

Final Presentation

AI Wrist Support

DS323 AI in Design



Tutored by 万芳
Hope HU 胡泓毅
11912308

Problem Definition



Repetitive strain injury (RSI) is caused by **repeated use or long-time pressure** of a body part, such as shoulder, elbow, forearm, wrist or hand.

At present times, more and more people are **using computers** to work, study or play games. This leads to the **wide use of mouses**, and **common illness of RSI for their right arms**.

Some examples of symptoms experienced by patients with RSI are aching, pulsing pain, tingling and extremity weakness, initially presenting with intermittent discomfort and then with a higher degree of frequency.

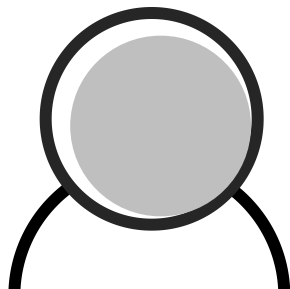
Problem Definition

Living in a society that is developing in a **rapid** pace, more and more people are suffering from anxiety. Thus if people want to be reminded of their health care, it is important to make the design **respectful** for their work and life. The design **needs to be accurate and mild, which requires the intervention of artificial intelligence.**



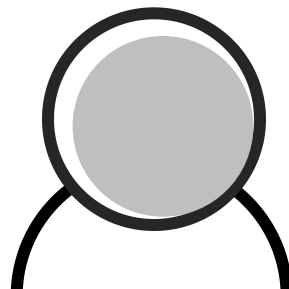
<https://www.centerforprofessionalrecovery.com/7-signs-your-anxiety-is-getting-the-best-of-you-at-work/>

User Research



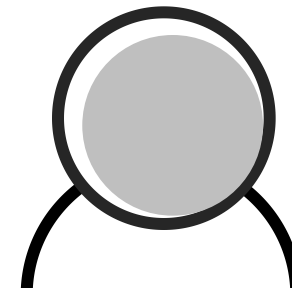
Design Student

“The mouse placed in the school lab is a disaster for my hand. Every time I finish working I feel **pains and stiffness in my wrist and fingers.**”



Design Student(SDIM)

“I use a **thumb-ball**. It frees my wrist and does not stop me from efficient working. Thumb-balls is a new way of interaction, and **some people find it hard to adapt to.**”



Mechanical Engineering Student

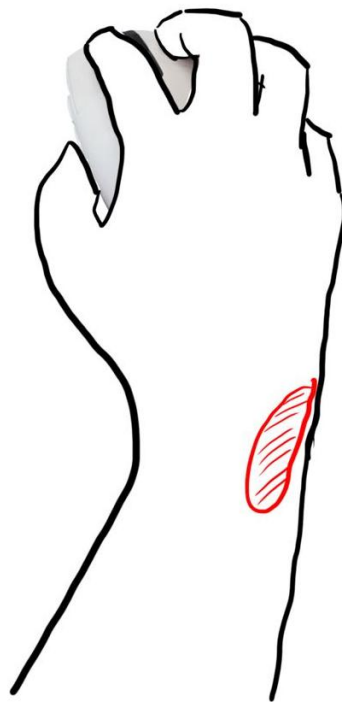
“I don't use mouse much when working, but I do play games a lot. After a long time of playing I would **consciously relax my arm and wrist.**”

Design Proposal

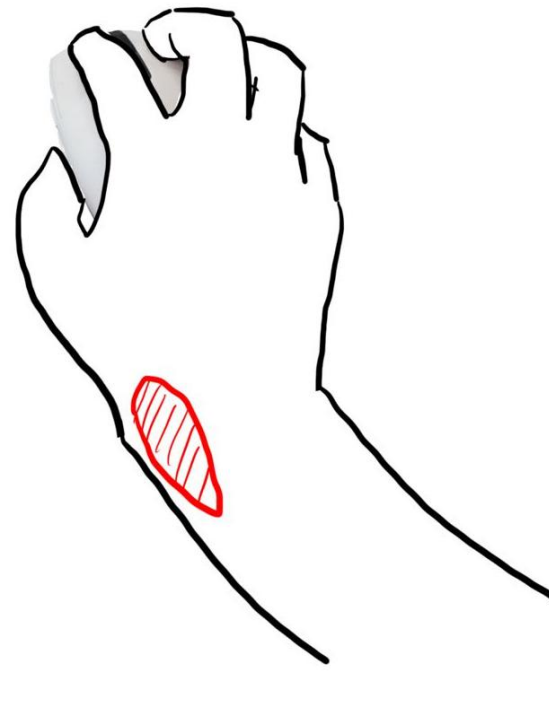


To reduce the pressure applied on the palm and wrist

↑ through physical support



To retrain the user's posture by using their hands



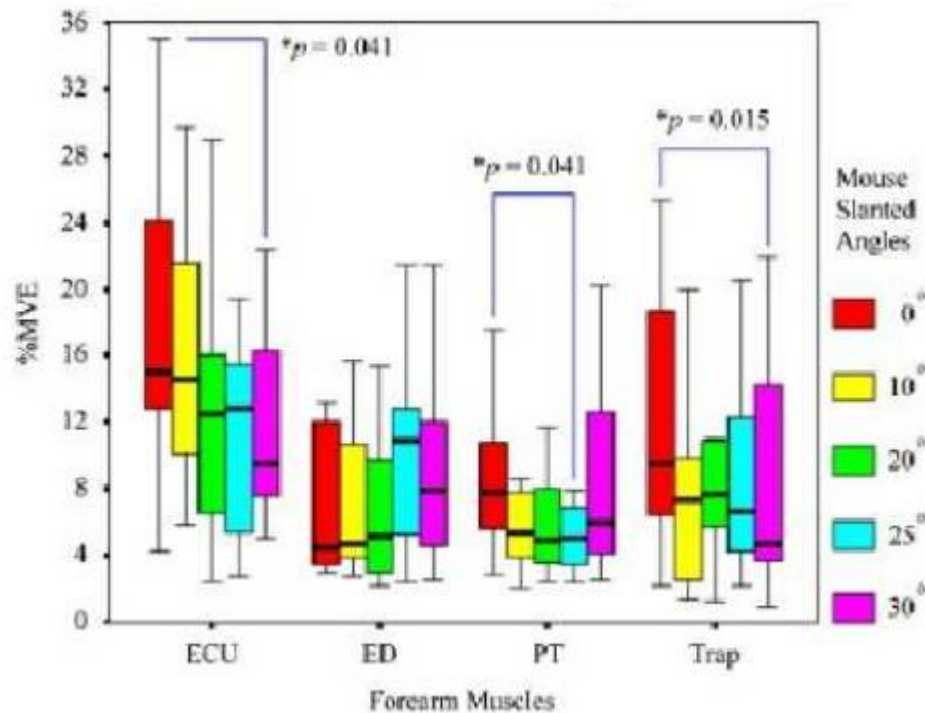
To remind the user to quit the repetitive working routine

↑ through artificial intelligence

Literature Research

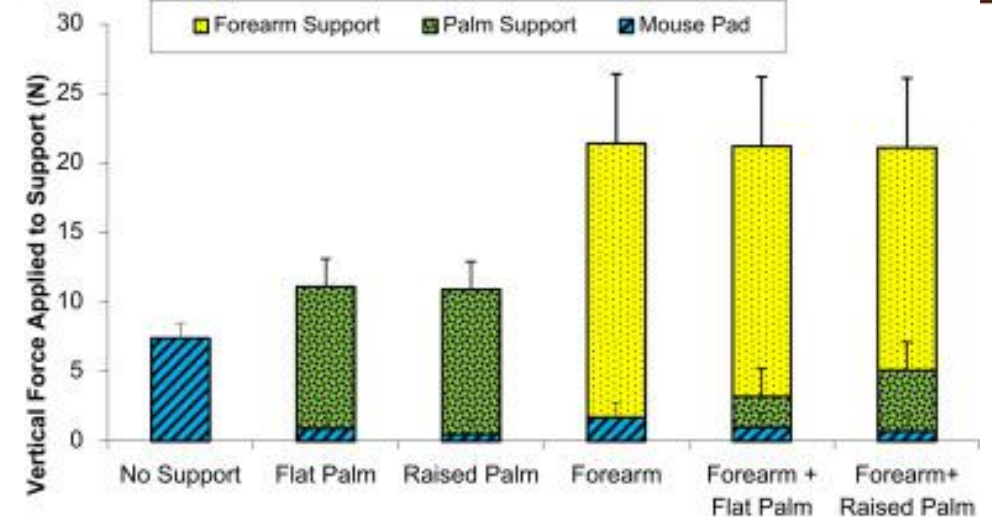
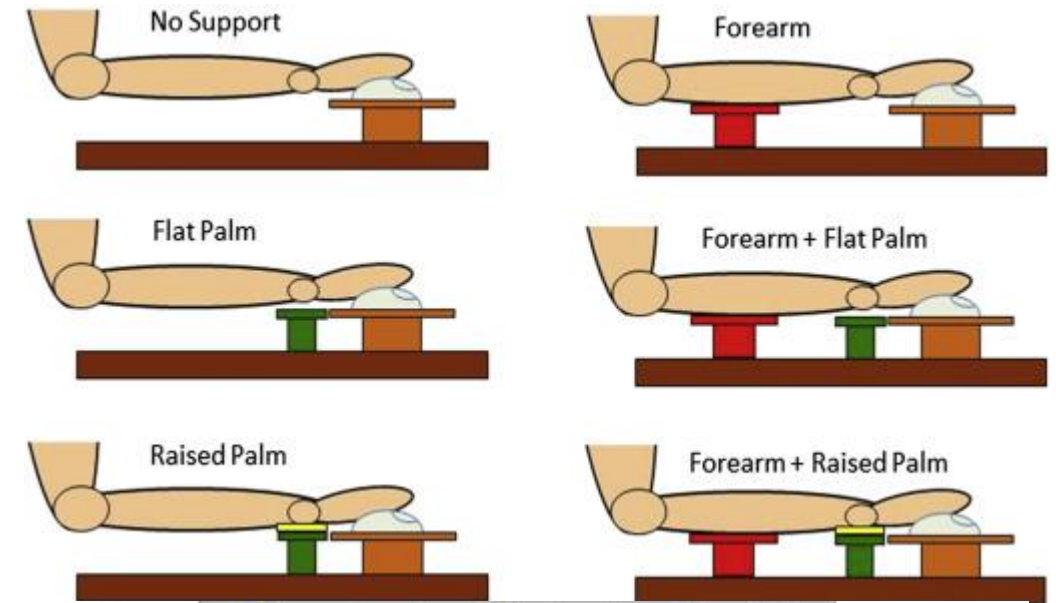
Research led by National Taiwan University shows the angle of 25° means the hand holding a mouse that uses minimum force.

The experience uses rats to detect their electromyographic signals.



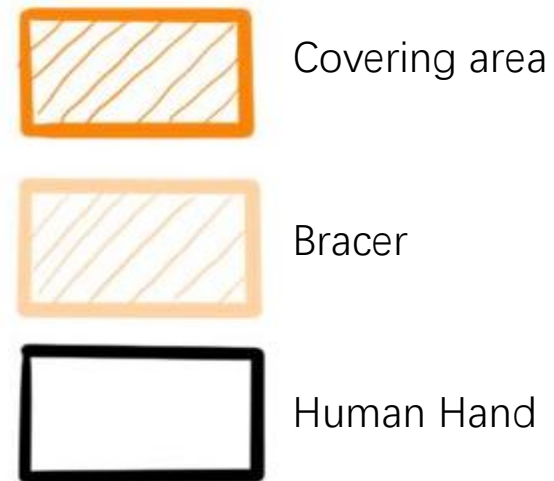
Chen H M, Leung C T. The effect on forearm and shoulder muscle activity in using different slanted computer mice. *Clinical Biomechanics*, 2007, 22(5):518-523.

Research led by Harvard University shows the comfortable status is related to the support given by the device.



Onyebeke L. C., Young J. G., Trudeau M. B., et al. Effects of forearm and palsupports on the upper extremity during computer mouse use. *Applied Ergonomics*, 2014, 45(3): 564-570.

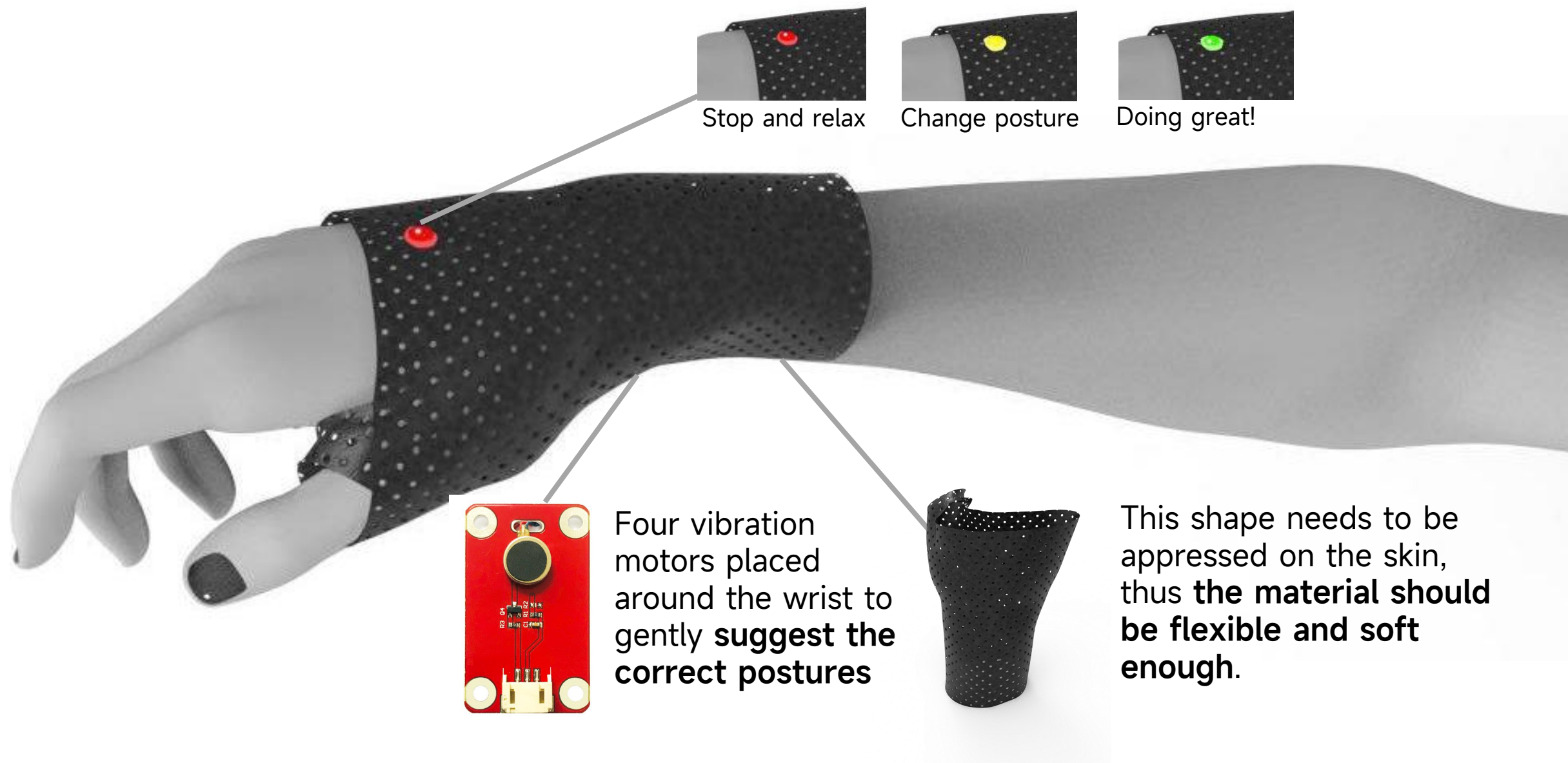
Design Proposal



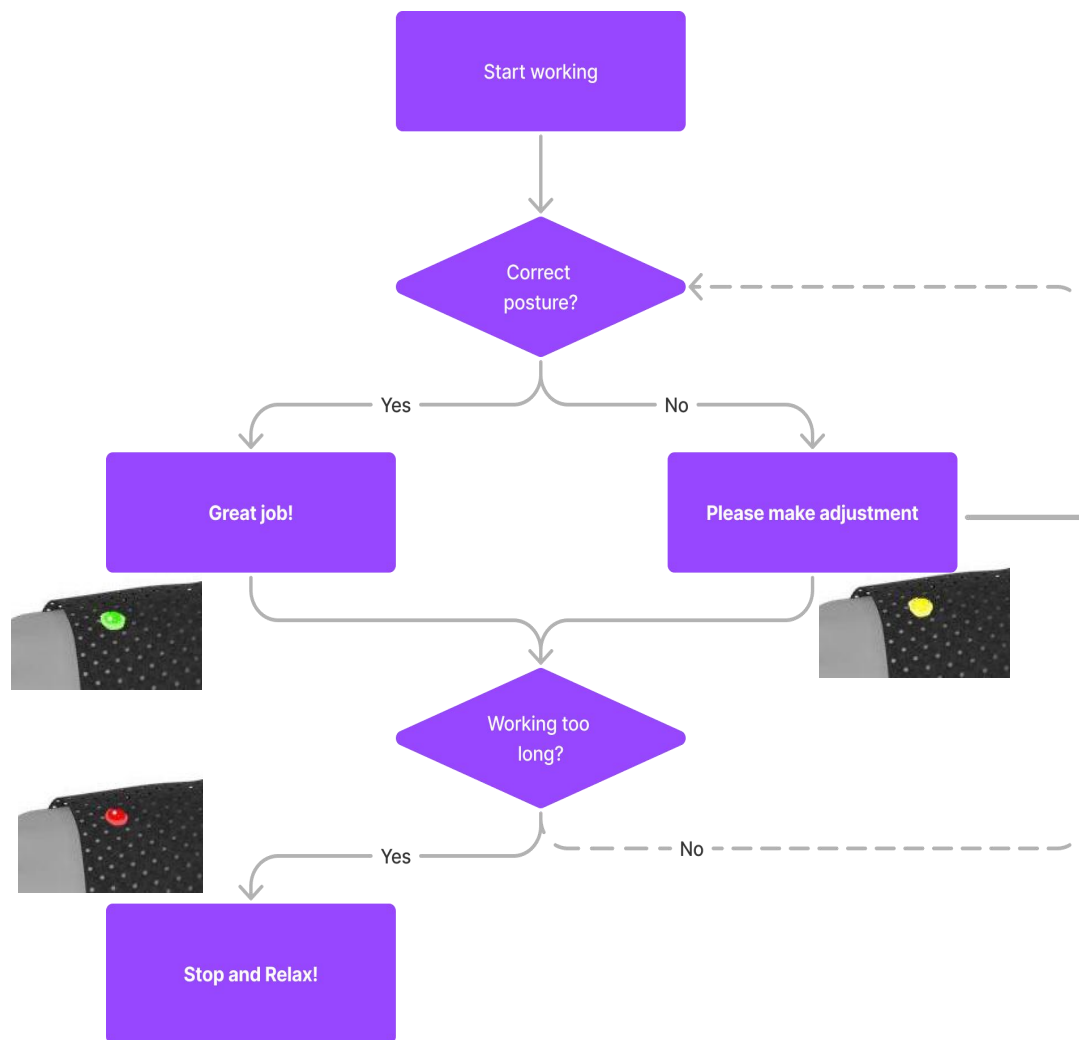
A wrist support wrapped around the wrist and palm



Design Proposal



Design Proposal



To help the user better understand the way to use their hand and body, the machine would also detect their body status to report the reason why they are using their wrists wrongly.

Desk/chair height difference

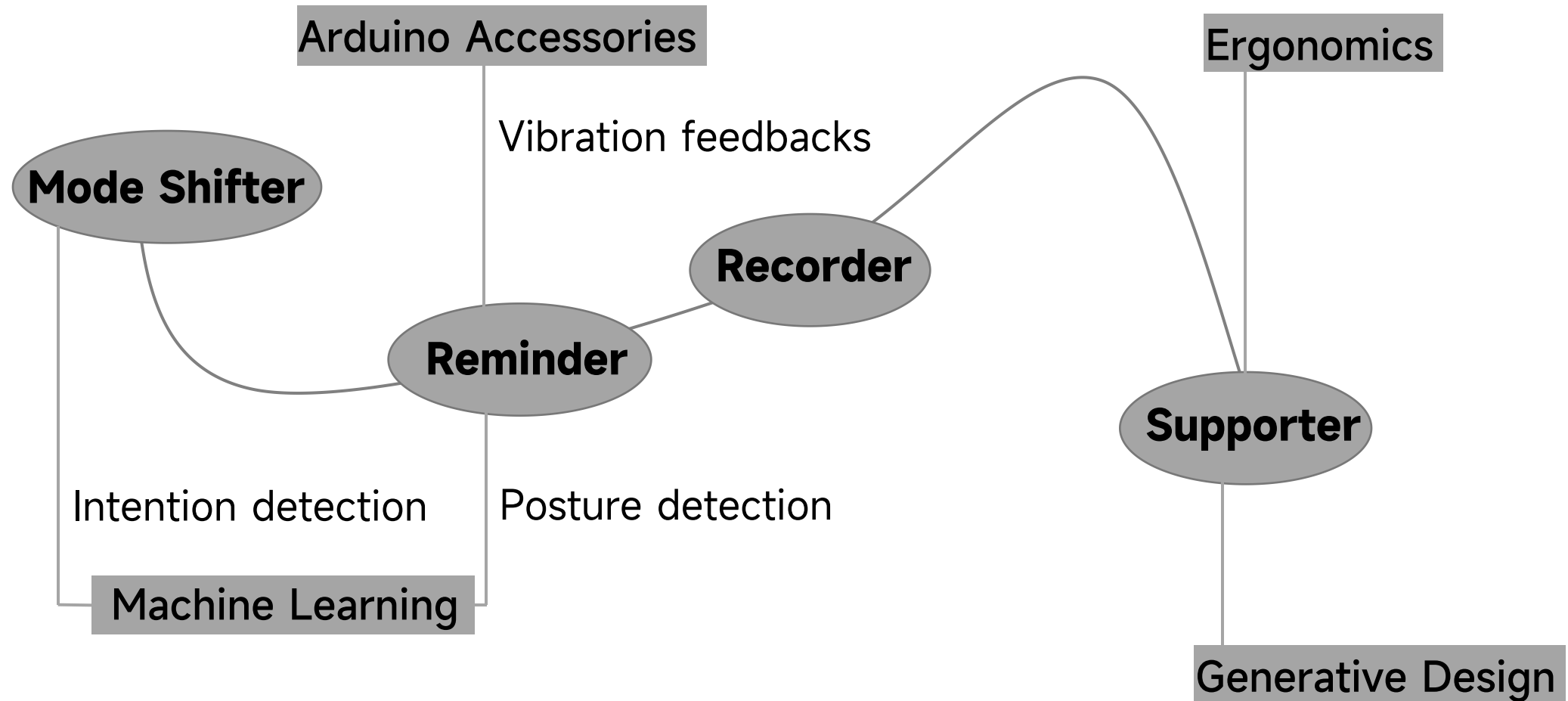
Wrong arm angle

Back not straight

.....

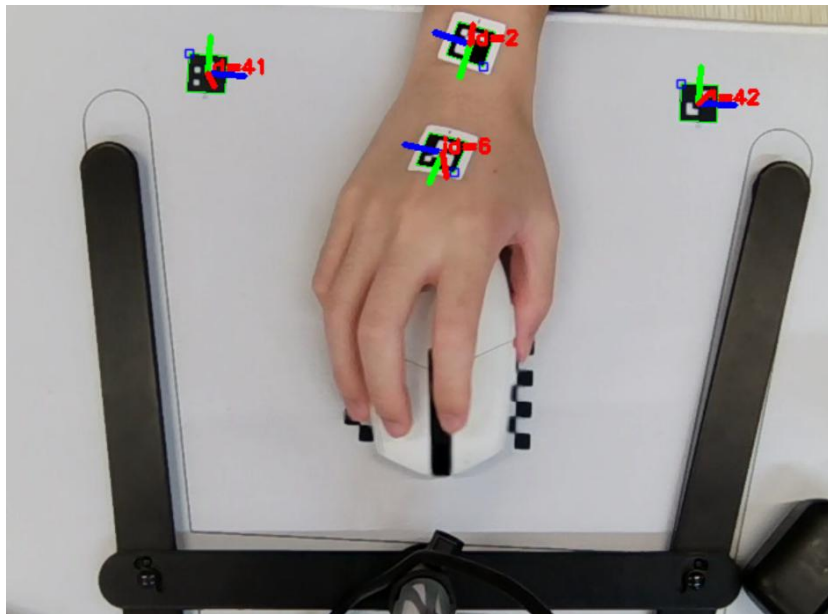
The vibration and the yellow light signal alarm the user to change their working posture. (Such will require the intervention of a speaker.)

Prototype Development

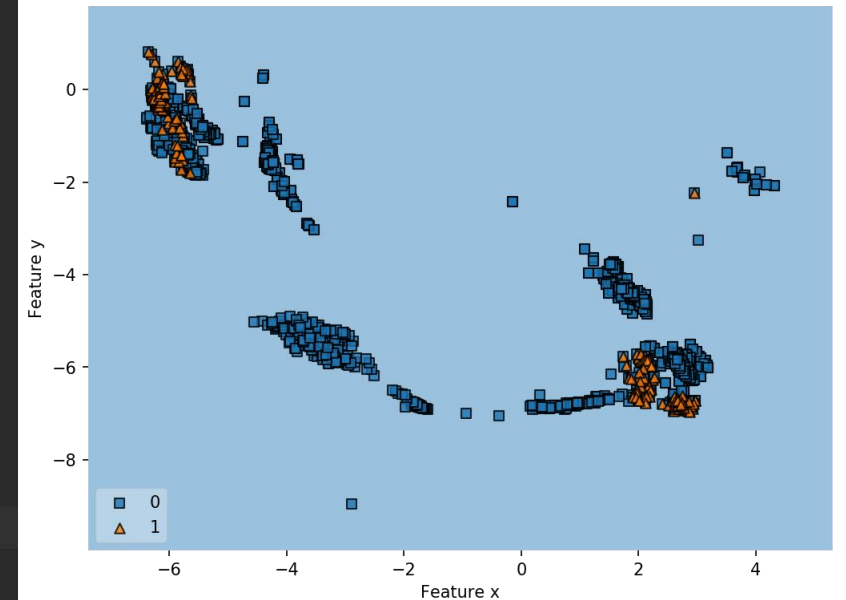


Prototype Development

Data Collection and Support Vector Machine Processing

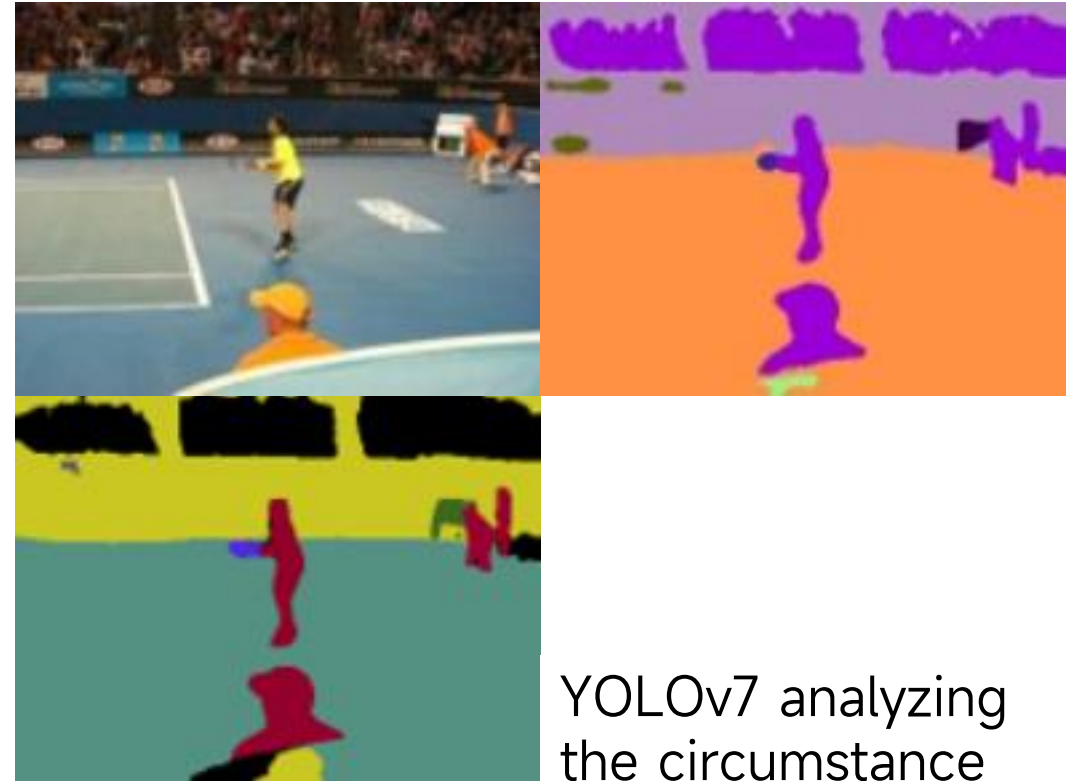
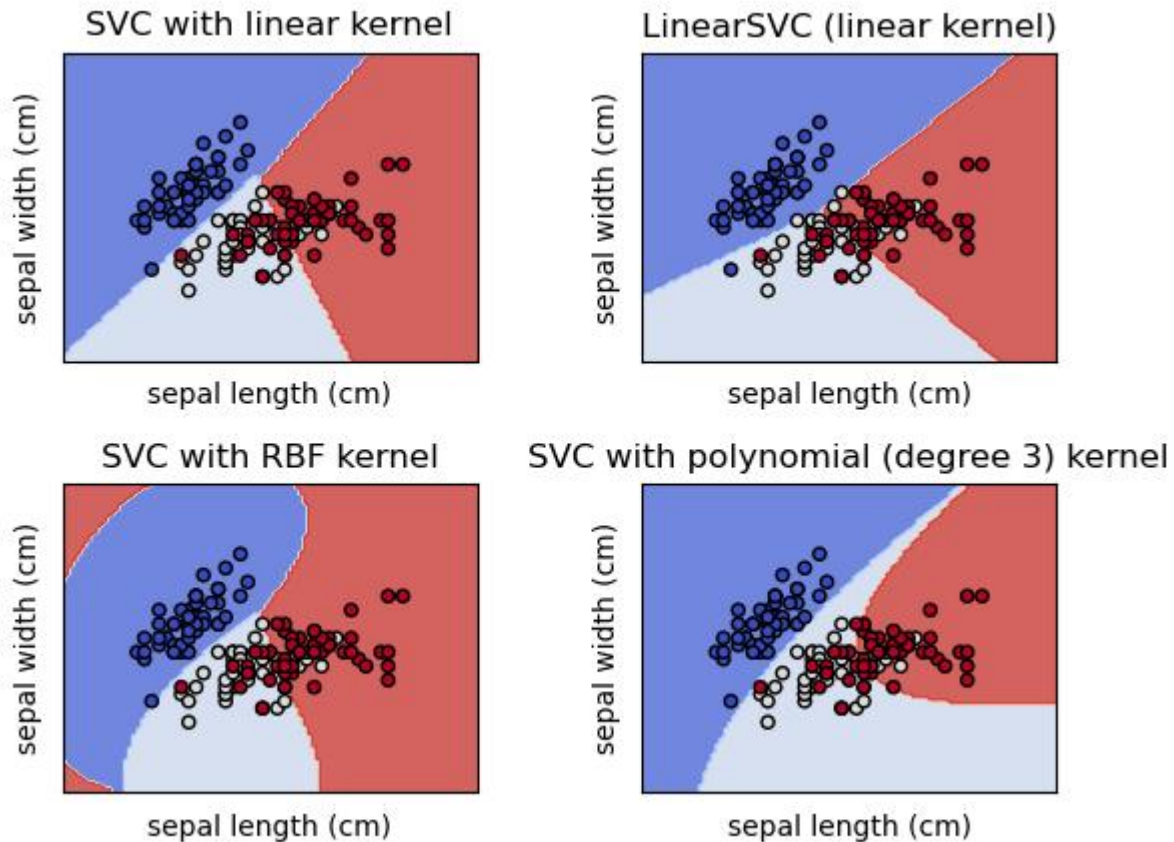


```
1 from sklearn import svm
2 import numpy as np
3
4 x=[[2,0],[1,1],[2,3]]
5 y=[0,0,1]
6 clf = svm.SVC(kernel='linear')
7 clf.fit(x,y)
8 # print(clf)
9 #
10 # print(clf.support_vectors_)
11 # print(clf.support_)
12 # print(clf.n_support_)
13
14 print(clf.predict([[2,0]]))
```



The data collection is **continuous movements of one person**, therefore is not large enough.

Further Development



YOLOv7 analyzing the circumstance

- Consider a **larger dataset** including different people with **different comfortable postures**
- Look into a **less noticeable way of detecting** to respect the user

