MIT ECG介紹與轉換格式

110316108 黃麗文

何謂 MIT ECG？

- 心電圖訊號處理技術

- MIT-BIH Arrhythmia Database（心律失常數據庫）
  由麻省理工學院(MIT)和波士頓醫院(BIH)建立

PhysioNet： https://physionet.org/lightwave/?db=mitdb/1.0.0

第一個能普遍獲得的標準測試資料庫

評估心律不整或心臟疾病偵測器的效能

共48筆資料

長度：30分鐘

取樣頻率：360Hz

解析度：11bit

| Reference annotations	Signals	Header
100.atr	100.dat	100.hea
101.atr	101.dat	101.hea
102.atr	102.dat	102.hea
103.atr	103.dat	103.hea
104.atr	104.dat	104.hea
105.atr	105.dat	105.hea
106.atr	106.dat	106.hea
107.atr	107.dat	107.hea
108.atr	108.dat	108.hea
109.atr	109.dat	109.hea
111.atr	111.dat	111.hea
112.atr	112.dat	112.hea
113.atr	113.dat	113.hea
114.atr	114.dat	114.hea
115.atr	115.dat	115.hea
116.atr	116.dat	116.hea
117.atr	117.dat	117.hea
118.atr	118.dat	118.hea
119.atr	119.dat	119.hea
121.atr	121.dat	121.hea

.hea (標頭檔)

ASCII碼字元儲存

記錄基礎訊息

```
100 2 360 650000
100.dat 212 200 11 1024 995 -22131 0 MLII
100.dat 212 200 11 1024 1011 20052 0 V5
# 69 M 1085 1629 x1
# Aldomet, Inderal
```
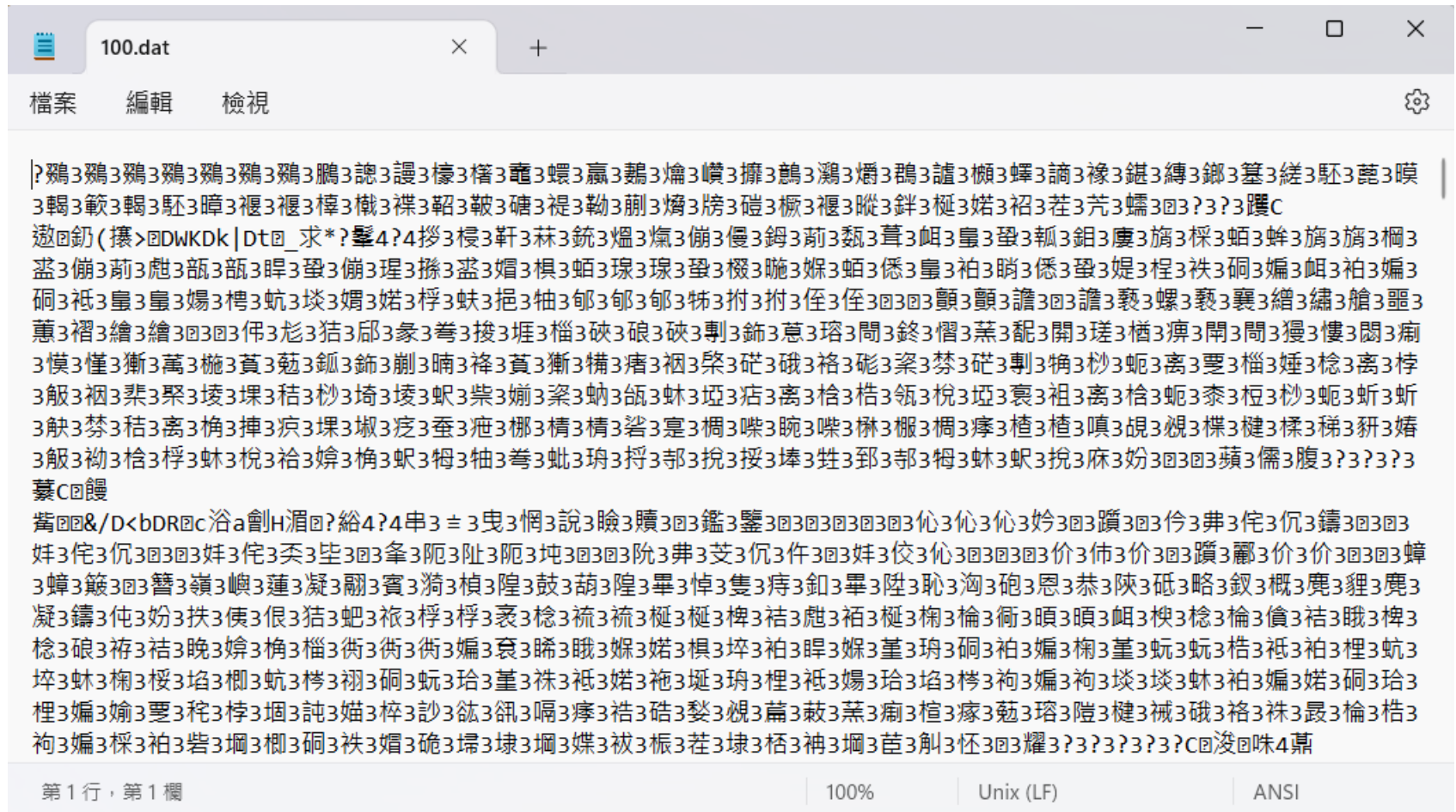
.atr (標記檔)

二進制儲存

記錄專家對心電信號
做出的診斷訊息
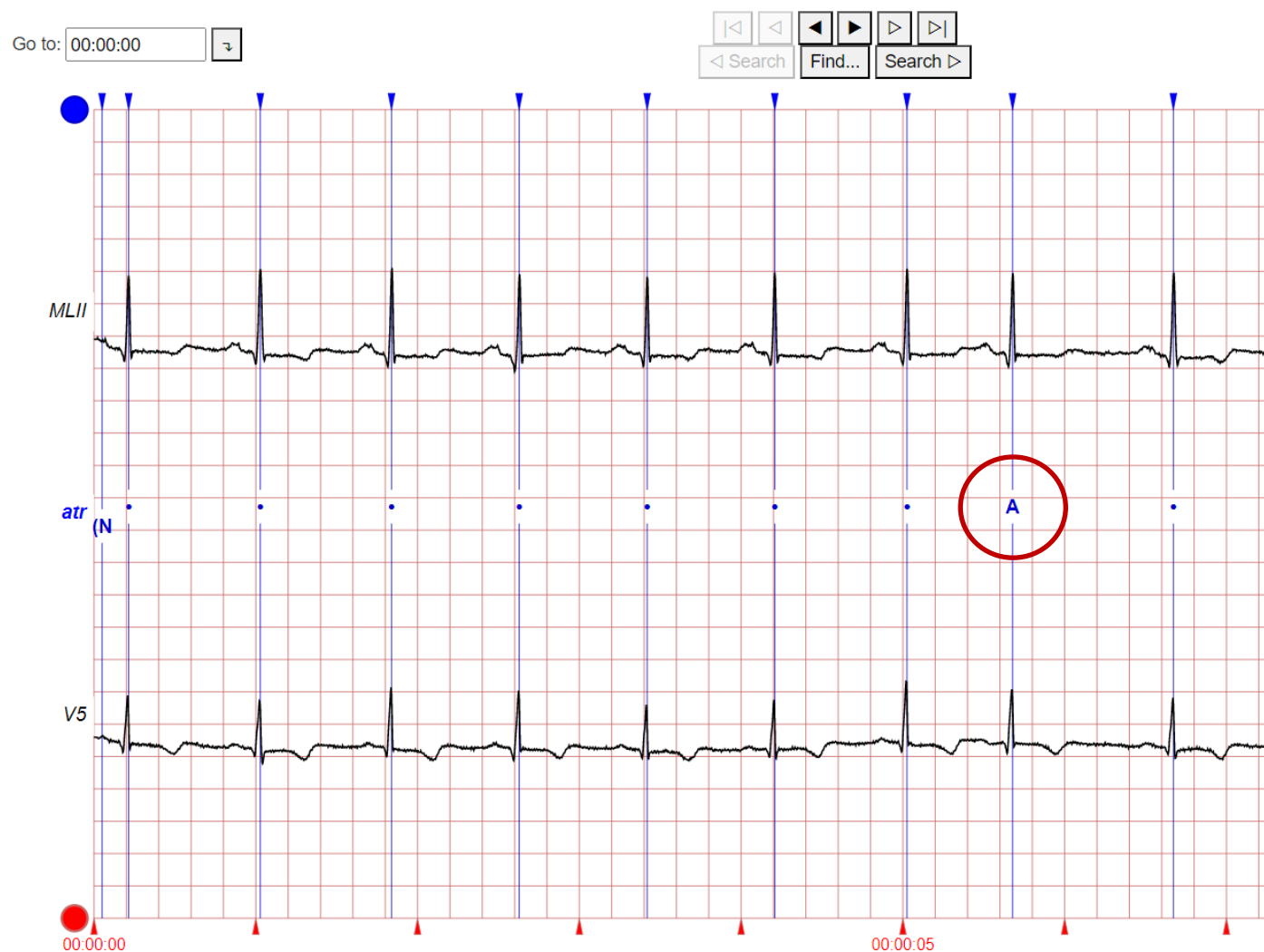
Code	Description
N	Normal beat (displayed as "·" by the PhysioBank ATM, LightWAVE, pschart, and psfd)
L	Left bundle branch block beat
R	Right bundle branch block beat
B	Bundle branch block beat (unspecified)
A	Atrial premature beat
a	Aberrated atrial premature beat
J	Nodal (junctional) premature beat
S	Supraventricular premature or ectopic beat (atrial or nodal)
V	Premature ventricular contraction
r	R-on-T premature ventricular contraction
F	Fusion of ventricular and normal beat
e	Atrial escape beat
j	Nodal (junctional) escape beat
n	Supraventricular escape beat (atrial or nodal)
E	Ventricular escape beat
/	Paced beat
f	Fusion of paced and normal beat
Q	Unclassifiable beat
?	Beat not classified during learning

.dat (資料檔)

二進制儲存

(Format212格式)

```c
#include <stdio.h>
#include <stdlib.h>

bool dataToJSArray(const char* filename, unsigned int readOffsetByte)
{                                        //從檔案的哪個位置開始讀取數據
    FILE* pFile; //要讀取的檔
    FILE* pFileOut; //要寫入的檔
    //size_t result;

    pFileOut = fopen("ECGdat2020.js", "w");
    pFile = fopen(filename, "rb");

    if (pFile == NULL)
    {
        fputs("File error", stderr);
        exit(1);
    }

    fseek(pFile, readOffsetByte, SEEK_SET); //將文件指針移到指定的讀取偏移位置(readOffsetByte)

    char buffer[24000];
    int readBytes; //需要讀取的字節數

    readBytes = 360 * 3 * 5;  //sample rate 360, 1.5 * 2 leads, 5 seconds
    fread(buffer, 1, readBytes, pFile); //從二進制檔案中讀取指定字節數(readBytes)的數據，並將結果存在buffer中
    buffer[readBytes] = 0; //最後一個字節設置為零，以確保JavaScript數組的結尾

    int i;
    unsigned char b1, b2, b3; //byte0 byte1 byte2
    int v; //chanel

    fprintf(pFileOut, "var ECGdat =[ \n");

    for (i = 0; i < readBytes; i = i + 3) //212格式
    {
        b1 = buffer[i];
        b2 = buffer[i + 1];
        b3 = buffer[i + 2];
        v = (b2 / 16) * 256 + b1; //chanel 1 1byte=8bits
        printf("%u, ", v);
        fprintf(pFileOut, "[ %u,", v);
        v = (b2 % 16) * 256 + b3; //chanel 2
        printf("%u \n ", v);
        fprintf(pFileOut, "%u ]", v);
        if (i + 3 < readBytes) fprintf(pFileOut, ",\n");
    }
    fprintf(pFileOut, "];");

    fclose(pFile);
    fclose(pFileOut);
}

int main(int argc, char* argv[])
{
    dataToJSArray("100.dat", 0);
    return 0;
}
```

二進制數據轉換為 JavaScript

Debug　x64　　本機 Windows 偵錯工具

Source1.cpp

main　　　　(全域範圍)　　　dataToJSArray(const char * filename, unsigned int readOffsetByte)

```cpp
1    #include <stdio.h>
2    #include <stdlib.h>
3
4    bool dataToJSArray(const char* filename, unsigned int readOffsetByte)
5    {                                          //從檔案的哪個位置開始讀取數據
6        FILE* pFile; //要讀取的檔
7        FILE* pFileOut; //要寫入的檔
8        //size_t result;
9
10       pFileOut = fopen("ECGdat2020.js", "w");
11       pFile = fopen(filename, "rb");
12
13       if (pFile == NULL)
14       {
15           fputs("File error", stderr);
16           exit(1);
17       }
18
19       fseek(pFile, readOffsetByte, SEEK_SET); //將文件指針移到指定的讀取偏移位置(readOffsetByte)
20
21       char buffer[24000];
22       int readBytes; //需要讀取的字節數
23
24       readBytes = 360 * 3 * 5;  //sample rate 360, 1.5 * 2 leads, 5 seconds
25       fread(buffer, 1, readBytes, pFile); //從二進制檔案中讀取指定字節數(readBytes)的數據，並將結果存在buffer中
26       buffer[readBytes] = 0; //最後一個字節設置為零，以確保JavaScript數組的結尾
27
28       int i;
29       unsigned char b1, b2, b3; //byte0 byte1 byte2
30       int v; //chanel
31
```

120 %　　　⊗ 0　　⚠ 1　　　　　　　　　　行: 16　字元: 18　　SPC　CRLF