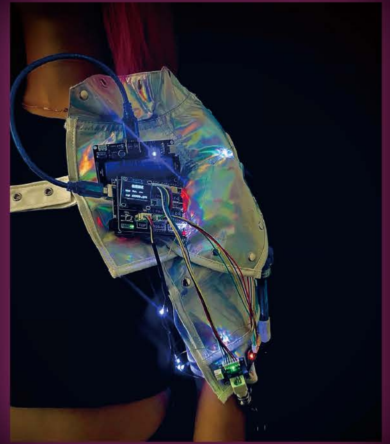


CYBORG BLOOD SAVER

Wearable device | Critical design | Speculative design

This critical and speculative design project is mainly based on the social problems caused by the mechanical viscera eroding people's bodies after human development into Cyborg. The purpose is to stimulate people to prepare for the possible future and think about whether this future is really the ideal society for people? In view of this common social problem in the future, I made a wearable device to help people detect the metal content in blood more quickly and effectively. People in the future can use this wearable device to detect the metal content in their bodies, and even save lives when necessary.

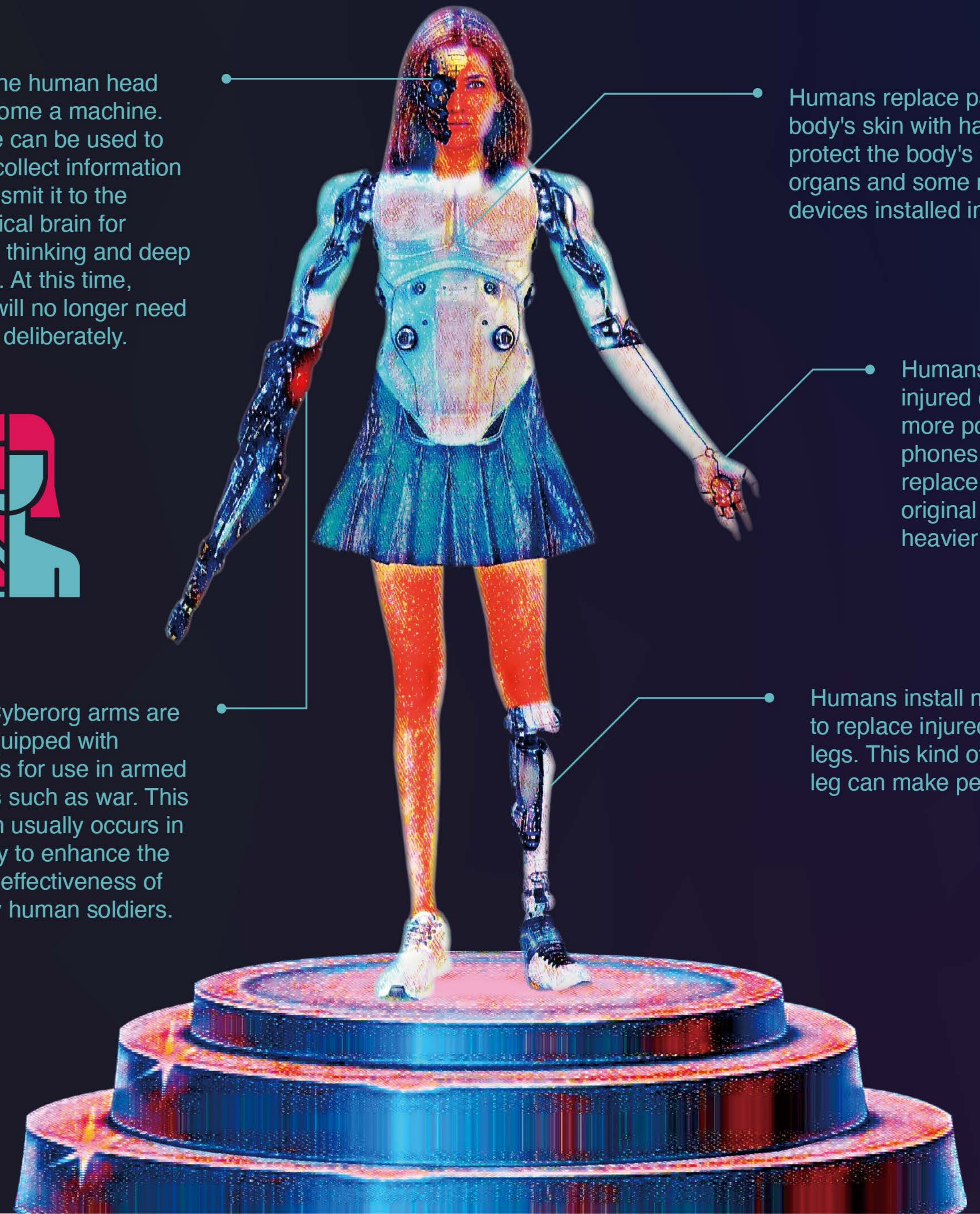
WHAT IS "CYBORG"

Cyborg" is not the same thing as bionics, biorobotics, or androids; it applies to an organism that has restored function or enhanced abilities due to the integration of some artificial component or technology that relies on some sort of feedback. While cyborgs are commonly thought of as mammals, including humans, they might also conceivably be any kind of organism.

PEOPLE'S IMPRESSION OF CYBORG

Half of the human head has become a machine. One eye can be used to quickly collect information and transmit it to the mechanical brain for storage, thinking and deep learning. At this time, people will no longer need to study deliberately.

Humans replace part of the body's skin with hard armor to protect the body's main internal organs and some mechanical devices installed in the body.



Humans will replace their injured or disabled arms with more powerful mechanical phones, which can not only replace the functions of the original arms but also grasp heavier objects.

Some Cyberorg arms are even equipped with weapons for use in armed conflicts such as war. This situation usually occurs in the army to enhance the combat effectiveness of ordinary human soldiers.

Humans install mechanical legs to replace injured or disabled legs. This kind of mechanical leg can make people run faster.

DEVELOPMENT TIMELINE OF FUTURE CYBORG VISION

After 100 years, human beings undergoing physical transformation from physical body to mechanical body have become the norm of society, even a trend. The name "human" will become "Cyborg" completely.

2022

First Combination of Man & Computer

Neuralink company represents human first time try to use an implanted computer to repair nerve damage in the body and improve learning ability, laying a foundation for human computer interconnection.

2032

Intelligent Artificial Limbs Technology

10 years later, people also invented more intelligent artificial limbs to serve the disabled and connected with the human-computer technology before joining, so that the human brain can quickly and naturally control the intelligent artificial limbs.

2052

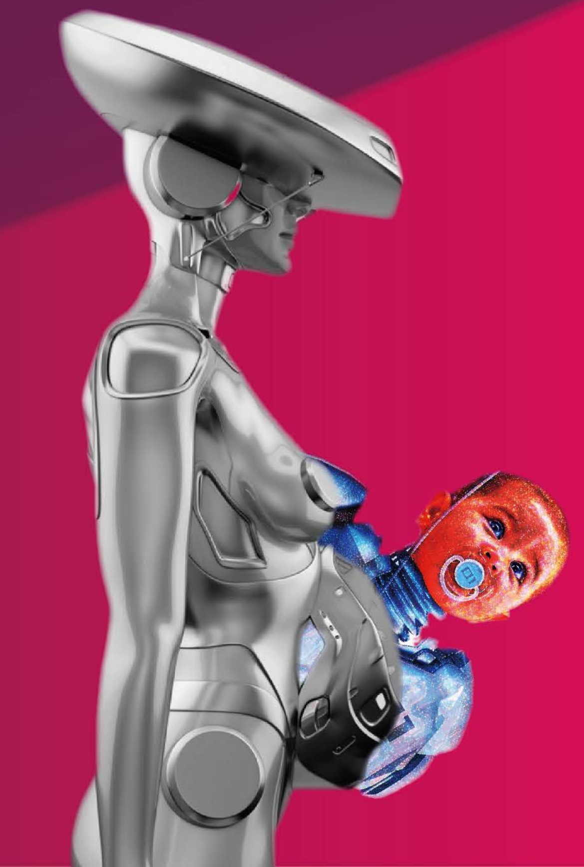
Mechanization of Visceral Organs

30 years later, the human mechanical viscera technology has been very mature, and people need not fear the danger of organ failure. As a result, a large number of people have replaced many aging organs of the body, and set up mechanical internal organs system in the body.

2122

Cyborg Reproduction & Genetic Technology

100 years later, humans at this time mastered Cyborg reproductive technology and genetic technology, so that babies can automatically obtain the parts of their parents' bodies that have been transformed after birth, and become Cyborg Babies

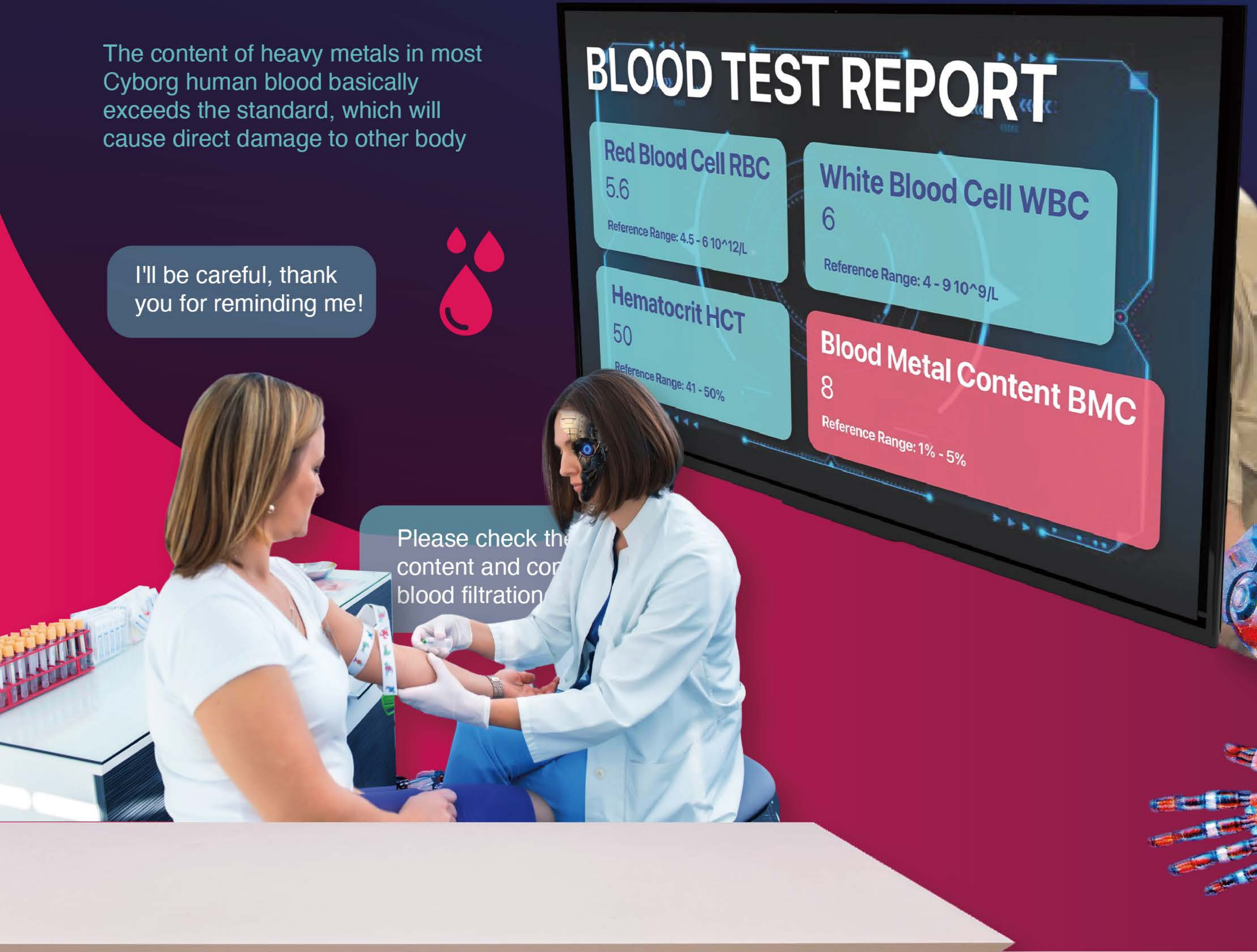


CYBORG GENERATION & RELATED PROBLEMS

Since human beings entered the era of Cyborg, more than half of their organs and limbs have been replaced by machines. Although this has enhanced human function, there are also many hidden dangers to individuals and society. Is it really right for human beings to transform their bodies in order to prolong their lives and improve their functions?

Personal Health Problems

The content of heavy metals in most Cyborg human blood basically exceeds the standard, which will cause direct damage to other body



Emergencies of Social Problems

The child had a traffic accident and needed surgery and blood transfusion, but when his father wanted to donate blood, he did a blood test and found that the metal content was too high to carry out timely blood transfusion. The child's life was in danger.

THREE TYPES OF SOLUTIONS

1. Go To The Hospital To Filter Metal & Clean Blood

The advantage is that there is a doctor to accompany, implement and explain the metal content of blood. The disadvantage is that it is not convenient to have regular rechecks, and the inspection time is long.

2.A Blood Cleaner Is Installed In The Body Through Surgery

The advantage is that it is very convenient and does not need to clean the blood regularly because it will automatically operate, and the efficiency is very high. The disadvantage is that it is inconvenient to implant in the body for maintenance. If it is damaged, it needs to be taken out by surgery.

3. Wearable Blood Detector and Cleaner

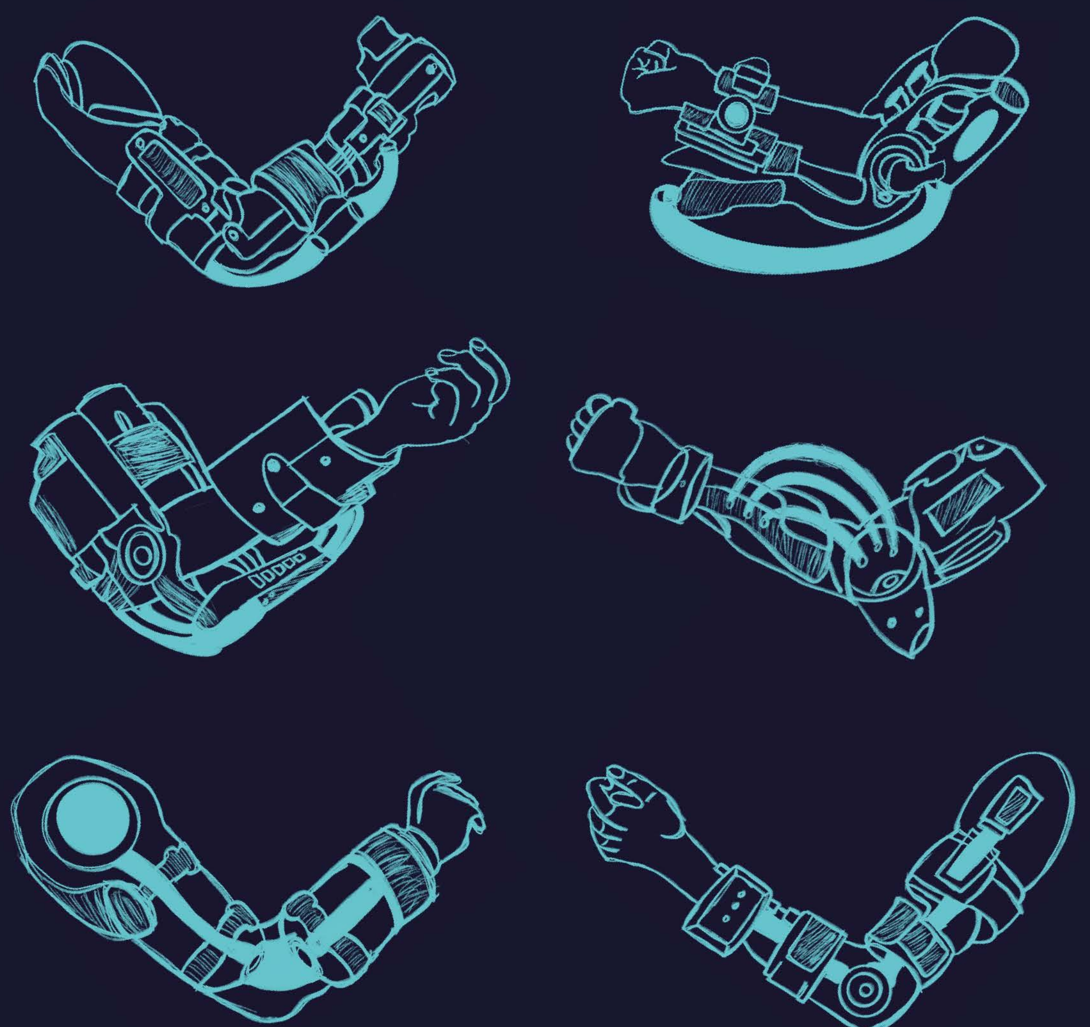
The advantage is that it is very convenient to carry, very efficient, and has the ability to quickly detect and filter, without waiting for the hospital's inspection results. The disadvantage is that it is easy to be damaged and there is no special doctor for real-time explanation.

The Best Solution - Wearable Blood Detector and Cleaner

This solution will be used by the final design direction because first of all, it is very convenient and can quickly detect heavy metals. Overall, it is much faster than the hospital and can be used in many emergency situations. At the same time, it is also very convenient to wear and maintain. People do not have to worry about how to take it out of the body for maintenance like an implanted detector.

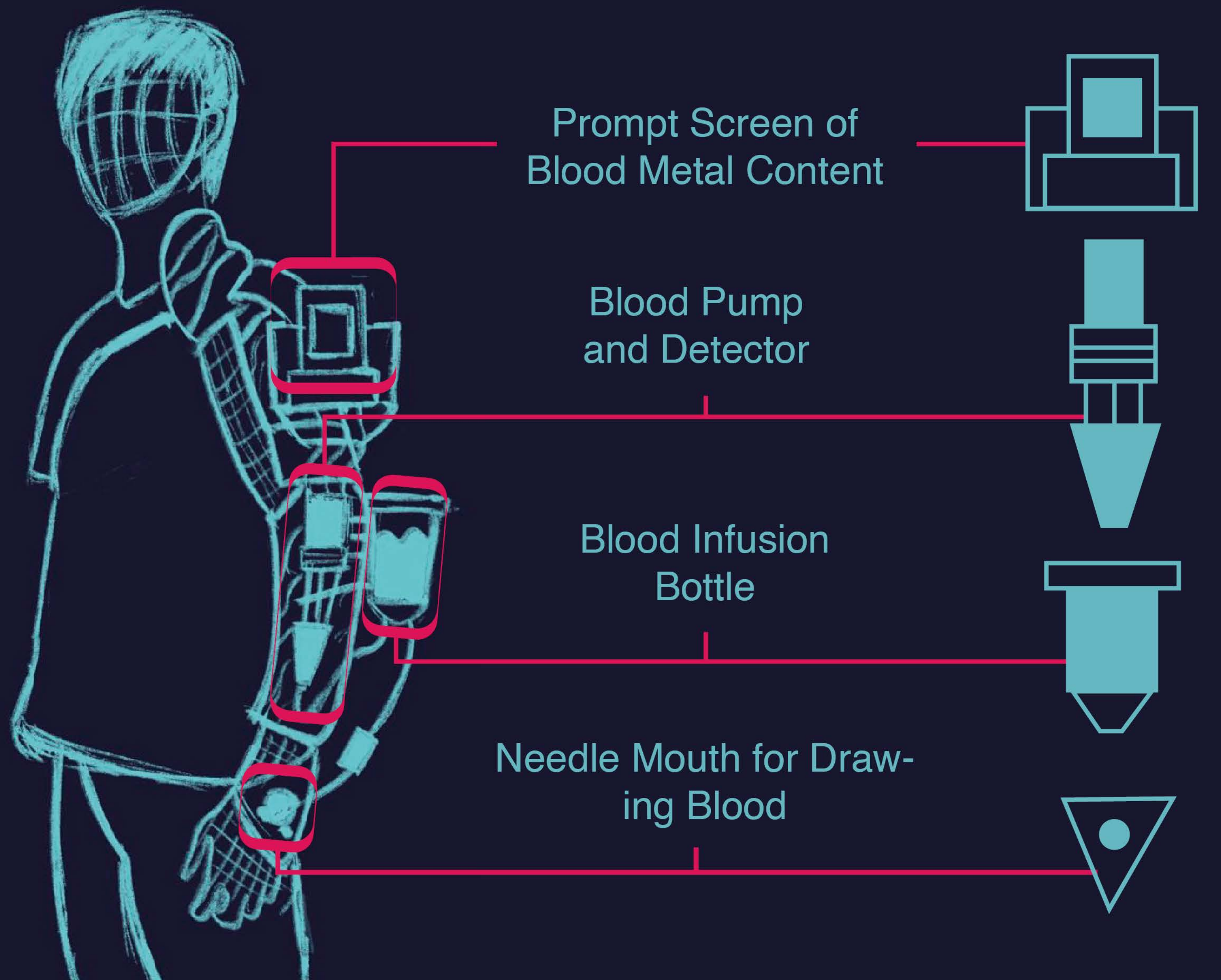
THUMBNAIL SKETCHES

The initial expression of these six sketches is that I will make a wearable blood detection and filtering instrument on my hand. What they have in common is that the blood is delivered to the instrument at the rear through the needle mouth at the front of the arm.



FINAL SKETCH FOR WEARABLE DEVICE

The final sketch is mainly intended to express that wearable devices are mainly composed of blood detectors and filters, and explain the functions of specific buttons and their operation modes. If the metal exceeds the standard, the indicators will appear on the device screen. The user can then confirm that after filtering, the pipeline will continue to draw blood until the body's metal indicators return to normal.



SLEEVE DESIGN SCHEME

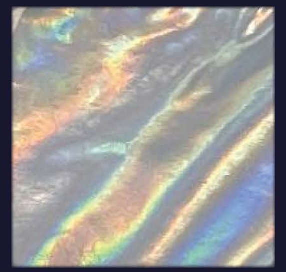
Choosing Textile Fabric

Cowhide

Pros: It has good flexibility, breathability, abrasion resistance and plasticity.
Cons: It is expensive and difficult to preserve, so it is easy to mildew.

Nylon

Pros: It has high mechanical strength, good toughness, high tensile and compressive strength.
Cons: It has poor low-temperature resistance, poor anti-static property and poor heat resistance.

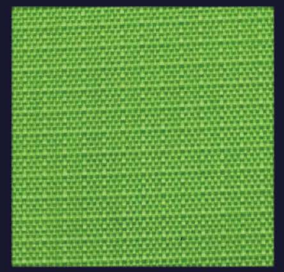


Laser

Pros: It has tear resistance and abrasion resistance, and its appearance has a sense of science and technology.
Cons: Its fabric texture is not soft enough.

Linen

Pros: It is heat dissipating and breathable, low-key in texture, advanced in color and tough in texture.
Cons: It is easy to wrinkle, has poor dimensional stability, and will have a hard prick feeling when worn close to the body.



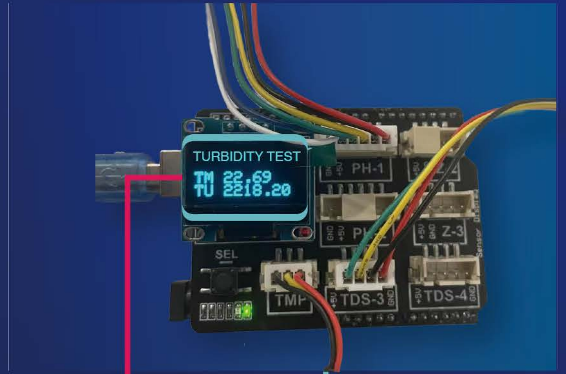
Polyester

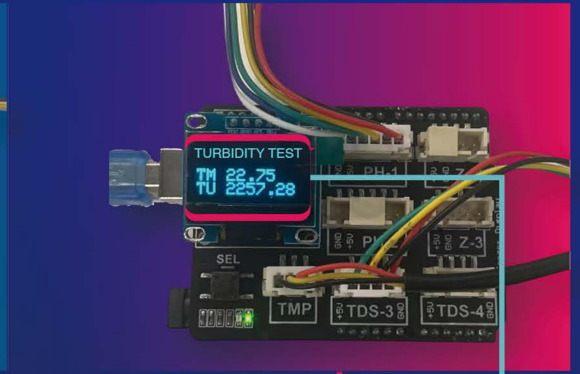
Pros: It has high strength, high elasticity, good heat resistance and strong plasticity.
Cons: It has low moisture absorption, easy dyeing and easy pilling.

Detailed Outline Sketches

Final Sleeve

THE GROUP OF TEST INSTRUMENT

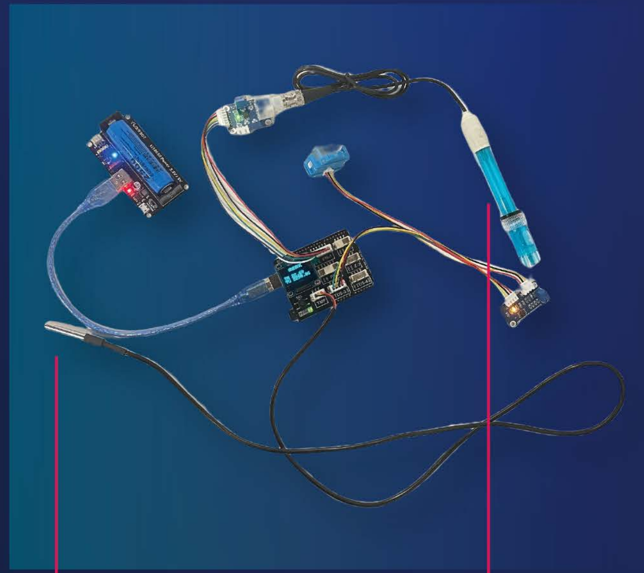




Arduino UNO

Value Before Test

Value After Test



Blood Transfusion Apparatus

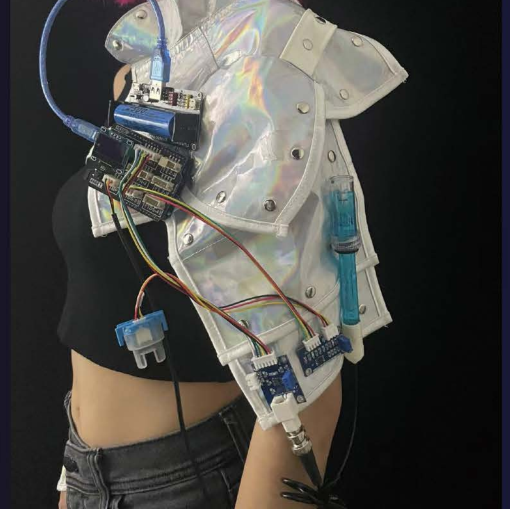
Liquid Turbidity Detector

Impurity Purifier

PROGRAMMING PROCESS

```
#include <avr/interrupt.h>
#include "PinChangeInt.h"
#include "OLED12864.h"
#include "OneWire.h"
#include "DallasTemperature.h"
#include "MsTimer2.h"

#define ONE_WIRE_BUS 4

OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);

OLED12864 oled12864;

float tmpetValue;
float tur_ch2_Value=0;
float ph_ch1_Value=0;
float TDS_ch4_Value=0;

int LED_PIN = 13;
int SET_PIN = 12;
int DS18B29_PIN = 4;
int PH_CH1_PIN = A0;
int PH_CH2_PIN = A1;
int ZHUODU_CH2_PIN = A1;
int ZHUODU_CH3_PIN = A2;
int TDS_CH3_PIN = A2;
int TDS_CH4_PIN = A3;

int flag_sel = 0;

static const unsigned char PROGMEM str_zhuo[] ={
0x00,0x40,0x20,0x40,0x10,0x40,0x17,0xFC,0x84,0x44,0x44,0x44,0x44,0x44,0x14,0x44,
0x17,0xFC,0x24,0x44,0xE0,0x40,0x20,0x48,0x20,0x44,0x2F,0xFE,0x24,0x02,0x00,0x00
};

static const unsigned char PROGMEM str_du[] ={
0x01,0x00,0x00,0x80,0x3F,0xFE,0x22,0x20,0x22,0x20,0x3F,0xFC,0x22,0x20,0x22,0x20,
0x23,0xE0,0x20,0x00,0x2F,0xF0,0x24,0x10,0x42,0x20,0x41,0xC0,0x86,0x30,0x38,0x0E
};

static const unsigned char PROGMEM str_ce[] ={
0x00,0x04,0x27,0xC4,0x14,0x44,0x14,0x54,0x85,0x54,0x45,0x54,0x45,0x54,0x15,0x54,
0x15,0x54,0x25,0x54,0xE5,0x54,0x21,0x04,0x22,0x84,0x22,0x44,0x24,0x14,0x08,0x08
 };

static const unsigned char PROGMEM str_shi[] ={
0x00,0x28,0x20,0x24,0x10,0x24,0x10,0x20,0x07,0xFE,0x00,0x20,0xF0,0x20,0x17,0xE0,
0x11,0x20,0x11,0x10,0x11,0x10,0x15,0x10,0x19,0xCA,0x17,0x0A,0x02,0x06,0x00,0x02
};

void setup() {
 pinMode(LED_PIN, OUTPUT);
 Serial.begin(115200);

 pinMode( SET_PIN,  INPUT );
 attachPinChangeInterrupt( SET_PIN , set_key_deal, RISING );

 MsTimer2::set(1000, TimerInt);
 MsTimer2::start();

 oled12864.init();
}

void loop() {

 update_tmp();

 if(flag_sel == 0){
  get_tur_ch2_value();
  update_show_zhuo();
 }else if(flag_sel == 1){
  get_ph_ch1_value();
  update_show_PH();
 }else if(flag_sel == 2){
  get_tds_ch3_value();
  update_show_TDS();
 }
 delay(100);
}

void set_key_deal(){
  flag_sel++;
  if(flag_sel >= 3){
   flag_sel = 0;
  }
  Serial.println("SET KEY");
}


void update_tmp(){
 sensors.requestTemperatures();
 tmpetValue = sensors.getTempCByIndex(0);
}

void TimerInt(){
 static int ledState = LOW;
  if (ledState == LOW) {
   ledState = HIGH;
  } else {
   ledState = LOW;
  }
  digitalWrite(LED_PIN, ledState);
}

void get_tur_ch2_value(){
 tur_ch2_Value = analogRead(ZHUODU_CH2_PIN);// read the input on analog pin 0:
 tur_ch2_Value = tur_ch2_Value * (5.0 / 1024.0); // Convert the analog reading (which goes
from 0 - 1023) to a voltage (0 - 5V):
 tur_ch2_Value = -0.0192*(tmpetValue-25) + tur_ch2_Value;
 tur_ch2_Value= -865.68 * tur_ch2_Value + 3347.19;

 if(tur_ch2_Value<=0){tur_ch2_Value=0;}
 if(tur_ch2_Value>=3000){tur_ch2_Value=3000;}
}
#define ARRY_LENGTH 10

void get_ph_ch1_value(){
 float PH_VALUE = 0;
 int pv[ARRY_LENGTH];
 for(int i = 0; i < ARRY_LENGTH; i++ ){
  pv[i] = analogRead(PH_CH1_PIN);
  delay(1);
 }
 for(int i = 0; i < ARRY_LENGTH; i++){
  for(int k = i; k < ARRY_LENGTH; k++ ){
   if( pv[i] < pv[k] ){
    int tmp = pv[i];
    pv[i] = pv[k];
    pv[k] = tmp;
   }
  }
 }
  if( tmpetValue > 42 )  pv[ARRY_LENGTH/2] += 5;
 else if(tmpetValue > 28){
  pv[ARRY_LENGTH/2] += 5*(tmpetValue - 28)/14;
 }

PH_VALUE = pv[ARRY_LENGTH/2];
 PH_VALUE = -5.887*(PH_VALUE*5/1024) + 21.677;
 if(PH_VALUE > 14.1){
  PH_VALUE = 14.1;
 }
 if( PH_VALUE < 0 ){
  PH_VALUE = 0;
 }
 ph_ch1_Value = PH_VALUE;
 if(ph_ch1_Value<=0){ph_ch1_Value=0;}
 if(ph_ch1_Value>=14.6){ph_ch1_Value=14.6;}
}
 if( PH_VALUE < 0 ){
  PH_VALUE = 0;
 }
 ph_ch1_Value = PH_VALUE;
 if(ph_ch1_Value<=0){ph_ch1_Value=0;}
 if(ph_ch1_Value>=14.6){ph_ch1_Value=14.6;}
}

void update_show_zhuo(){
 oled12864.clear();
 oled12864.drawBitmap(32, 0,  str_zhuo, 16, 16, 1);
 oled12864.drawBitmap(48, 0,  str_du, 16, 16, 1);
 oled12864.drawBitmap(64, 0,  str_ce, 16, 16, 1);
 oled12864.drawBitmap(80, 0,  str_shi, 16, 16, 1);
 oled12864.show(2,0,"TM ");
 oled12864.show(2,3,(float)tmpetValue);
 oled12864.show(3,0,"TU ");
 oled12864.show(3,3,tur_ch2_Value);
 oled12864.display();

 Serial.print( tmpetValue );
 Serial.print( "  " );
 Serial.println( tur_ch2_Value );
}

void update_show_PH(){
 oled12864.clear();
 oled12864.show(0,3,"PH");
 oled12864.drawBitmap(64, 0,  str_ce, 16, 16, 1);
 oled12864.drawBitmap(80, 0,  str_shi, 16, 16, 1);
 oled12864.show(2,0,"TM ");
 oled12864.show(2,3,(float)tmpetValue);
 oled12864.show(3,0,"PH ");
 oled12864.show(3,3,ph_ch1_Value);
 oled12864.display();

 Serial.print( tmpetValue );
 Serial.print( "  " );
 Serial.println( ph_ch1_Value );
}



#define VREF 5.0      // analog reference voltage(Volt) of the ADC
#define TDS_SCOUNT  10           // sum of sample point
int analogBuffer[TDS_SCOUNT];    // store the analog value in the array, read from ADC
int analogBufferTemp[TDS_SCOUNT];
int analogBufferIndex = 0,copyIndex = 0;
float averageVoltage = 0,TDS_CH3_VALUE = 0,temperature = 25;

 void get_tds_ch3_value(){
  for(int i = TDS_SCOUNT; i >= 0; i--){
   analogBuffer[i] = analogRead(TDS_CH3_PIN);    //read the analog value and store into the
buffer
   delay(1);
  }
 for(copyIndex=0;copyIndex<TDS_SCOUNT;copyIndex++)
     analogBufferTemp[copyIndex]= analogBuffer[copyIndex];
    averageVoltage = getMedianNum(analogBufferTemp,TDS_SCOUNT) * (float)VREF /
1024.0; // read the analog value more stable by the median filtering algorithm, and convert to
voltage value
    float compensationCoefficient=1.0+0.02*(temperature-25.0);    //temperature compensation
formula: fFinalResult(25^C) = fFinalResult(current)/(1.0+0.02*(fTP-25.0));
    float compensationVolatge=averageVoltage/compensationCoefficient;  //temperature
compensation
    TDS_CH3_VALUE=(133.42*compensationVolatge*compensationVolat-
ge*compensationVolatge - 255.86*compensationVolatge*compensationVolatge + 857.39*com-
pensationVolatge)*0.5; //convert voltage value to tds value
    Serial.print(tmpetValue,1);
    Serial.print("  ");
    Serial.println(TDS_CH3_VALUE,1);
}

void update_show_TDS(){
 oled12864.clear();
 oled12864.show(0,2,"TDS");
 oled12864.drawBitmap(64, 0,  str_ce, 16, 16, 1);
 oled12864.drawBitmap(80, 0,  str_shi, 16, 16, 1);
 oled12864.show(2,0,"TM ");
 oled12864.show(2,3,(float)tmpetValue);
 oled12864.show(3,0,"TD ");
 oled12864.show(3,3,TDS_CH3_VALUE);
 oled12864.display();

 Serial.print( tmpetValue );
 Serial.print( "  " );
 Serial.println( TDS_CH3_VALUE );
}

int getMedianNum(int bArray[], int iFilterLen)
{
    int bTab[iFilterLen];
    for (byte i = 0; i<iFilterLen; i++)
   bTab[i] = bArray[i];
    int i, j, bTemp;
    for (j = 0; j < iFilterLen - 1; j++)
    {
   for (i = 0; i < iFilterLen - j - 1; i++)
      {
    if (bTab[i] > bTab[i + 1])
       {
   bTemp = bTab[i];
      bTab[i] = bTab[i + 1];
   bTab[i + 1] = bTemp;
     }
   }
    }
    if ((iFilterLen & 1) > 0)
  bTemp = bTab[(iFilterLen - 1) / 2];
    else
  bTemp = (bTab[iFilterLen / 2] + bTab[iFilterLen / 2 - 1]) / 2;
    return bTemp;
}
```

ASSEMBLY PROCESS



After completing the technical test, I assembled the blood drawing device and turbidity detection device on the sleeve.

After the user puts on the rear device, the blood turbidity test is performed.

FINAL OUTCOME

when we all become Cyborgs, we will have more and more mechanical impurities in our blood.

We need to filter and purify the impurities in our blood to sustain life and donate blood.