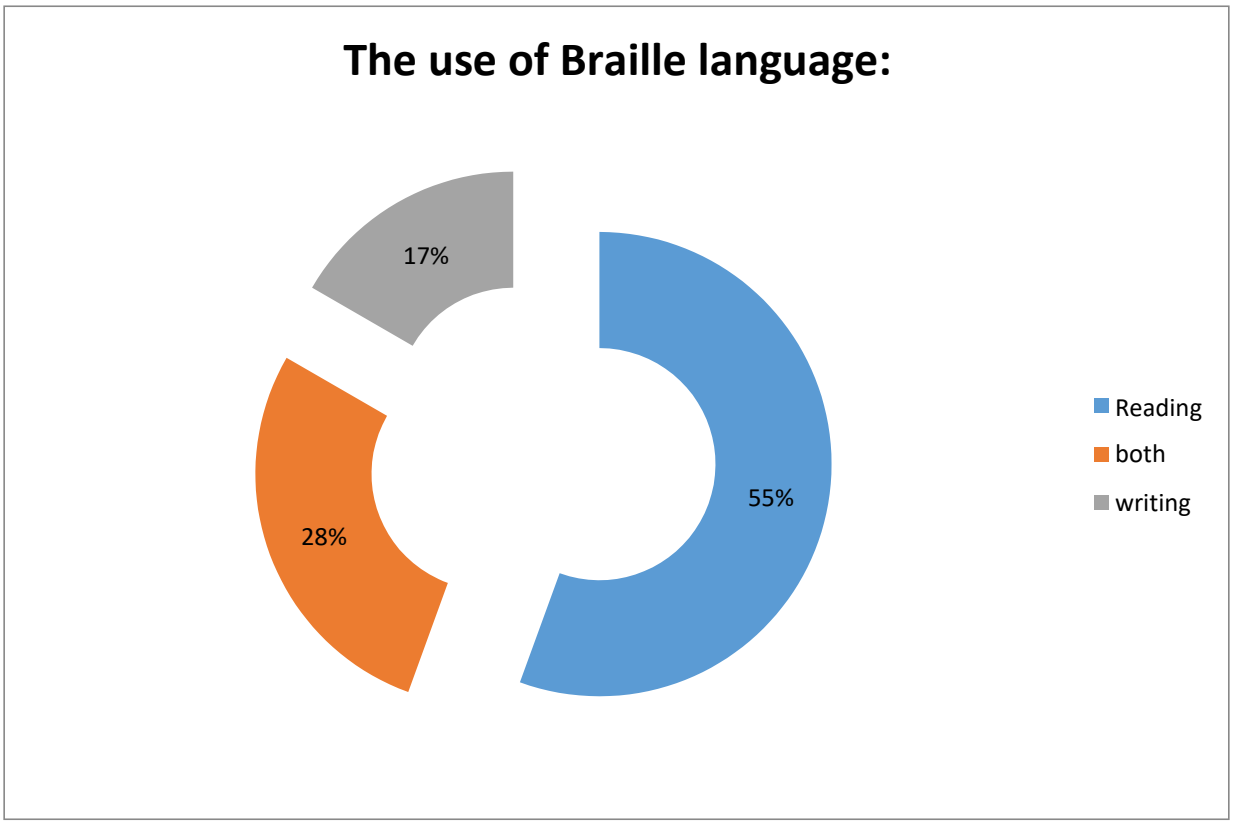


Conclusion:

As a conclusion to this graph , we found that the majority of blind people use Braille and that confirm the importance of the BRAILLE code in their life .

Most of blind persons use Braille language for reading with the percentage of 55%.

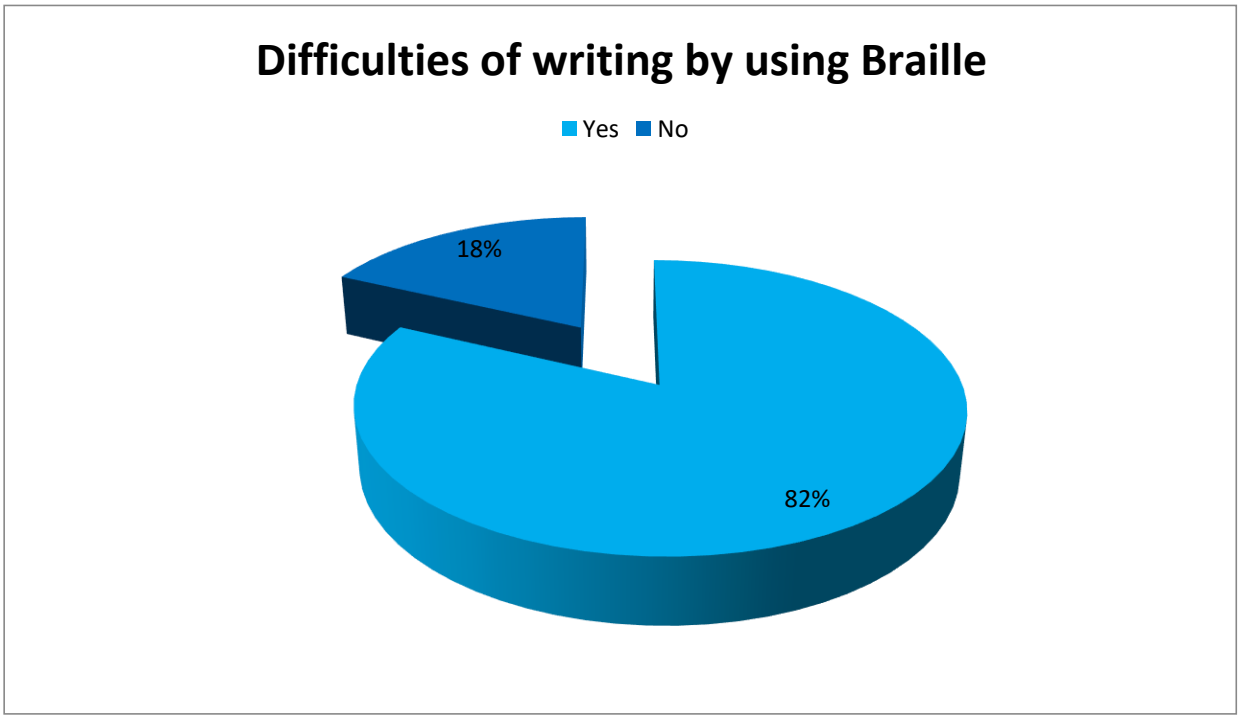
Only 17% use Braille to write and 28% use it to both write and read.



Conclusion:

We conclude that most of blind persons can only read Braille language and only few can write it.

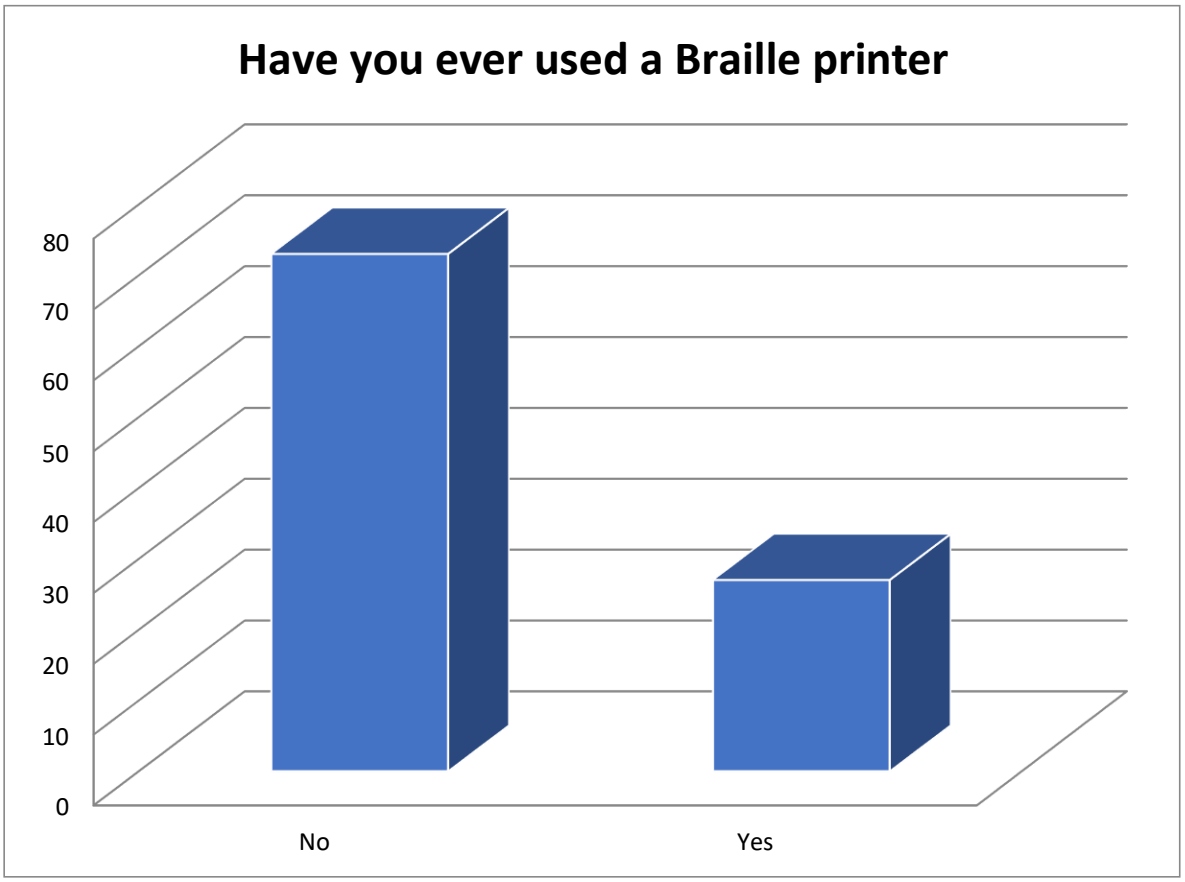
We see that 82% of blind people have problems with writing in the Braille language



Conclusion:

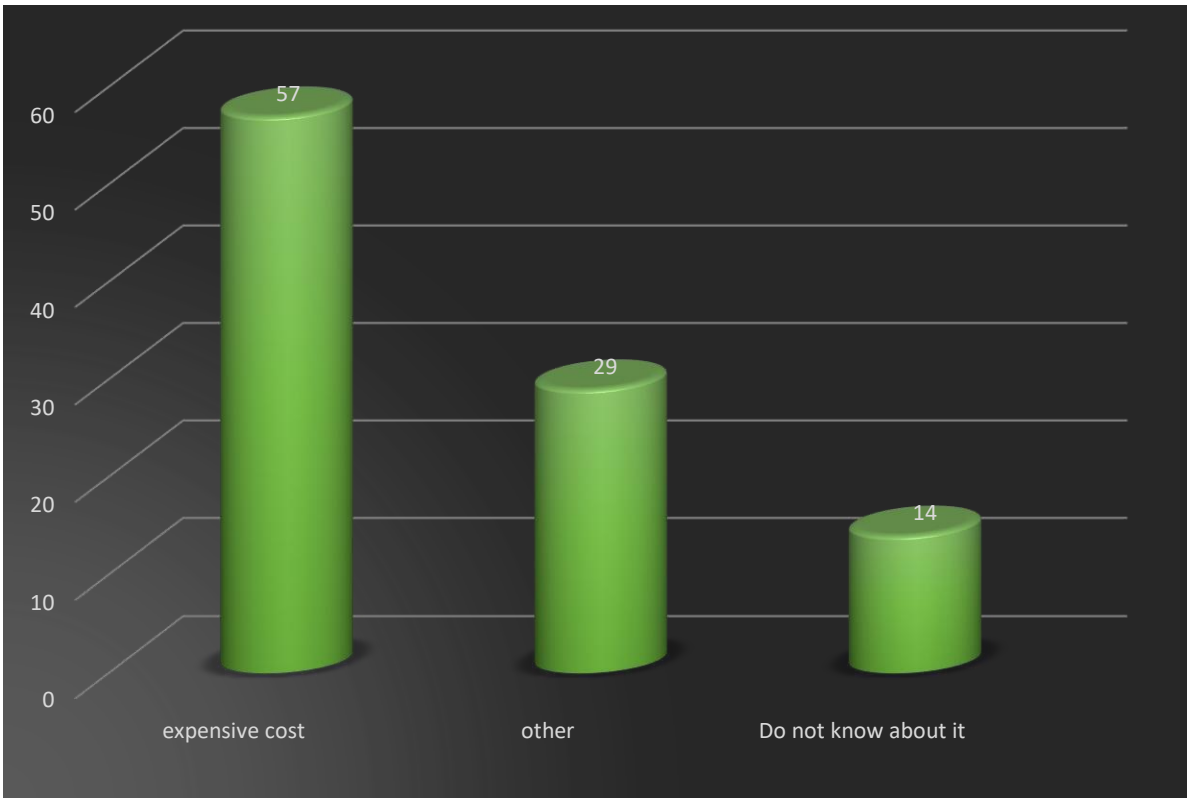
The most common problem for blind people is that they can't write with Braille language and that is a serious problem because they have the opportunity to write anything they want but they can't.

This question shows that 73% of blind people- which is a high percentage- don't use the Braille embosser.

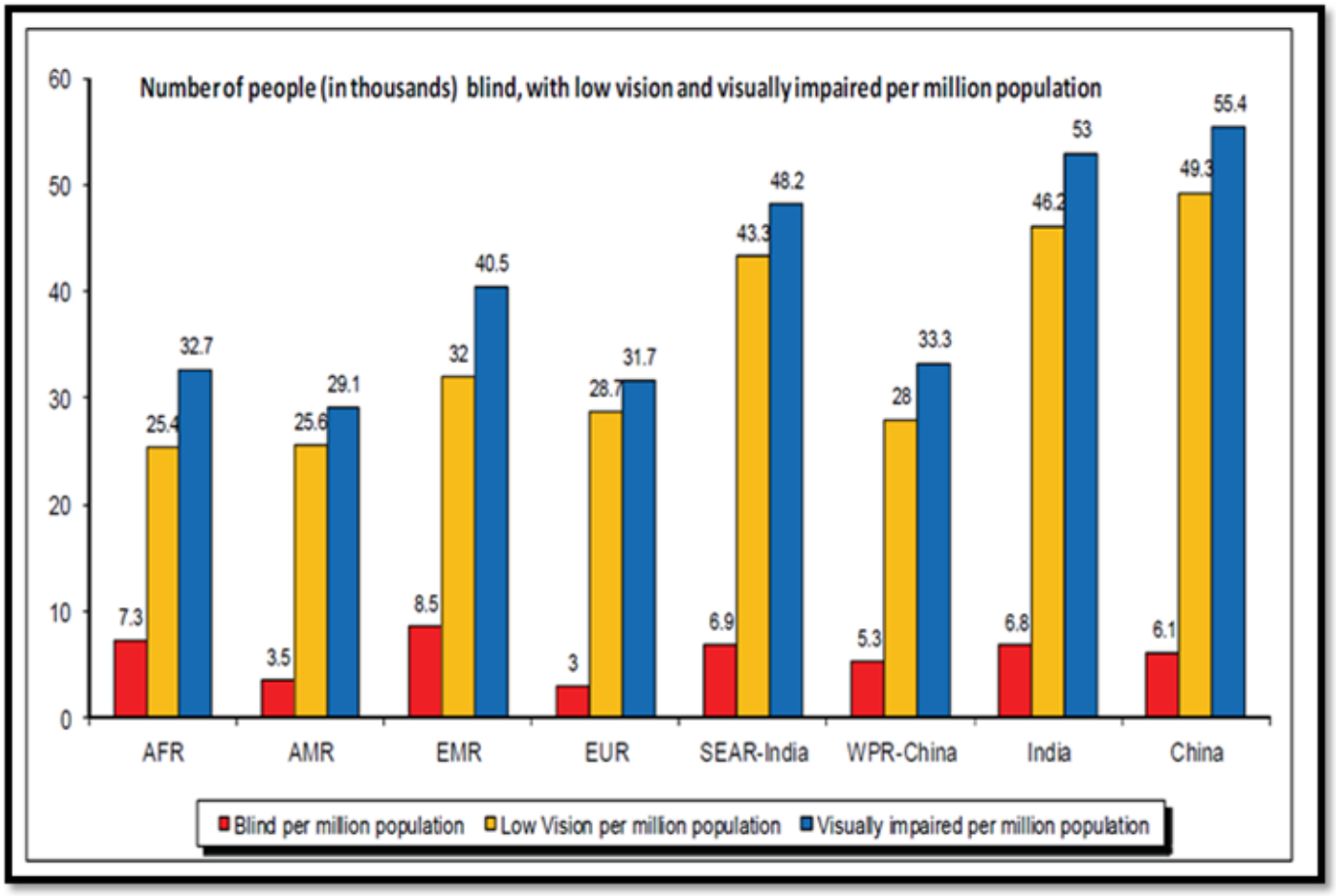


Conclusion:

The high percentage of the blind people that don't use Braille embossers shows that they got problems when they used it.

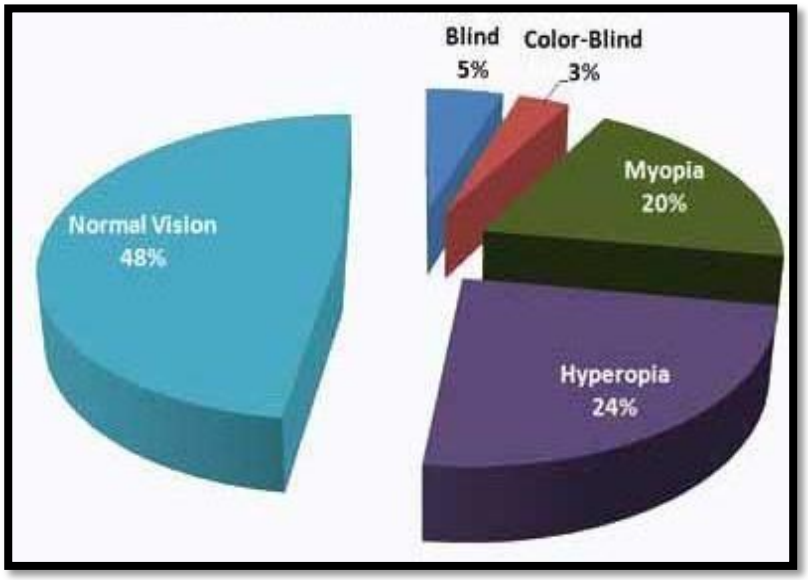


The main problem that faces visually impaired people that they can't use the Braille printer because it's very expensive and unaffordable to normal people



his graph shows that around the world, there is a huge number of blind per million population (in thousands).

There are 285 million people worldwide who, due to some disability (i.e. they are suffering with low vision), cannot read all content on a website. 39 million of those people are blind and cannot access any of the content via sight.

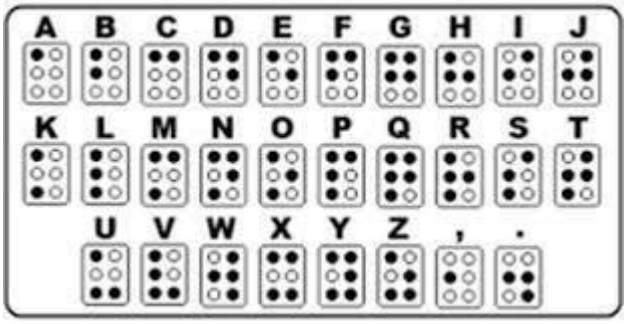


This graph shows the high percentage of people who have vision problems in Tunisia. So, with this graph we can see that more than 50% of people have vision problems.

VI-Bibliography review:

1.Braille System:

In order to properly prepare for this project, a lot of research had to be done, concerning several subjects, mainly a research on Braille writing system and their need and functionality in general.



In order to fully understand what we are dealing with, we had to research the actual problem itself; it is true that Braille code was a really great solution for many people but today it is still not very developed even it was invented since 1829 by Louis Braille, it is still considered a very complicated language yet so it can't be useful for all people who needs it.

2.Braille printers:

Obviously we needed to know more about Braille language and its importance for visually- impaired and we have found that is most of blind people use it to read and write. we have also found that recently Braille printer was invented but unfortunately they were not very helpful for two general reasons.

3. Problems:

First of all, for using it we must type the text that we want to convert to Braille document so the blind person always depends on others help, the second reason is that Braille printers are too expensive so they aren't available for everybody. They cost at least 7500 dollars (according to Internet).

4. Prototype making:

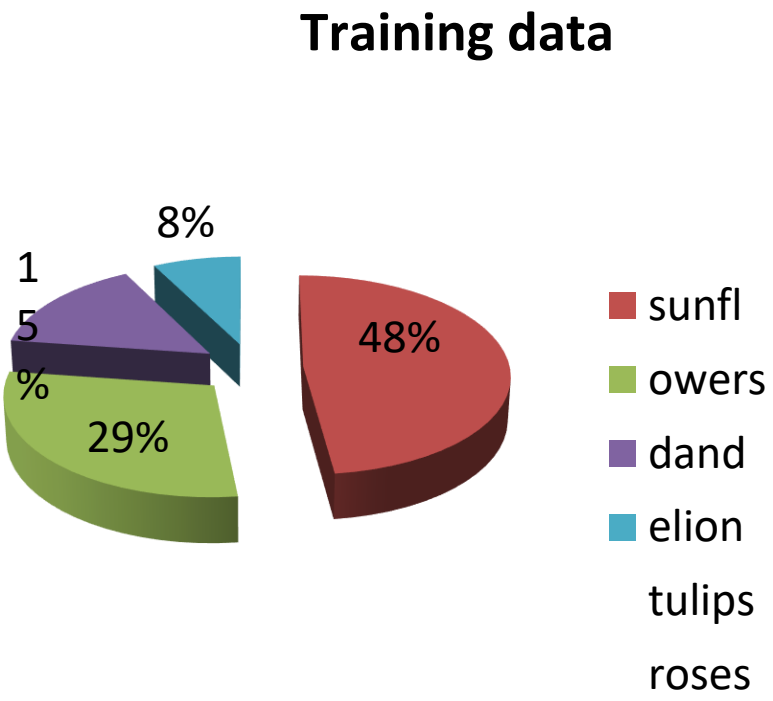
After identifying the problem and becoming fully aware of what we are dealing with, the general idea became clear: creating a system able to translate many different languages to Braille, it was time to move on to the technical solutions.

The main problem that we faced when it came to the technical part was vocal detection and translation from any language to the Braille one and so that became a priority on our research list.

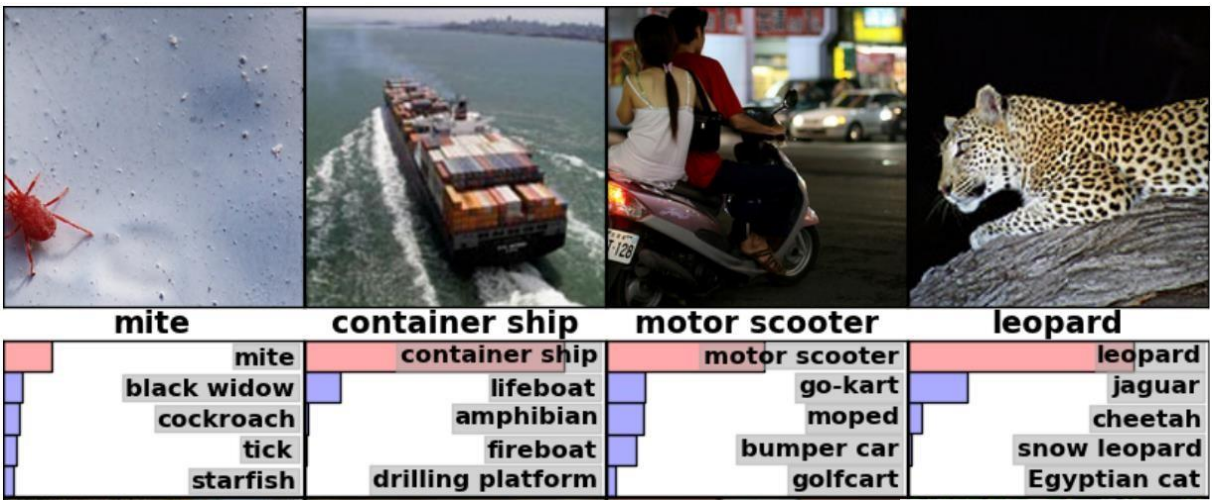
In order to truly put all our research and abilities to work and make them a reality, we first had to build a prototype, but lacking the proper knowledge on building a prototype, we focused our efforts to researching the best and most efficient way to build the perfect prototype. This included the research of the ability of printing a Braille letter moving to a word then to a whole sentence.

After making sure the prototype phase was all well and done, we moved on to the real purpose of the project, we started researching to build the real thing, the final phase was learning all the necessities of building our real system and integrating it into a Braille printer.

5.Image recognition:



Source: Internet



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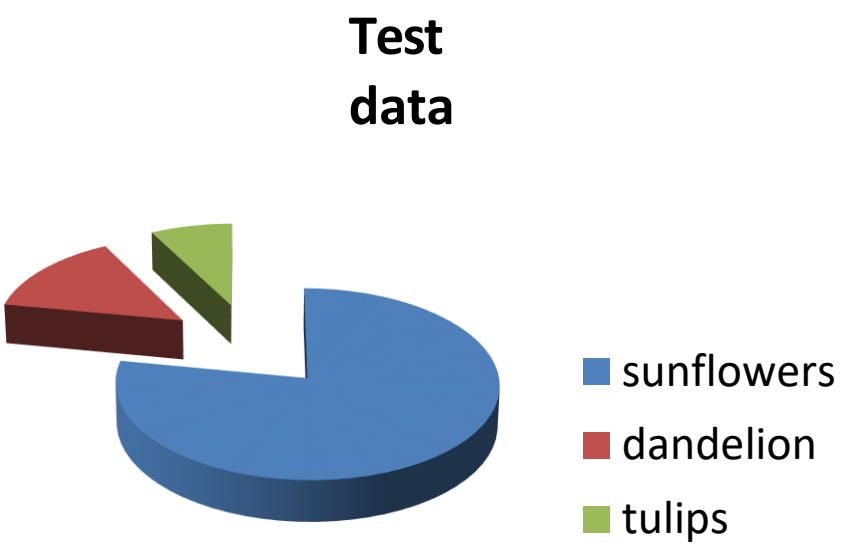
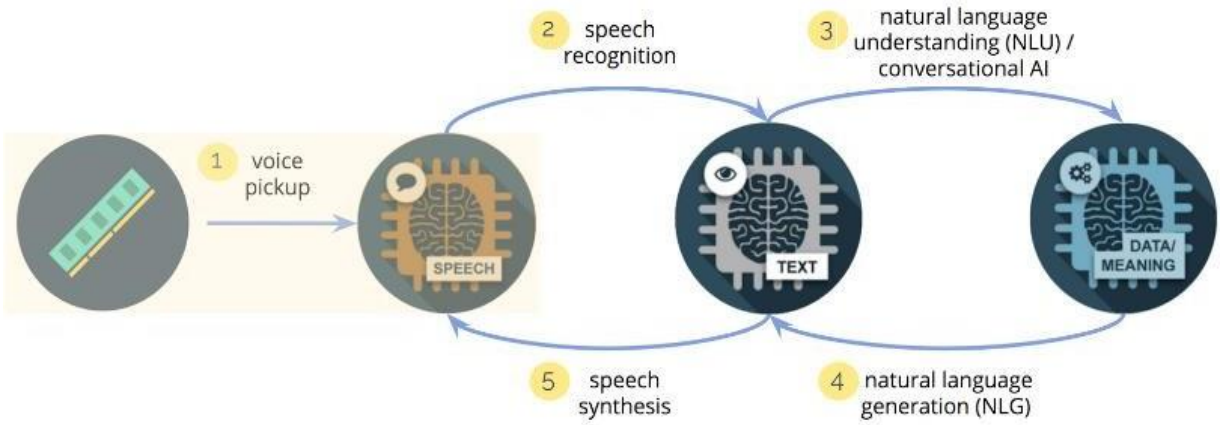


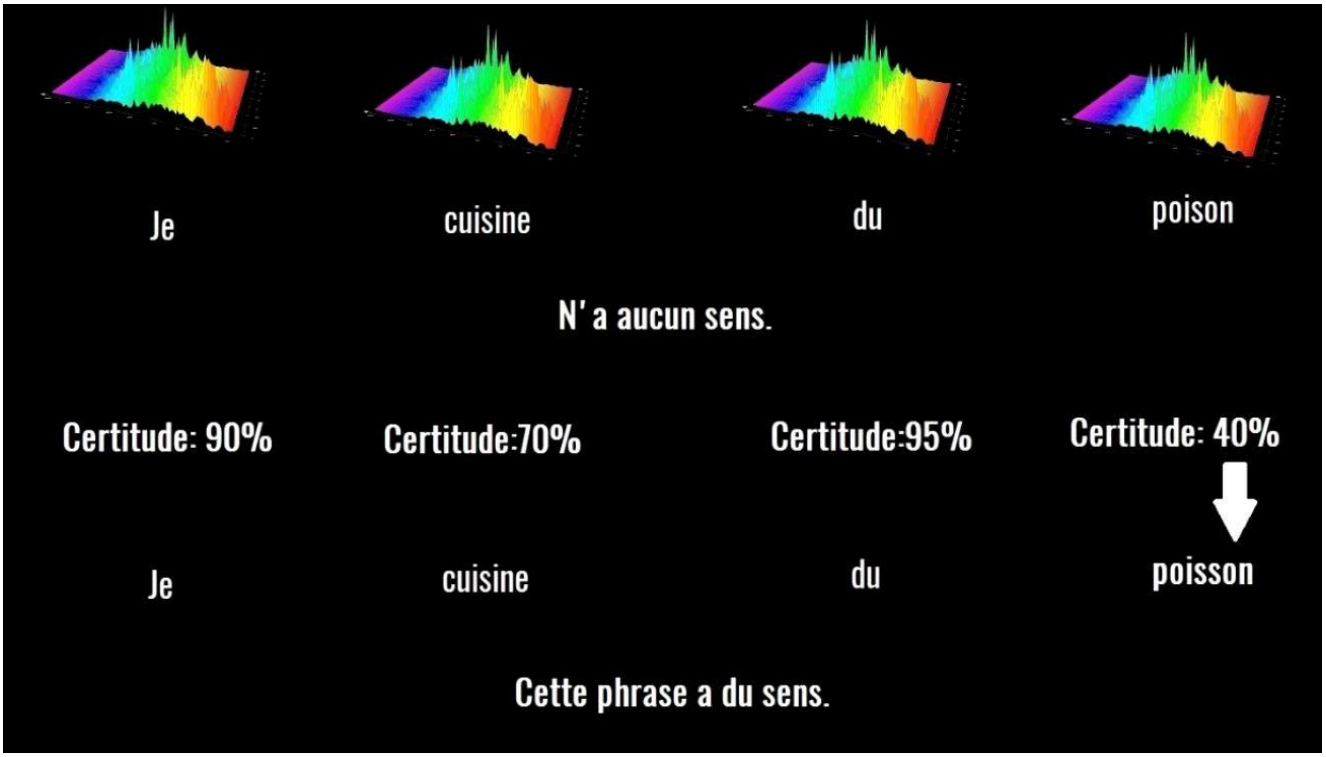
Source :Internet

Those graphs shows the functionality of the image code recognition based on python , training data and test data.

First it scan the image and then it gives a percentage of the description. Second it gives a percentage in test data it chooses the superior percentage us a result**.**

6.Speech recognition:

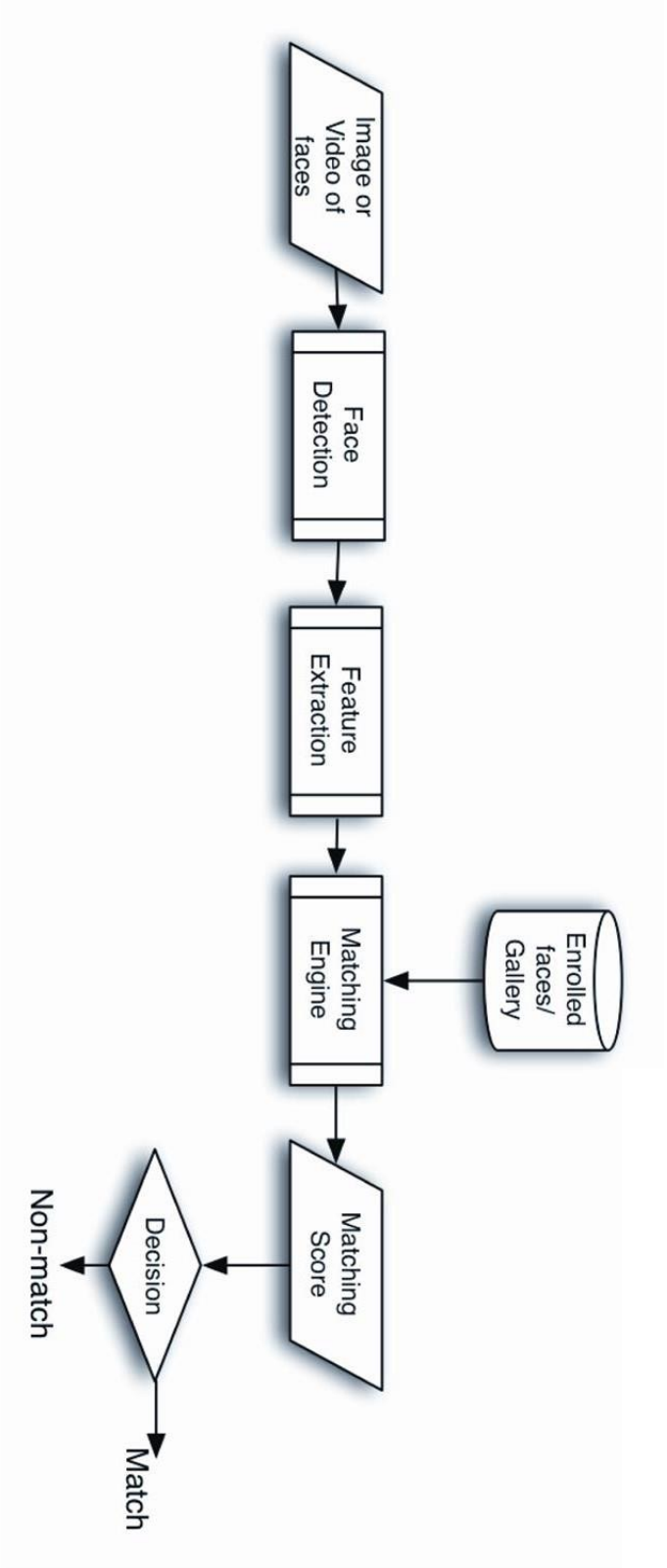




Source: Internet

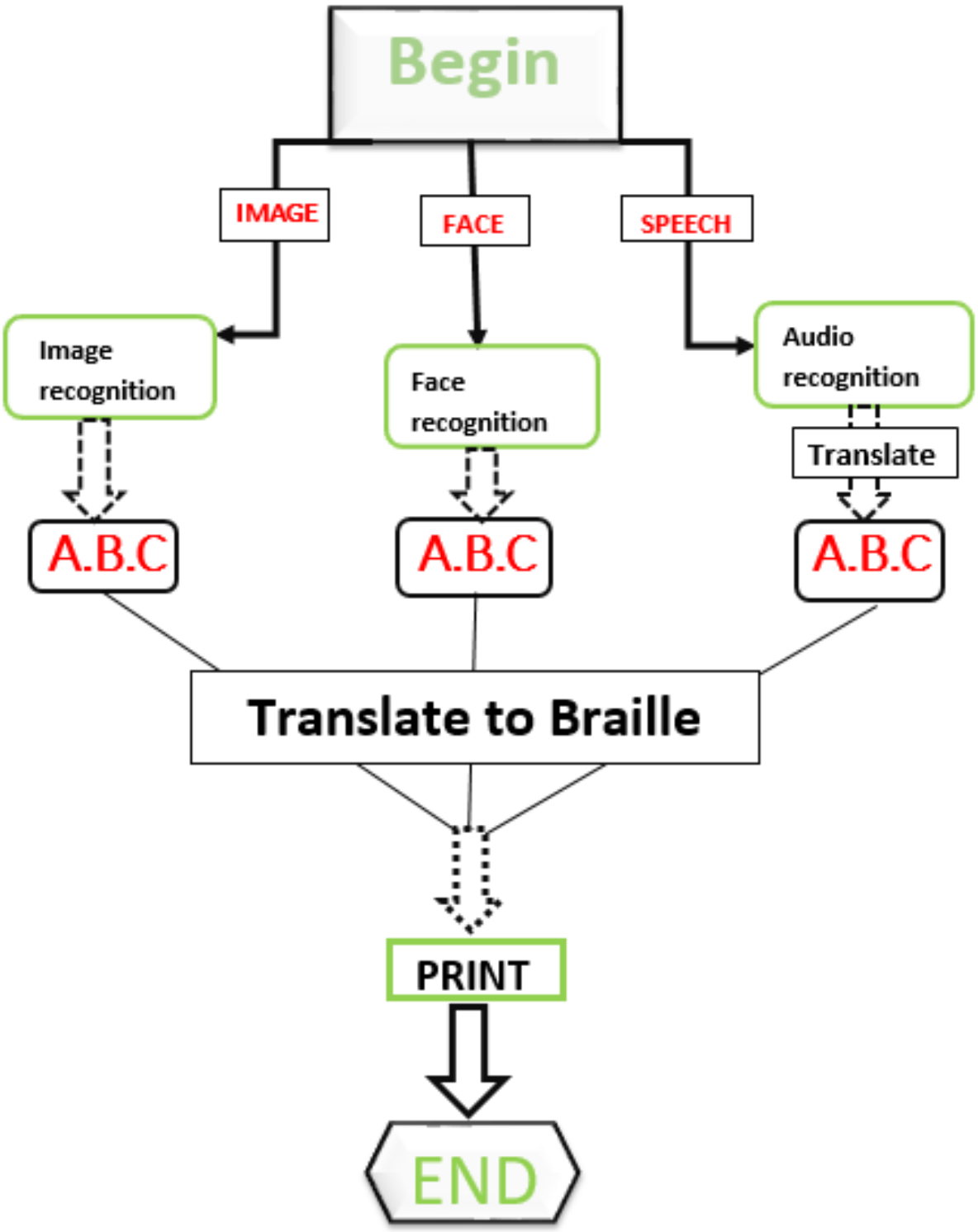
Those graphs show the principle of the code of the speech recognition; the first step is voice pickup, second the speech recognition, then understanding the natural language, after that generation the natural language and the final step is the speech analysis according to the phrase meaning**.**

7.Face recognition Principle :



VII-Diagrammes :

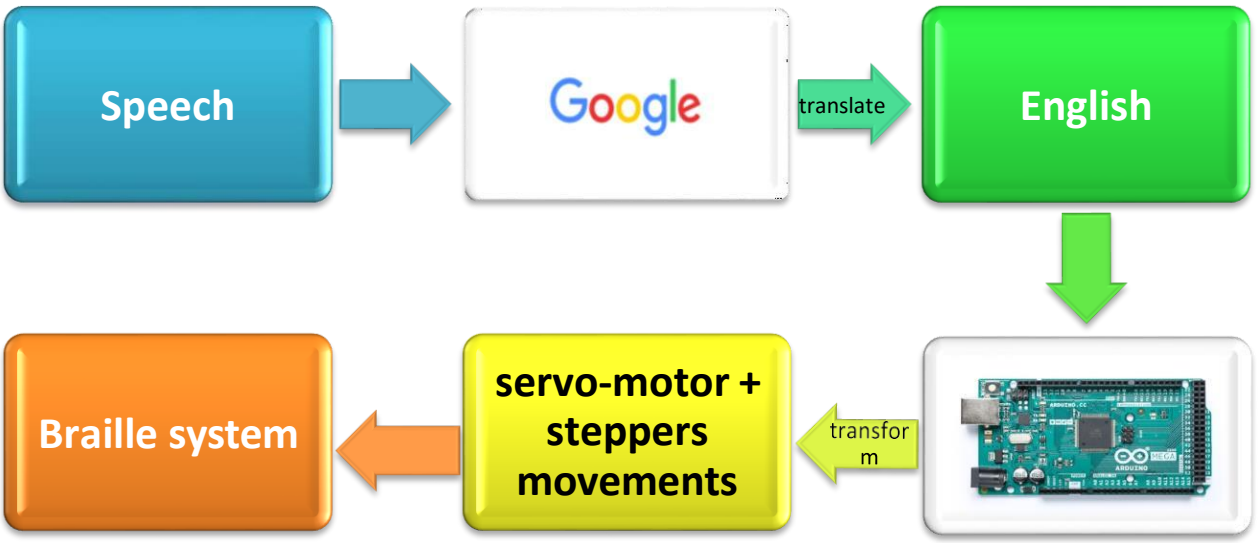
1.General Diagram:

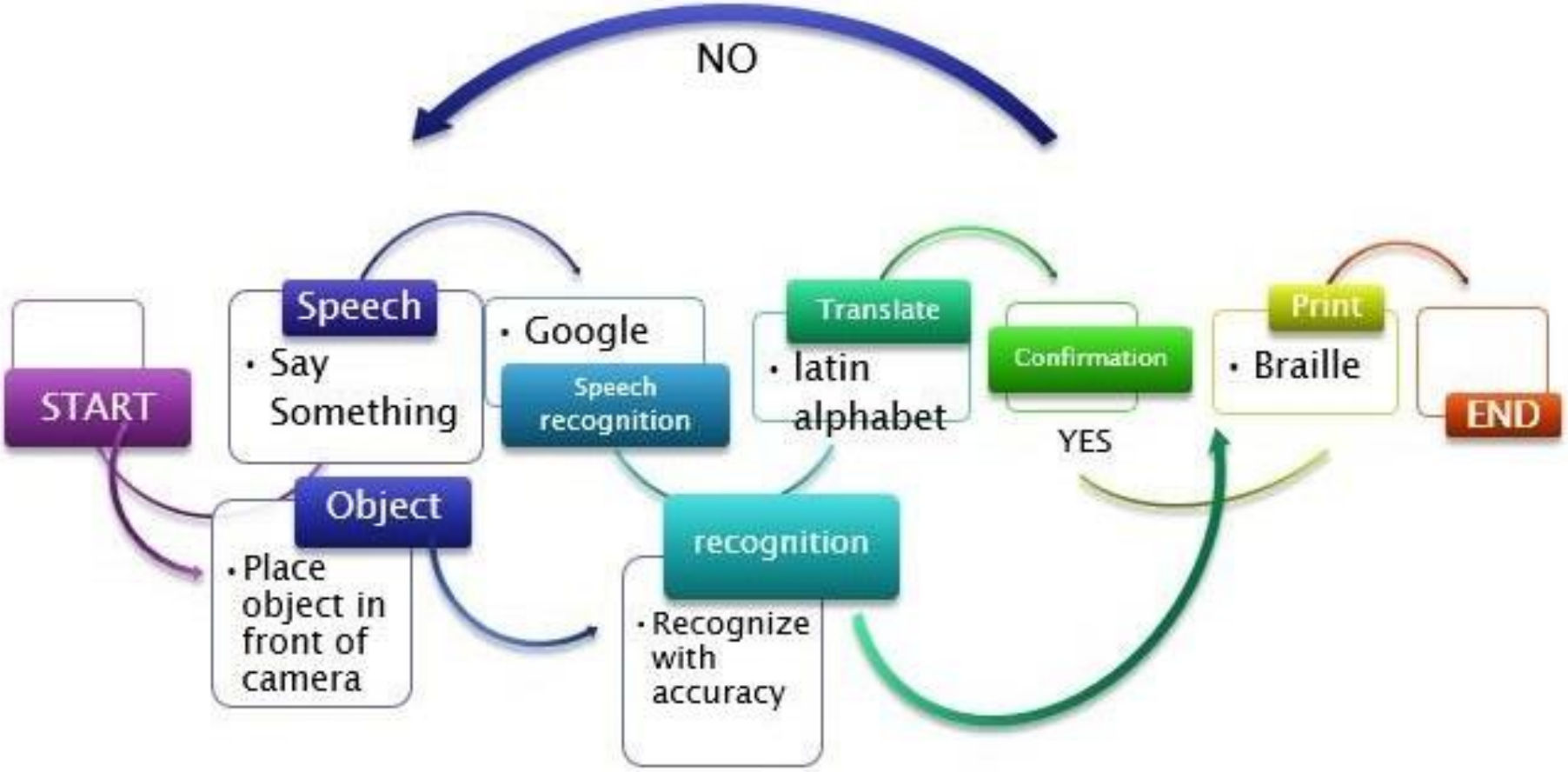


2.Technical Diagram :

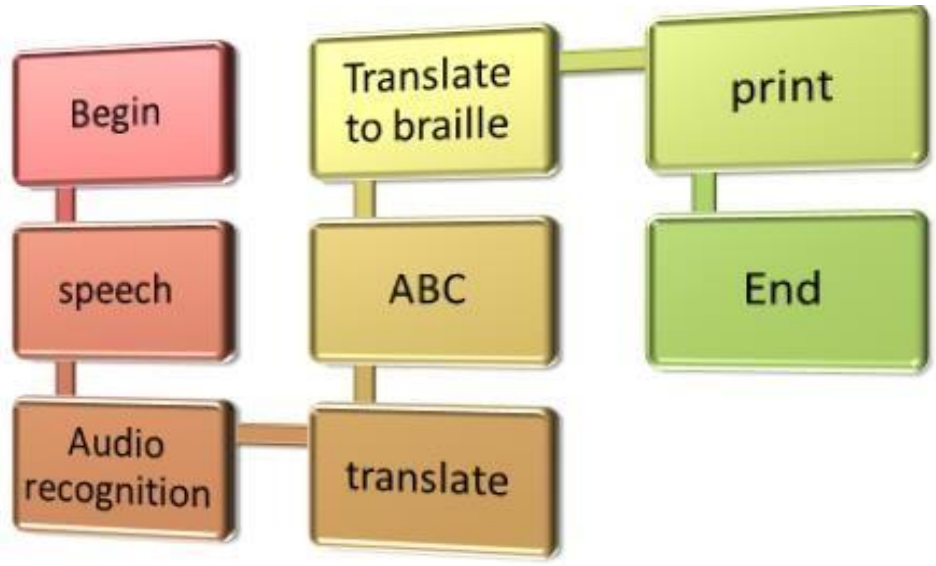
At first we use web service that allow the user to save his speech. Second it will be translated in English language using Google. After analysing, it will connect with arduino, which transforms it to servo motors and steppers movement as a printer basic on 3D printer mechanism.

As a solution it will print any type of speech with any language to Braille characters.




NO
START
Speech
• Say Something
• Google
Speech recognition
Translate
• latin alphabet
Confirmation
YES
Print
• Braille
END
Object
• Place object in front of camera
recognition
• Recognize with accuracy

3.Functional Diagram:



VIII-Technical solutions:

The first problem that we have found is the information's reception from the user. Then, we have noticed that we can use two different types of inputs peripherals either keyboard or microphone.

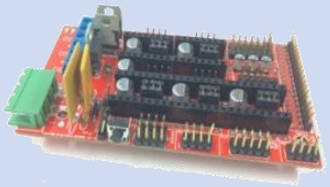
Our printer convert many different languages to Braille writing, in order to realize this step, we have to translate received information from any language to Latin alphabets, and so we have decided to use the google cloud API translator which is a google application that can translates different languages using the Internet.

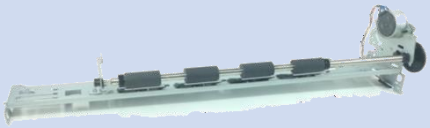
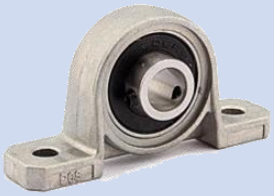
After we worked on transforming Latin language into Braille one by using a specific coding system that translates each Latin letter to its analogical Braille one.

One of the most important problems that we have faced is the fact of printing the Braille writing. At this part of the project, our machine prints every Braille letter by moving pins on a particular way depending on angles to each specific letter

After reaching the step of printing one letter with our Braille printer, the main problem was the fact of printing words and sentences in different paper's position. So, we tried to make the whole system of printing follows two axes (X and Y) in order to fix the position of the letter in the writing line and follows the axe Z to go back to the next line.

IX-Materials list:

 1-Arduino Mega	 2-RAMPS board	1- Steppers drivers
 4-END stops	 5-Servo Motor	 6-Steppers
 7-Rods	 8- Clamps	 9-Lead Screw Rods
 10-Linear Bearings	 11-Coupler	 12-Screws

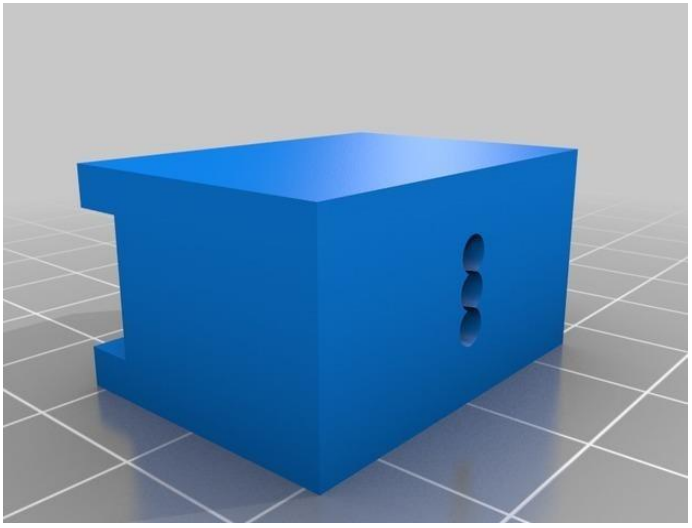
 **13- Printer carriage**	 **14-Power supply**	 **15-Pillow Block**

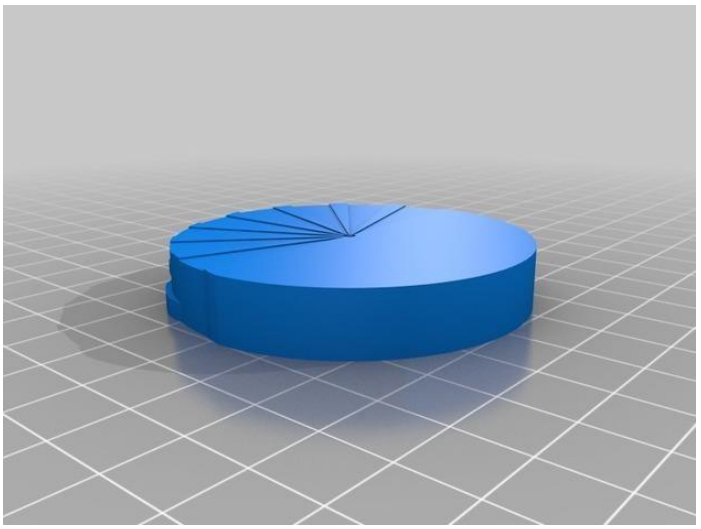
X-Variables:

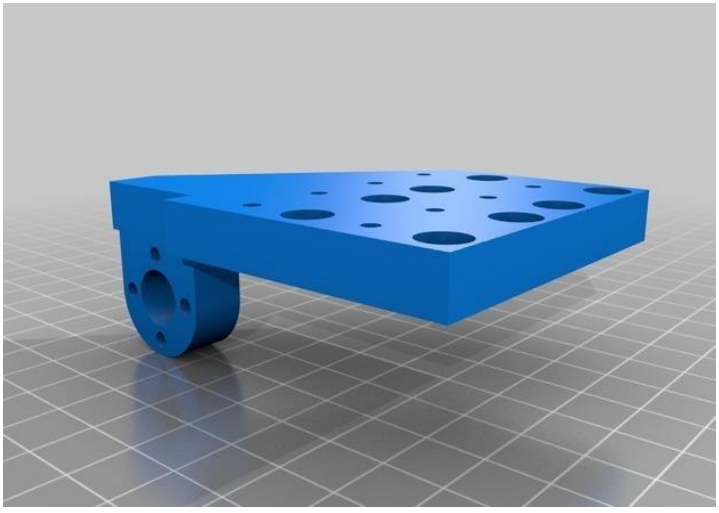
Alphabets	Alphabets change from image to image, from face to face and from speech to speech.
Images forms	Images change with the photos taken by blind people signify forms of pictures change with the scene in front of the blind.
Faces	People's faces differ from one to another, they mostly do not look alike.
Speech	Speech changes with people's meaning or people's idea and the language speaking with.

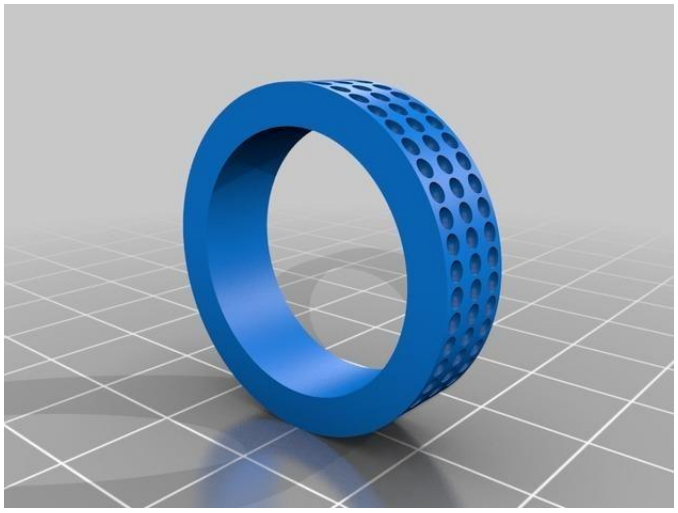
XI-Realization:

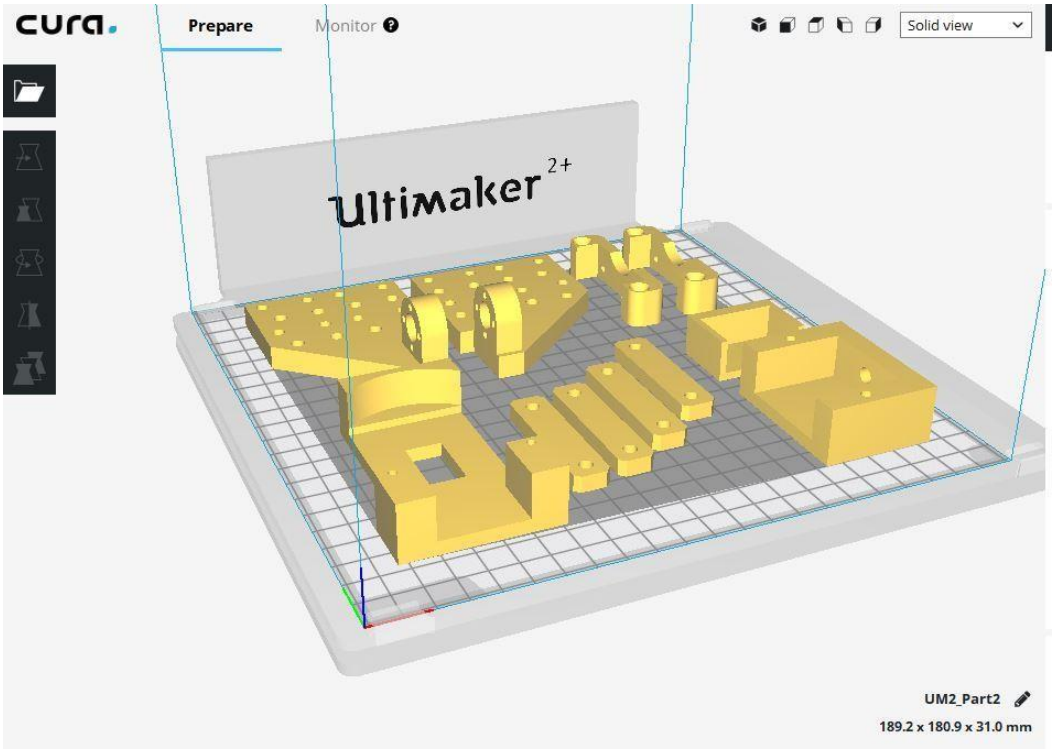
1.Experiences and photos:

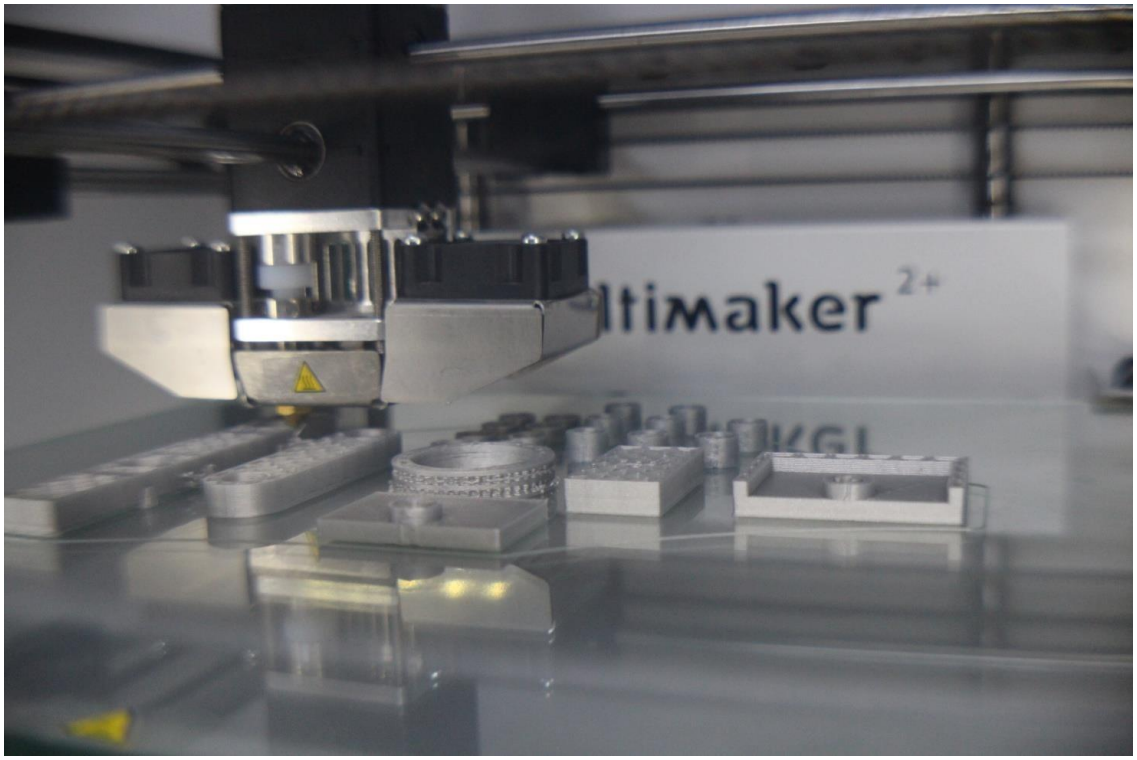






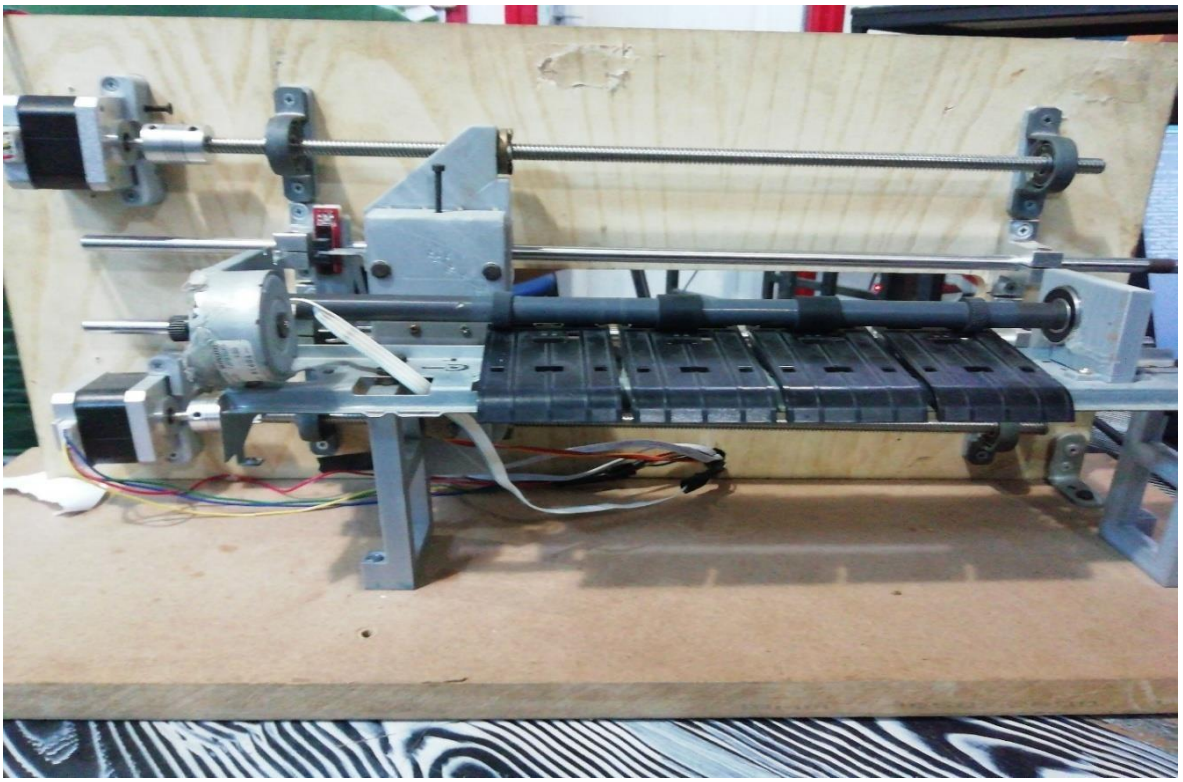


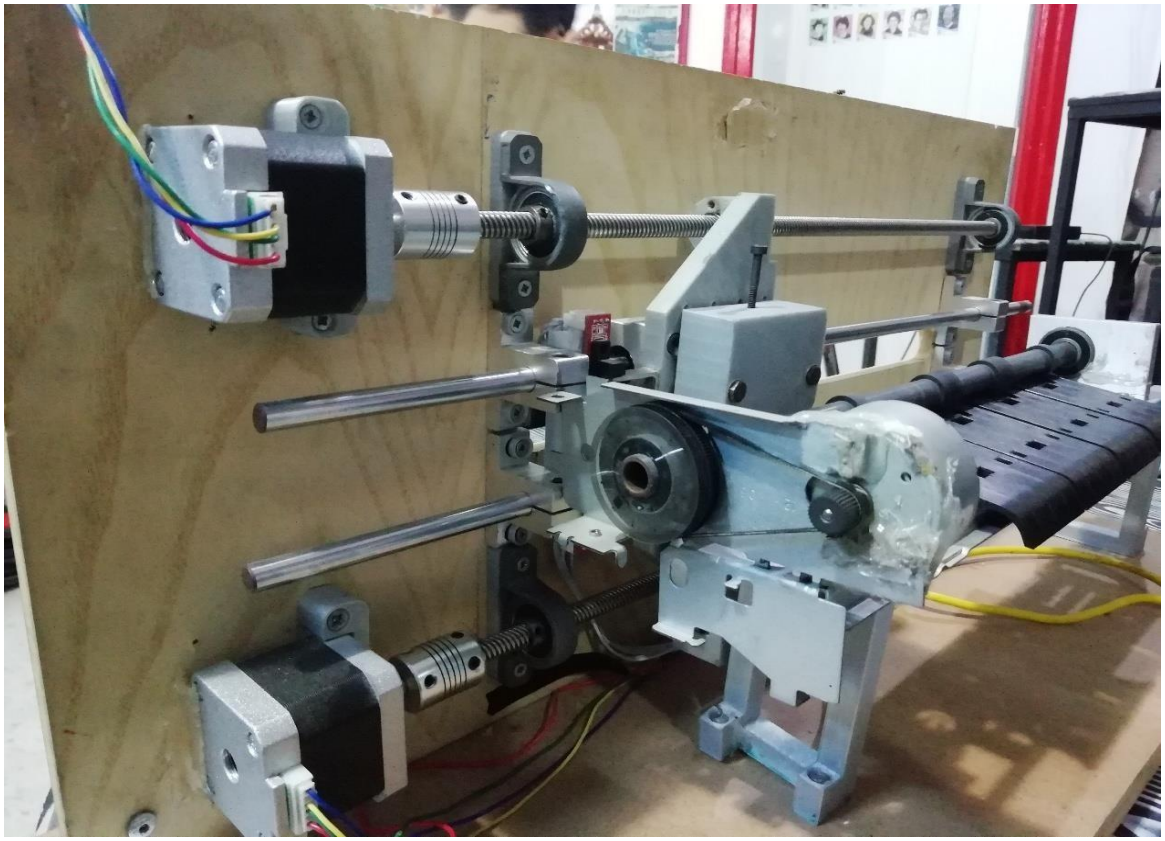

cura.
Prepare
Monitor
Solid view
Ultimaker 2+
UM2_Part2
189.2 x 180.9 x 31.0 mm


ltimaker 2+

2.Final prototype photos:

Source: All the photos are taken by Me





XII-Results:

After testing the system several times and making sure each of its contents and components were performing their given tasks properly, we were able to take notes and compare results from the desired effect to the actual effect.

We have achieved our design criteria and we made a system which puts an end to several problems existing in the ordinary Braille printer:

*the Blind's Shine is a full automatic Braille printer.

*it works with Python Programming Language.

*it will help them to write anything they want just by speaking.

*It is also compatible with any language; English, French, Spain, Italian, Arabic and even Chinese thanks to Google Translate Services.

As a conclusion, The Blind's Shine is a perfect solution for blind people to read and write in any language.

XIII-Conclusions:

After reaching this far of a point into the project, it has become possible to take notes and to effectively conclude that the system that we have created can efficiently perform the task it was created to do, which is printing Braille characters on paper using a cheap and easy-to-use Braille embosser for the visually impaired people using the speech recognition whatever the language is and translate it to English then to Braille.

And so, we can conclude that the system is an extremely beneficial one and a noticeable improvement from its traditional counterpart to say the least, it is able to help all the blind people in the world to read and write anything with any language just by speaking to this machine, this will reduce a huge effort from blind people and make them free to write and read without the help of anybody.

XII-Future work

Despite the efforts performed in this project to make blind's people life easier, and the many approaches to print with vocal recognition, the project will not stay in its current state, but continue to improve and evolve, and in time it will be upgraded to newer versions with better and more varied features.

One particular feature we're going to focus on, is the ability to work on face and object recognition as a scanner to make the visually impaired people read the name of the object and know people's faces like anyone else.

XIII- References :

http://www.who.int/blindness/publications/globaldata/en/

https://www.sitepoint.com/how-many-users-need-accessible-websites/

http://Braillebug.afb.org/Braille_deciphering.asp

https://www.bustle.com/articles/53624-how-does-Braille-work- what-its-like-to-be-a-Braille-reader-and-the-people-who

https://www.indexBraille.com/en-us/about-us/our-history/the-index-Braille-story

http://www.afb.org/info/living-with-vision-loss/Braille/what-is-Braille/123

https://www.slate.fr/story/104479/ordinateur-reconnaissance-image-description https://www.slate.fr/story/103937/intelligence-artificielle-google- photos

https://svds.com/tensorflow-image-recognition-raspberry-pi/

https://www.pyimagesearch.com/2017/10/16/raspberry-pi-deep-learning-object-detection-with-opencv/

【評語】190043

In this project, the authors develop the solution to transform vocal messages into braille printed text. The topic of this project is not a new one. There are many existing tools or products that can provide the same service. The authors are suggested to survey these works and identify the critical issues to enhance the performance of such a system.