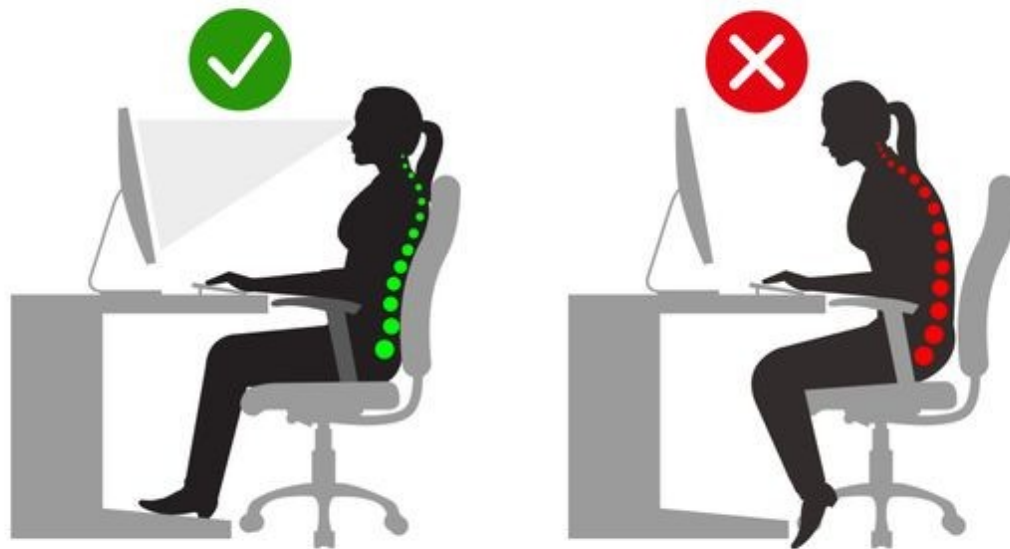


Detecteur de mauvaises postures au travail



Contexte



9 FRANÇAIS SUR 10
DÉCLARENT AVOIR DÉJÀ
EU **MAL AU DOS**

Source: Doctissimo

Les chiffres du mal de dos lié au travail

20 %
des accidents
de travail

Près de
15 %
des accidents
de trajet

1/5
entraîne un arrêt
de travail

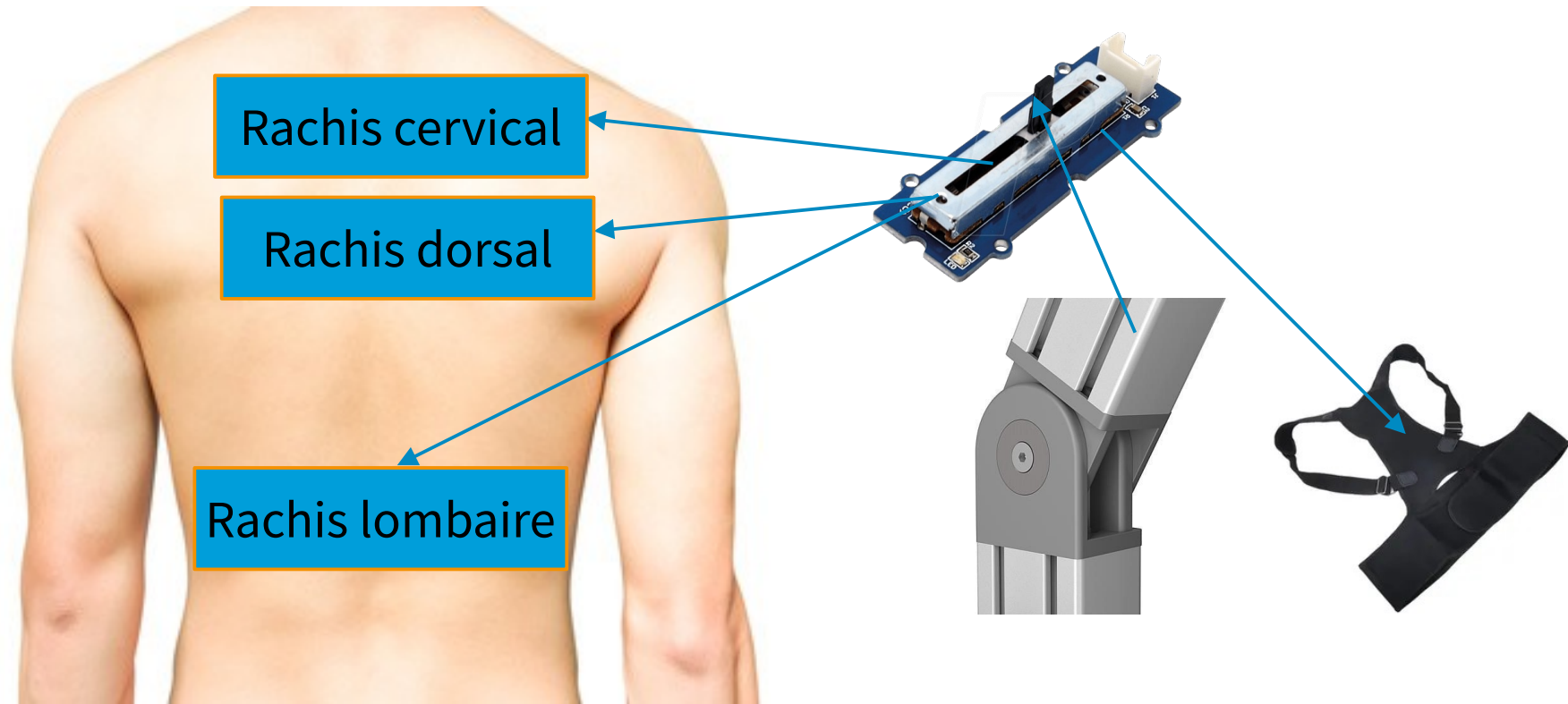
2 mois
d'arrêt en moyenne
pour un accident
du travail

Source: Ameli

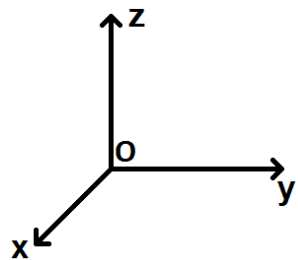
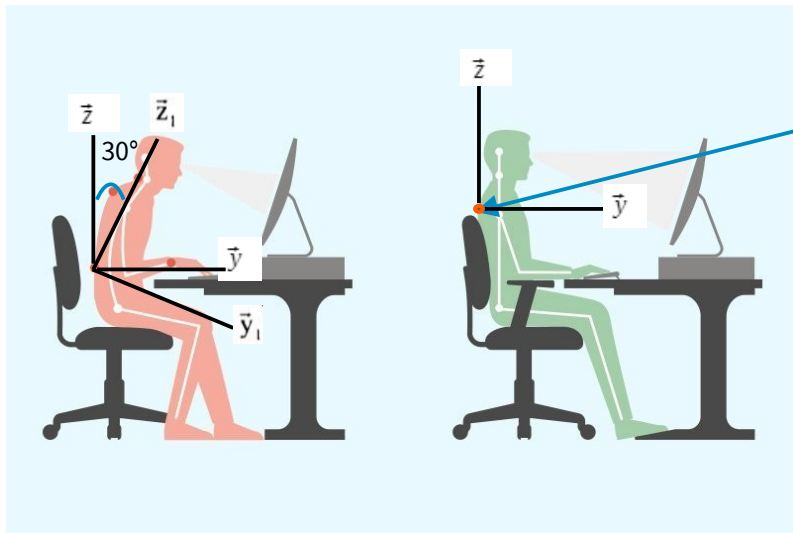
Comment peut-on améliorer la bonne posture d'une personne ?



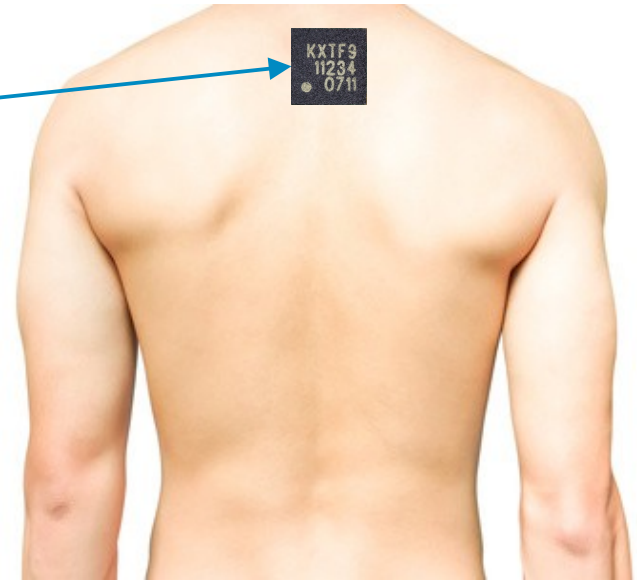
1ère solution pour la maquette



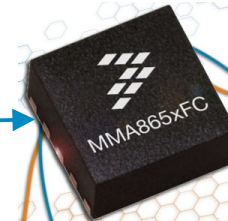
2ème solution pour la maquette



Rachis cervical

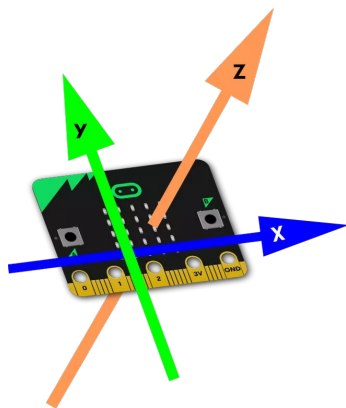


Accéléromètre



Matériel utilisé

Carte microbit v1



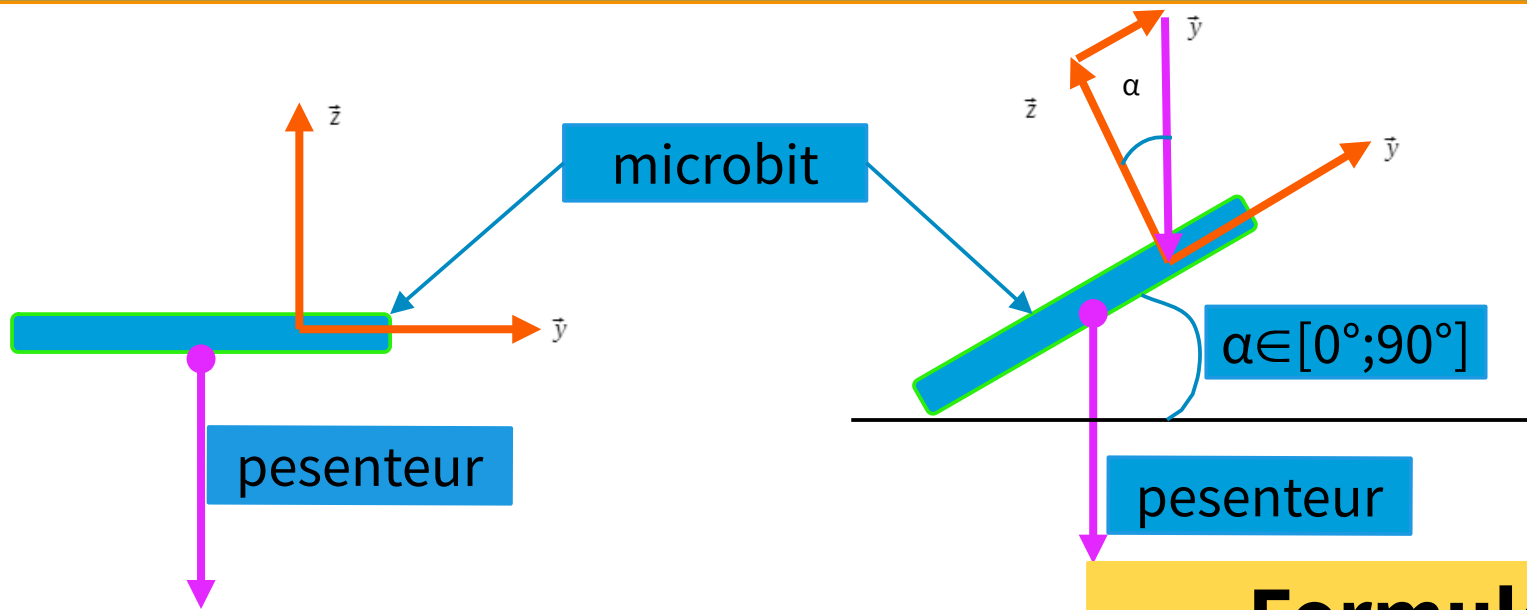
Boitier d'alimentation



Smartphone android



Fonctionnement d'un accéléromètre



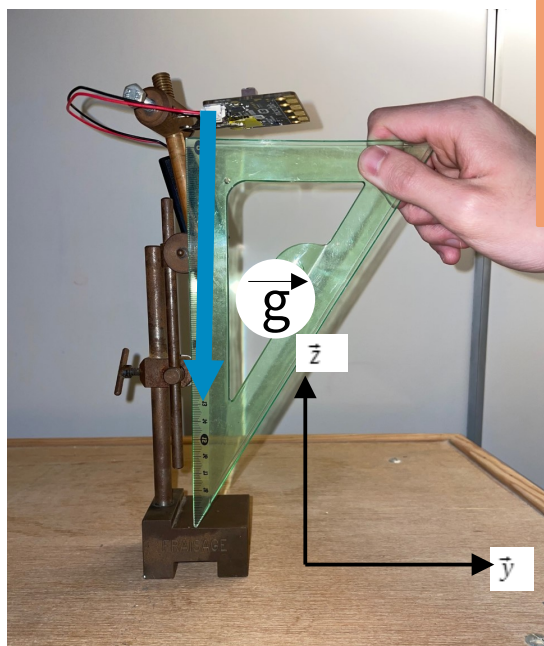
$$\text{Pesenteur} = 9.81 \text{ m/s}^2$$

Formule:

$$||z|| = 9.81 * \cos(\alpha)$$

$$||y|| = 9.81 * \sin(\alpha)$$

Utilisation de l'accéléromètre



-68 -24 -1012 Angle=1.359°

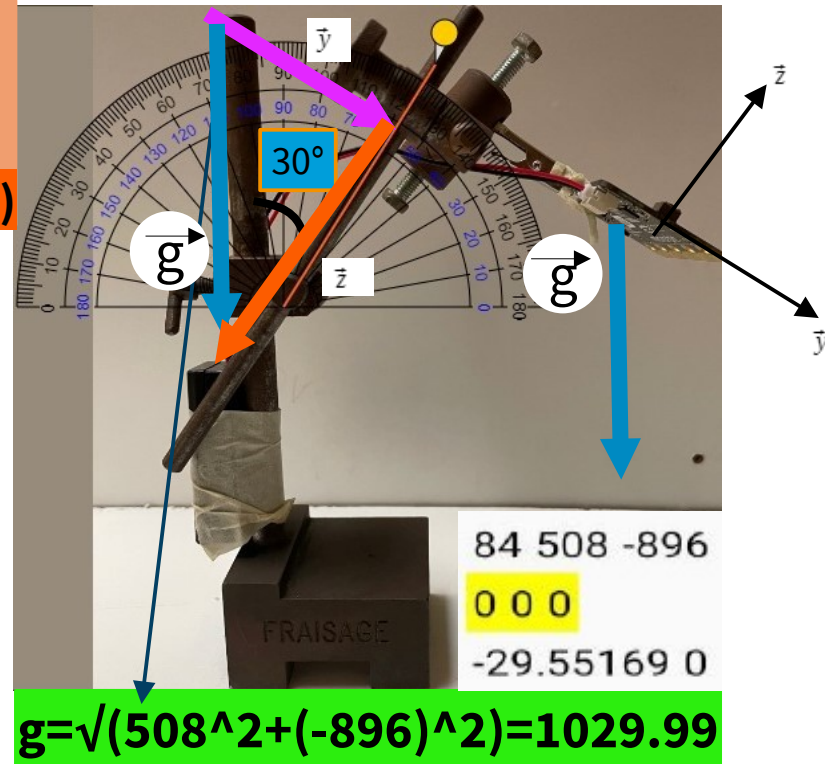
Pesenteur microbit=1024

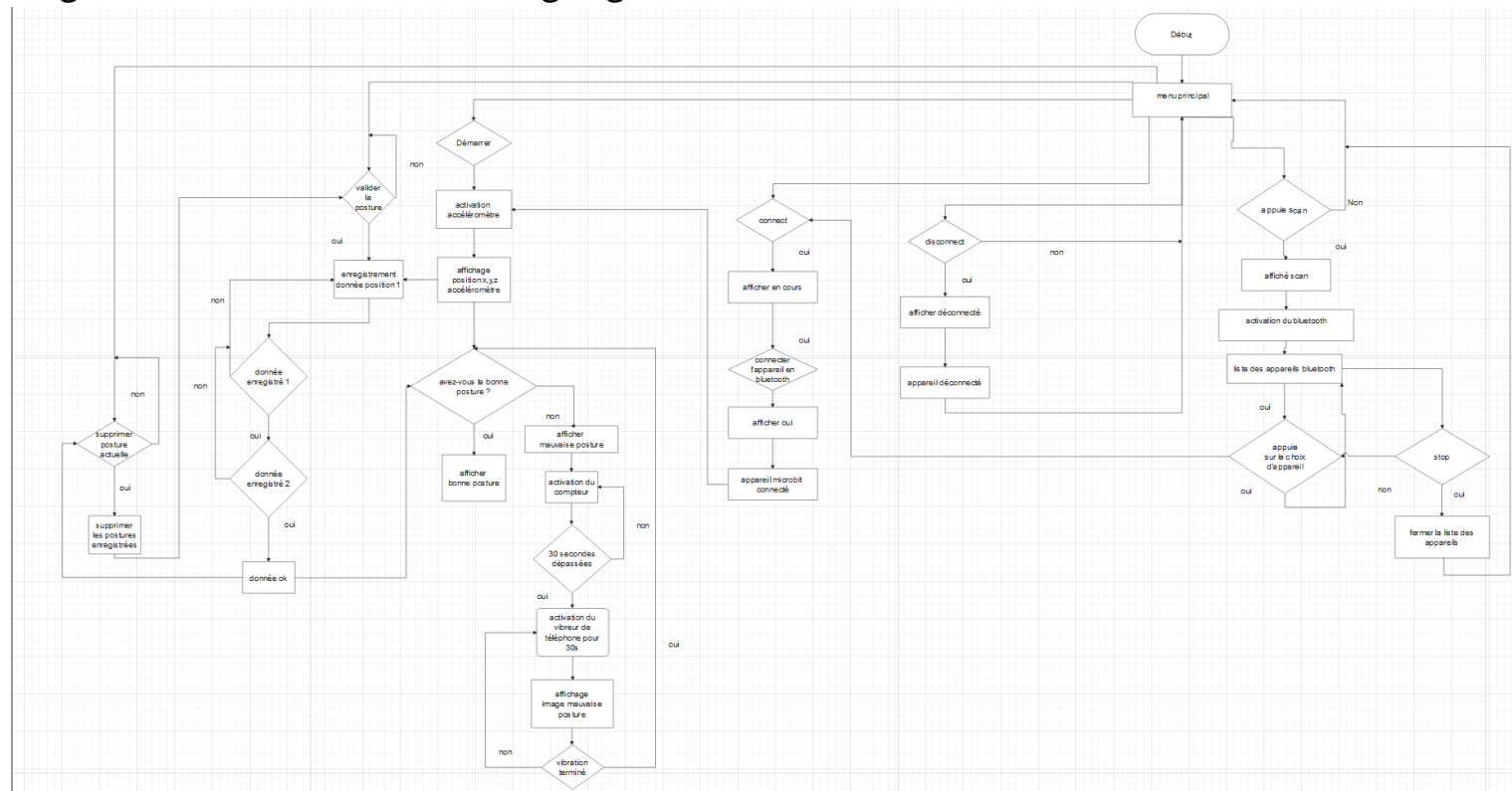
Formule:

$$\frac{\|y\|}{\|z\|} = \sin(\alpha^\circ) * 1024 / \cos(\alpha^\circ) * 1024$$

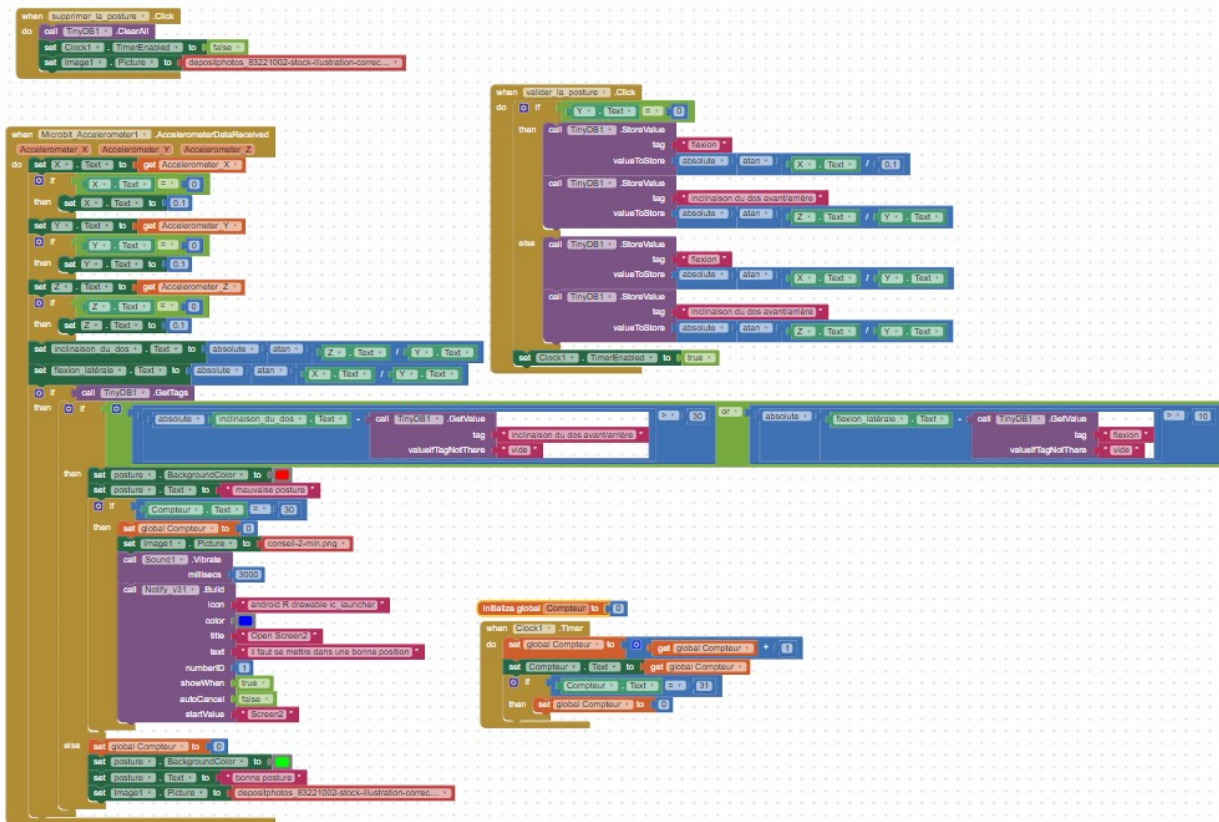
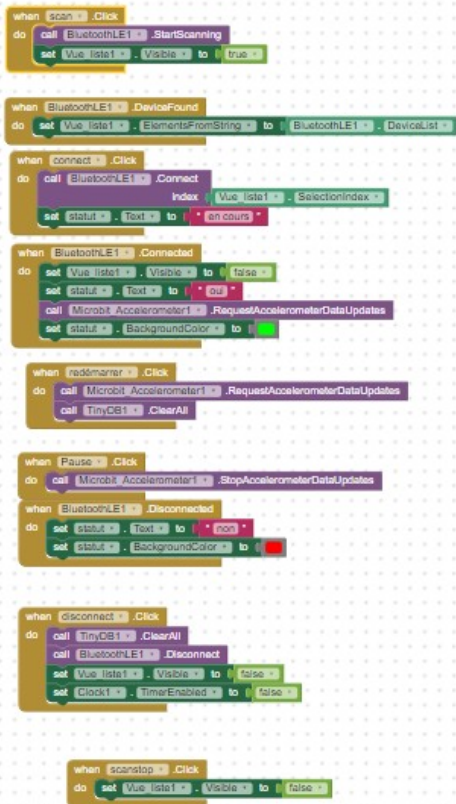
Donc:

$$\text{Angle de posture} = \arctan(\|y\| / \|z\|)$$

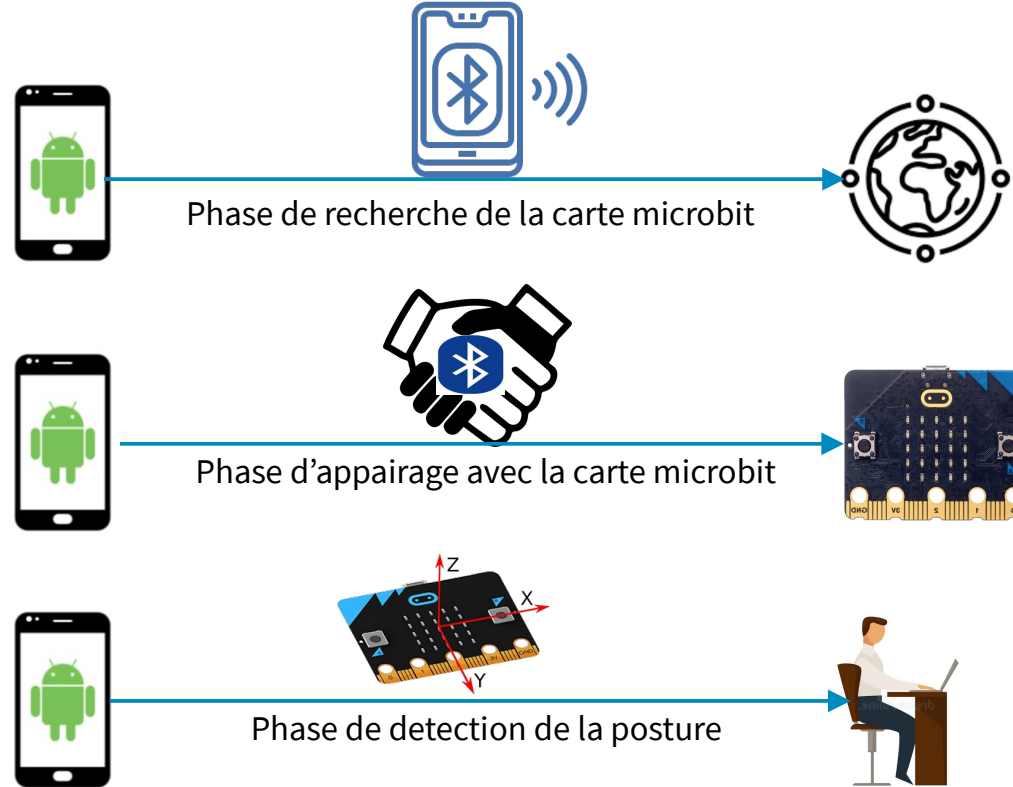




Programmation de l'application



Connexions entre la téléphone et la carte microbit



Phase de recherche de l'appareil

```

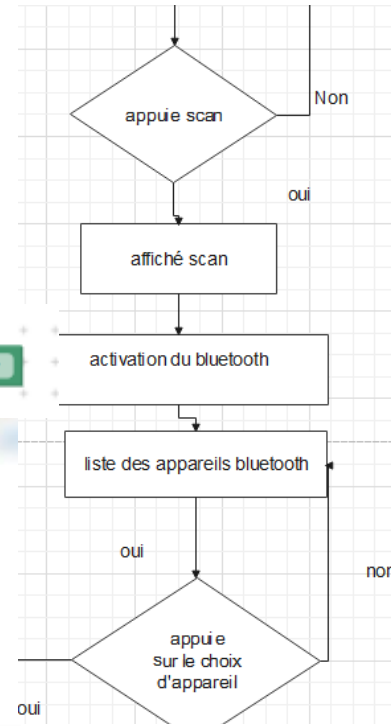
when scan.Click
do
  call BluetoothLE1.StartScanning
  set Vue_liste1.Visible to true

```

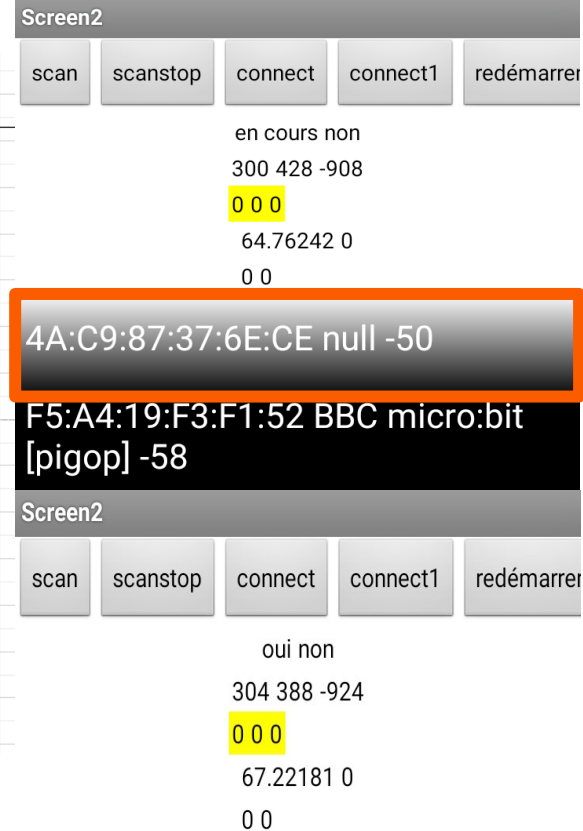
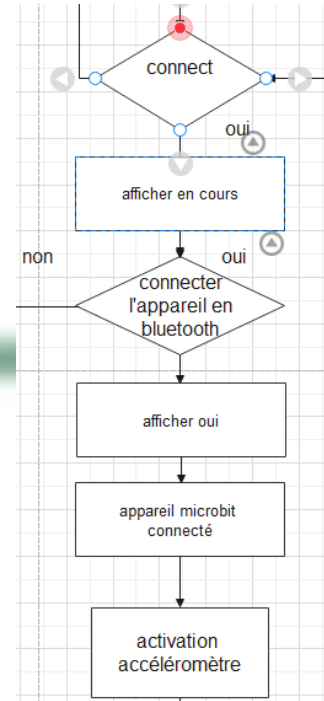
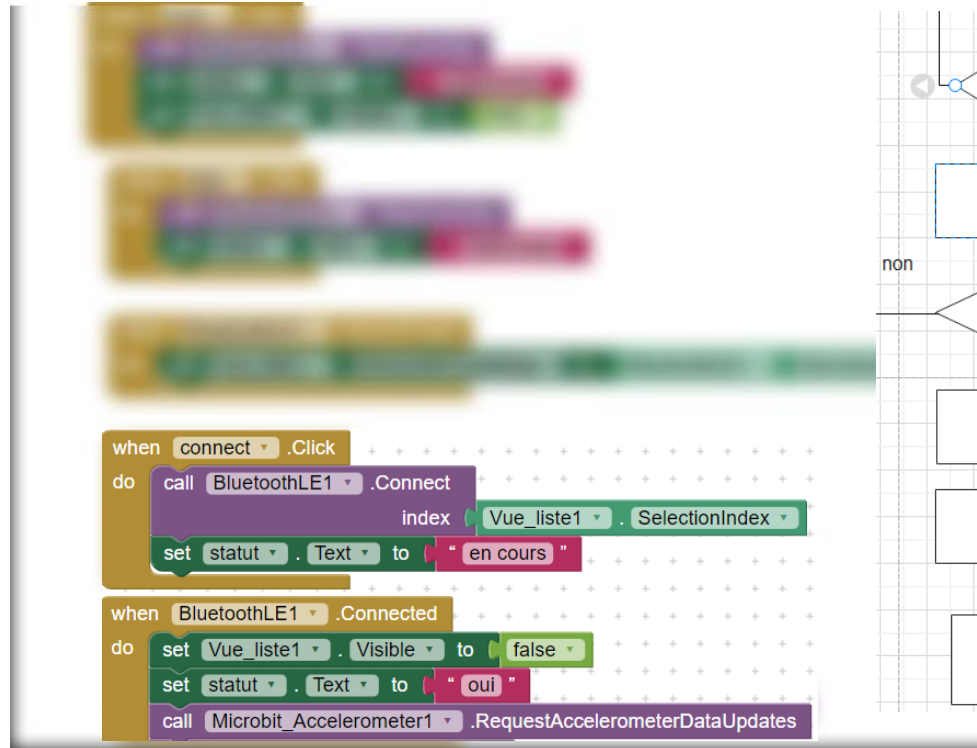
```

when BluetoothLE1.DeviceFound
do
  set Vue_liste1.ElementsFromString to BluetoothLE1.DeviceList

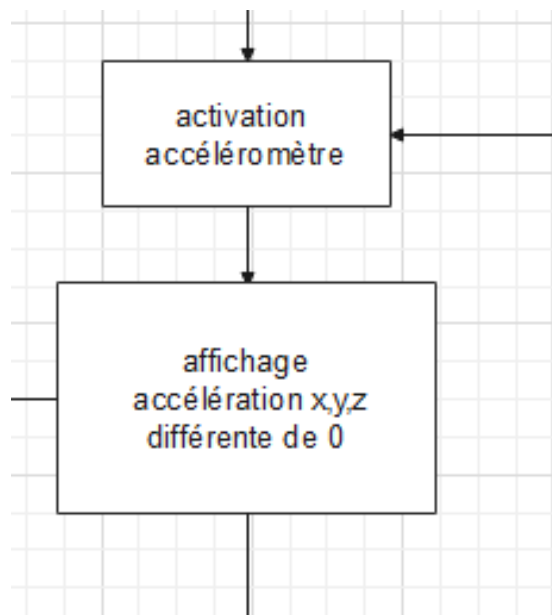
```



Phase de connection de l'appareil(1)



Phase de connection de l'appareil(2)



```

when Microbit_Accelerometer1 . AccelerometerDataReceived
  Accelerometer_X Accelerometer_Y Accelerometer_Z
do
  set X . Text to get Accelerometer_X
  if X . Text = 0
  then set X . Text to 0.1
  set Y . Text to get Accelerometer_Y
  if Y . Text = 0
  then set Y . Text to 0.1
  set Z . Text to get Accelerometer_Z
  if Z . Text = 0
  then set Z . Text to 0.1
  
```

oui non

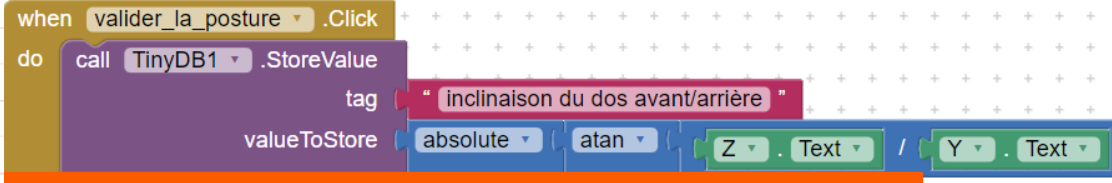
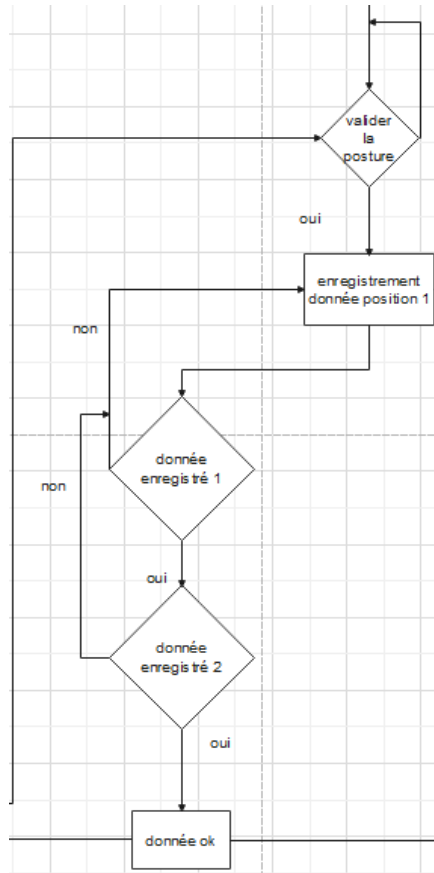
72 → 752 -724

0 0 0

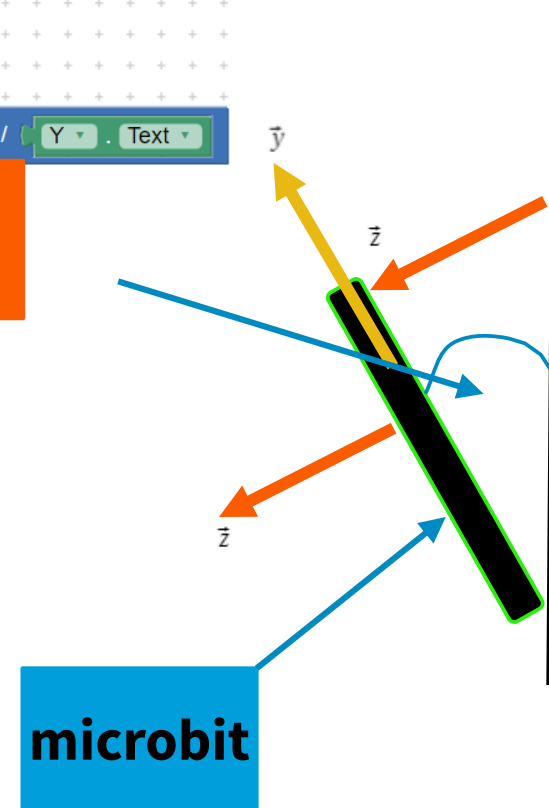
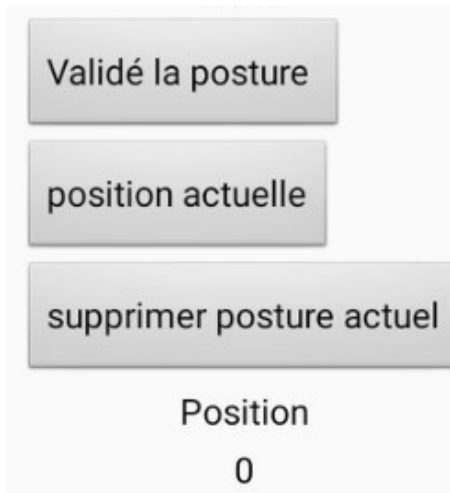
43.91322 0

0 0

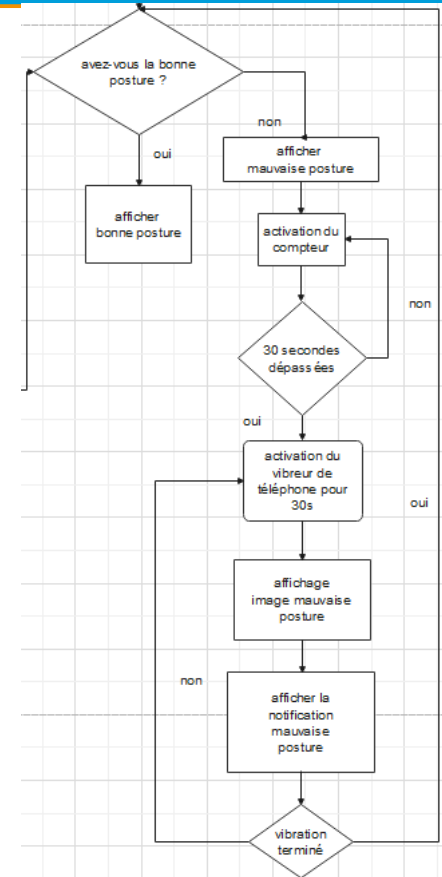
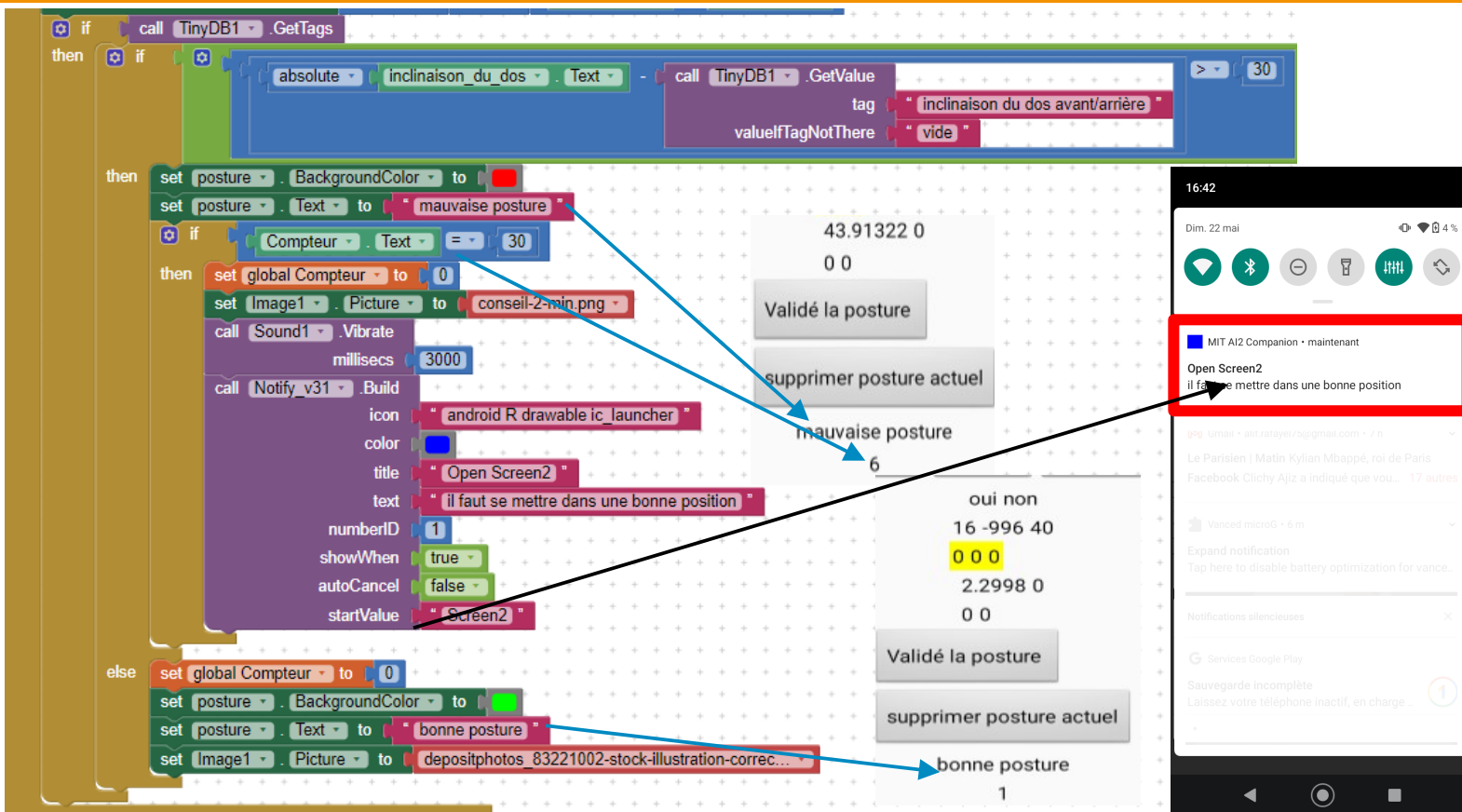
Phase de détection de la bonne posture en inclinaison(1)



Formule:
Angle de posture = $\arctan(||Z||/||Y||)$



Phase de détection de la bonne posture en inclinaison(2)



Autre cas de mauvaise posture

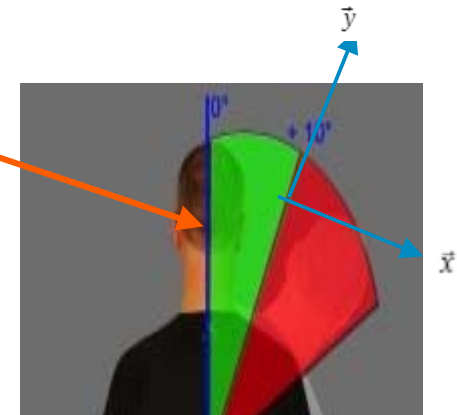
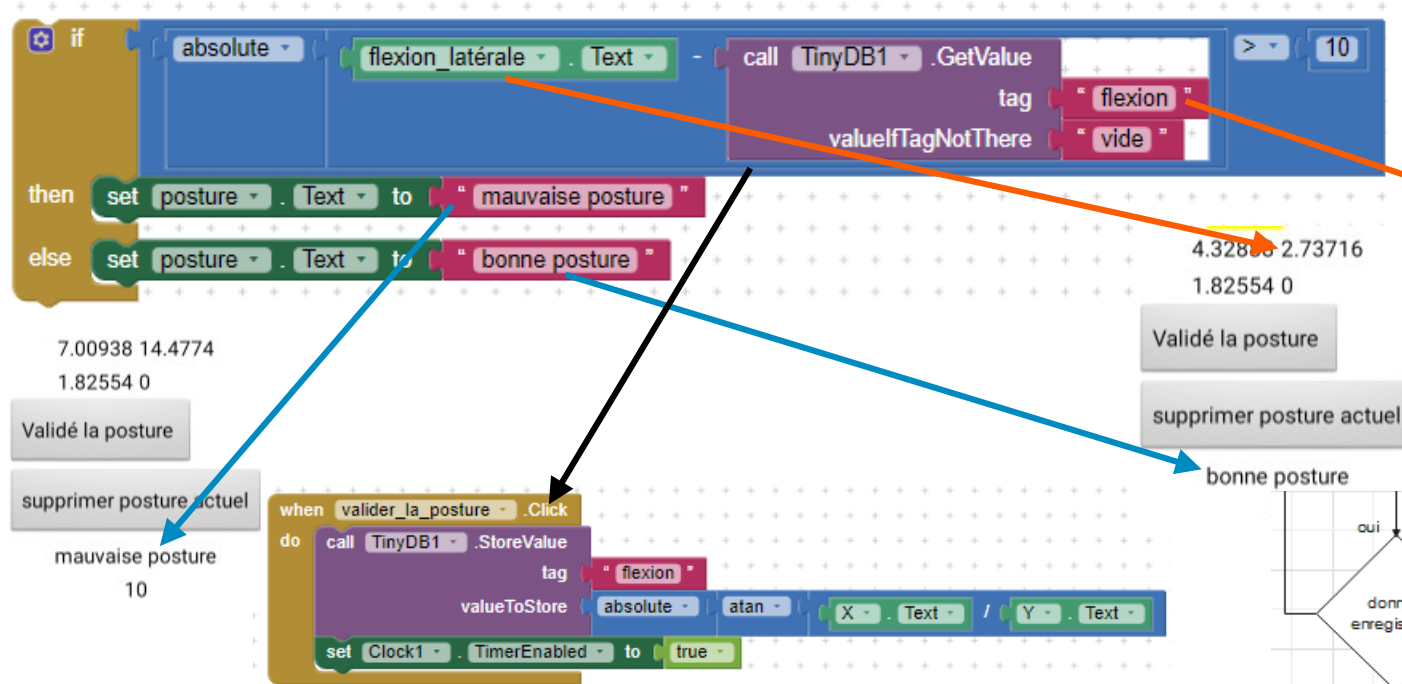
Flexion latérale



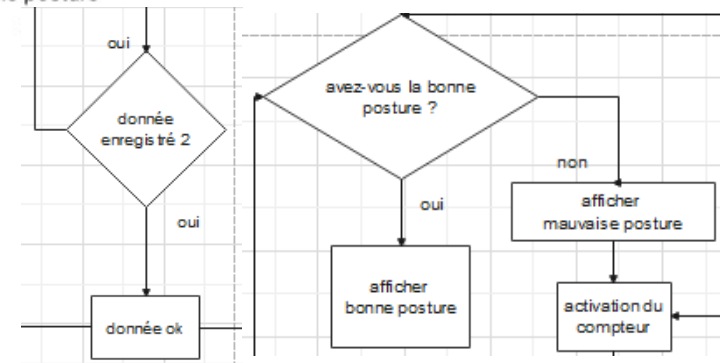
Flexion du haut du dos



Flexion du haut/latérale



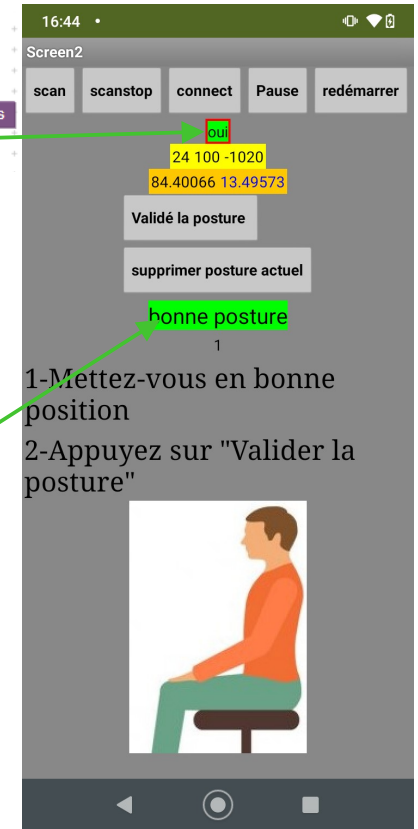
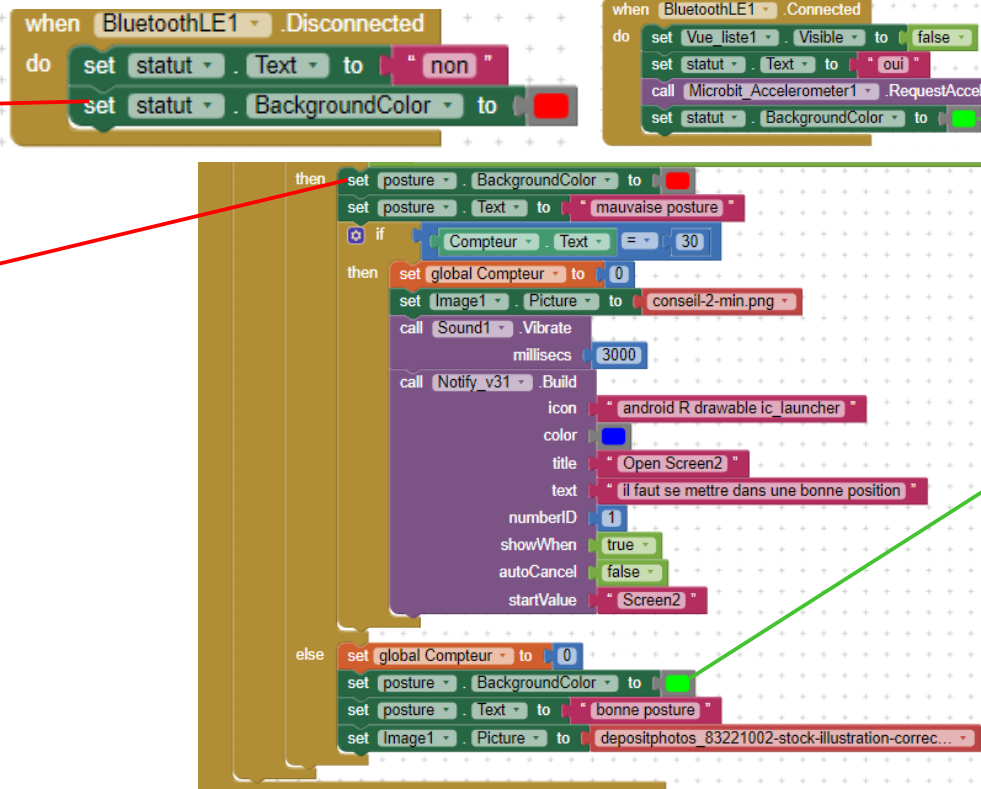
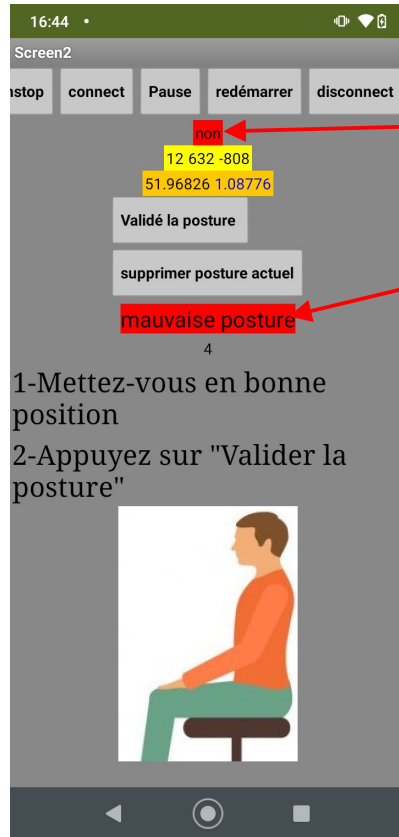
Formule:
Angle de posture = arctan(||x||/||y||)



Flexion du haut/latérale et inclinaison du dos



Résultat final de l'interface de l'application



Merci pour votre attention...

Annexe

Programmation de l'affichage de l'accéléromètre

```

when scan.Click
do
  call BluetoothLE1.StartScanning
  set Vue_liste1.Visible to true

when BluetoothLE1.DeviceFound
do
  set Vue_liste1.ElementsFromString to BluetoothLE1.DeviceList

when connect.Click
do
  call BluetoothLE1.Connect
  index Vue_liste1.SelectionIndex
  set statut.Text to "en cours"

when BluetoothLE1.Connected
do
  set Vue_liste1.Visible to false
  set statut.Text to "oui"
  call Microbit_Accelerometer1.RequestAccelerometerDataUpdates
  set statut.BackgroundColor to green

when redémarrer.Click
do
  call Microbit_Accelerometer1.RequestAccelerometerDataUpdates
  call TinyDB1.ClearAll

when Pause.Click
do
  call Microbit_Accelerometer1.StopAccelerometerDataUpdates

when BluetoothLE1.Disconnected
do
  set statut.Text to "non"
  set statut.BackgroundColor to red
  
```

```

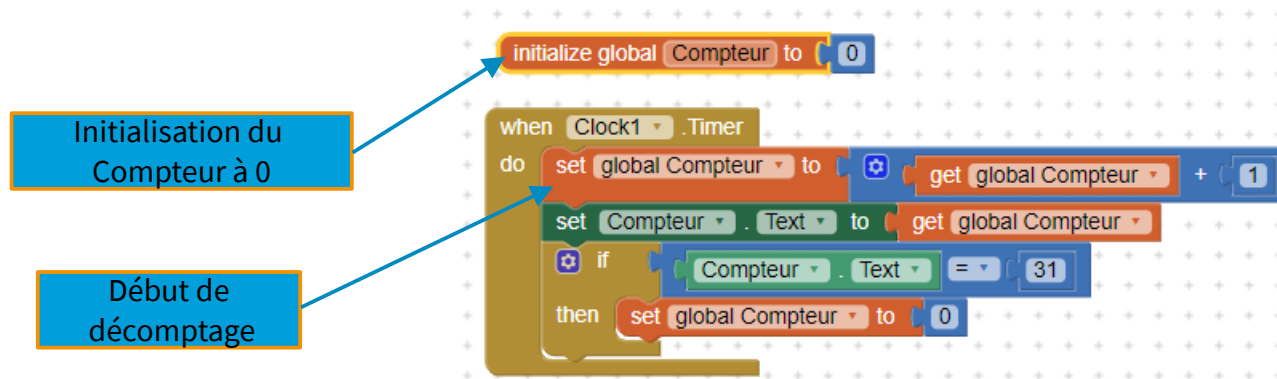
when Microbit_Accelerometer1.AccelerometerDataReceived
  Accelerometer_X Accelerometer_Y Accelerometer_Z
do
  set X.Text to get Accelerometer_X
  if X.Text = 0
  then set X.Text to 0.1

  set Y.Text to get Accelerometer_Y
  if Y.Text = 0
  then set Y.Text to 0.1

  set Z.Text to get Accelerometer_Z
  if Z.Text = 0
  then set Z.Text to 0.1
  
```

Fonctionnement du compteur

2



Programmation de l'application

Arrêt du scan des
appareils bluetooth

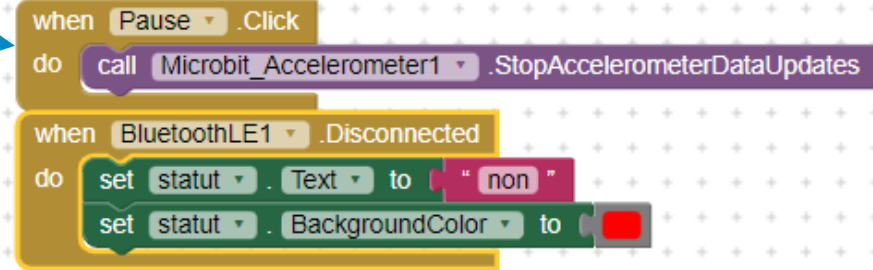
when `scanstop` .Click
do

set `Vue_liste1` . Visible to `false`

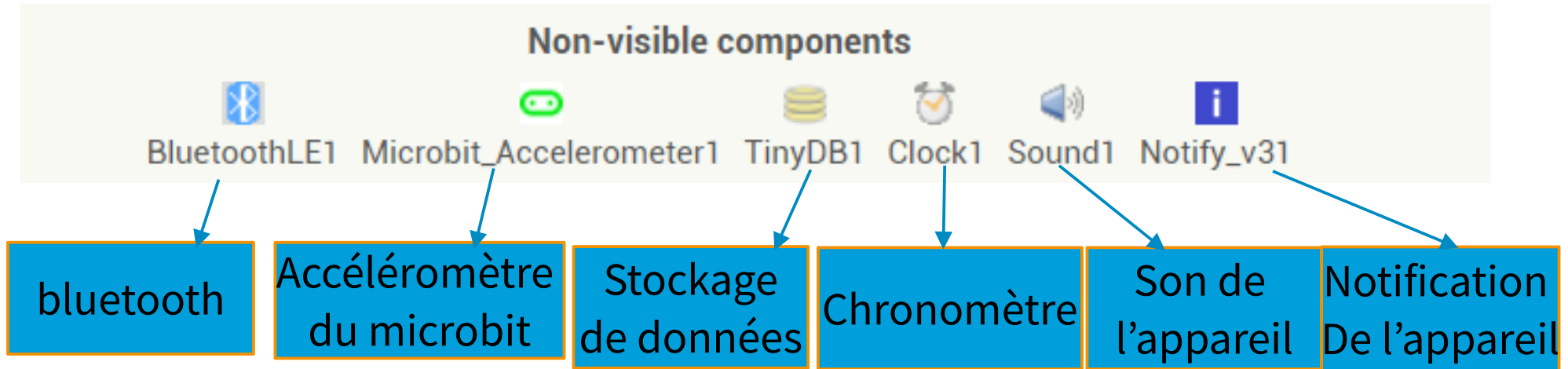
Programmation de l'application

Mettre l'accéléromètre
en pause

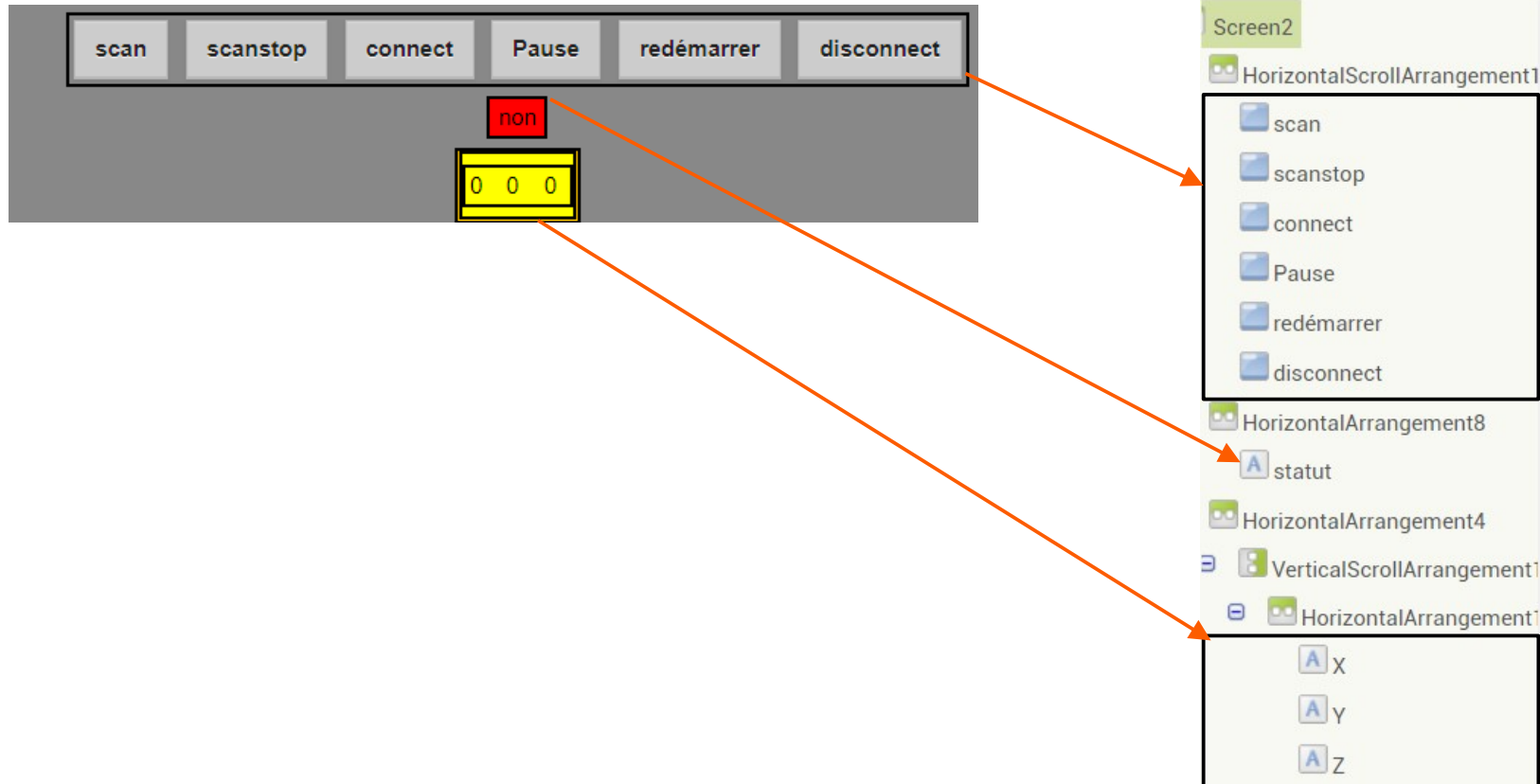
Arrêt complet
du bluetooth



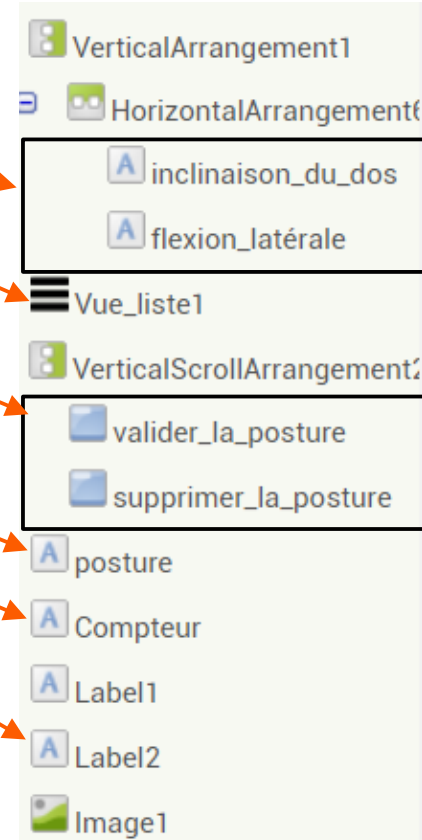
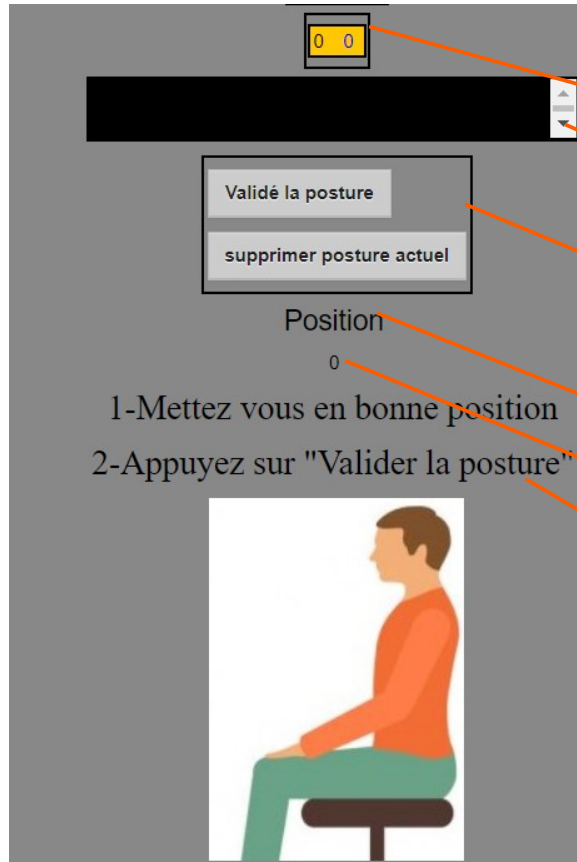
Module de l'application



Interface de l'application



Interface de l'application



Programmation du microbit

