

# Intermediate report with L<sup>A</sup>T<sub>E</sub>X

Bey Nesrine, Gresh Clément

Université de Paris

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## 1 General Presentation

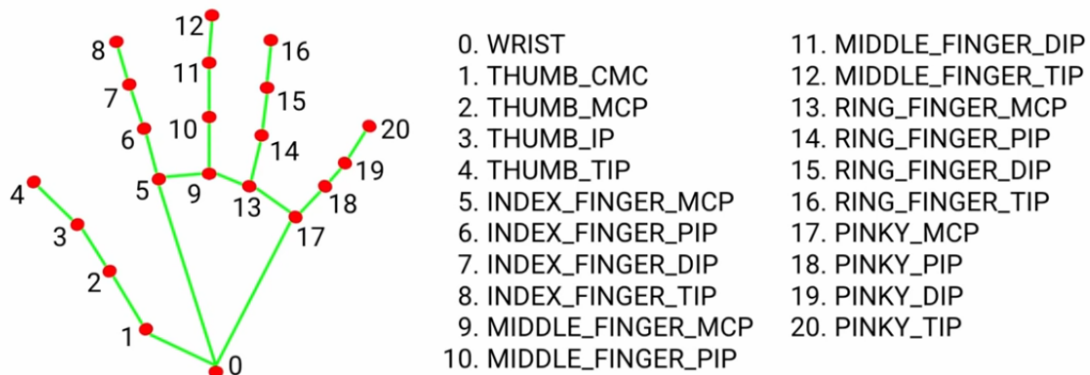
this project is about identifying Sign Language Movements made in front of a camera and translating them into a readable or hearable wording.

Thanks to **Opencv** and **MediaPipe** it was simple to identify the landmarks on the hands and to acknowledge the data and process it in order to store the positioning of each landmark with its exact coordinates.

As shown in Figure 1, the fingertips are easily recognized and their positioning can be determined depending on other marks on the same finger, in order to know whether the finger is closed or not, whether it is on left side or the right one (concerns the opening and closing of thumbs only).

if you would like to know more about MediaPipe click [here](#).

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Source: Media Pipe Website

Figure 1: hand landmarks

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## 2 Advancement Description

Currently our code can determine the hand positioning as well as a specific fingertip's coordinates, it then can tell which letter of the **Sign Language Alphabet** it is, we have decided to work on different branches where one consists of using predefined methods and classes and the other aims to write the methods that can do the equivalent tasks.

We will incorporate some code samples and images of how it can recognize, we still haven't developed an efficient Artificial Intelligence but we'll enlighten you about it in the next content. The following portion of the code shows a sample of the module that identifies letters efficiently.

Source code 1: Naive Hand Recognition

```
while True:
    success, img = cap.read()
    img = detector.hand_detection(img)
    lmList = detector.find_position(img, draw=False)
    # print(lmList)
    if len(lmList) != 0:
        fingerPos = []
        # thumb
        if lmList[fingerTips[0]][1] > lmList[fingerTips[0] - 1][1]: # 1
            refers to x
            fingerPos.append(1)
        else:
            fingerPos.append(0)

        # 4 finger
        for i in range(1, 5):
            if lmList[fingerTips[i]][2] < lmList[fingerTips[i] - 2][2]: # 2
                refers to y
                fingerPos.append(1)
            else:
                fingerPos.append(0)
        for i in range(0, 5):
            if fingerPos[0] == 0 and fingerPos[1] == 1 and fingerPos[2] == 1 and
                fingerPos[3] == 1 \
            and fingerPos[4] == 1:
                print("C'est la lettre B de l'alphabet!")
            elif fingerPos[0] == 1 and fingerPos[1] == 0 and fingerPos[2] == 0
                and fingerPos[3] == 0 \
            and fingerPos[4] == 0:
                print("C'est la lettre A de l'alphabet!")
            elif fingerPos[0] == 0 and fingerPos[1] == 0 and fingerPos[2] == 0
                and fingerPos[3] == 0 \
            and fingerPos[4] == 0:
                print("C'est la lettre E de l'alphabet!")
            elif fingerPos[0] == 0 and fingerPos[1] == 0 and fingerPos[2] == 1
                and fingerPos[3] == 1 \
            and fingerPos[4] == 1:
                print("C'est la lettre F de l'alphabet!")
            elif fingerPos[0] == 0 and fingerPos[1] == 1 and fingerPos[2] == 1
                and fingerPos[3] == 0 \
            and fingerPos[4] == 0:
                print("C'est la lettre U de l'alphabet!")
```

### 3 Developement And Difficulties

As mentioned in the previous content, we are yearning to develop a good fonctionning Artificial Intelligence and the steps to make that happen are to use unsupervised machine learning algorithms, such as **k-means** algorithm that forms **k** clusters depending on **n** observations, connected to a database the observations made from the data are collected and identified on camera, and they are put back into the database.

Futuristically we would like **AI** to be able to indentify all letters of the alphabets on its own, so that we can start to implement and integrate spoken words that include face recognition, body gestures and movements.

The difficulties were/are finding a database of French **Sign Language Alphabet** and because we could'nt find one we have to create a database with a lot of data which is time consuming, as well as incorporating the body gestures along with the hand movements.

We would like to discuss this matter in the next check up.