运用脑电信号监测系统预警睡眠状态下疾病的突发

Using EEG monitoring and warning specific disease in deep sleep situation

负责人：王煜小组成员：张洪滨 邵嘉琳 江旻宇 付雨童指导教师：段立娟 陈军成

Group Leader : Wang Yu

Group Member : Zhang Hongbin , Shao Jialin , Jiang Minyu , Fu Yutong

Supervisor : Duan Lijuan , Chen Juncheng

**项目简介**

本项目研究的根本内容是脑机交互技术。该技术的目的是将“数据采集、传输、识别”的这一模式，应用于对人体脑电的实时采集以及分析。

EEG: electroencephalograph

KEY POINT: Brain-computer interactive technology

Purpose: Using “data acquisition, transmission, identification” in collecting and analyzing real-time EEG data.

本项技术可以应用在“脑电信号监测系统”，该系统综合利用传统传感器、脑电传感器等实时监测并记录室内人、物信息，对室内可能存在的危险进行预警。当室内存在潜在危险时，通过报警、短信、微信等方式及时通知相关责任人，降低室内人、物的风险，为幼儿、老年人等特定群体在室内提供安全保护，可以有效降低特定人群因无人陪伴而收到潜在生命威胁的几率。

This technology can be used on the EEG signal monitoring system, which uses sensors such as traditional sensors and EEG sensors, to monitor and record real-time data of people and articles indoor.

（When there are potential dangers indoor, the system could inform related people through alarm, SMS, and Wechat to avoid dangerous situation of indoor people and materials. This system provides protection for specific people indoor like the old and the baby.）

为了更直观地展现此技术，我们制作了脑电波小车。该小车应用了脑机交互技术，使佩戴脑电传感器的操作者可以通过脑电波远距离无线操控小车的前进模式和移动方向。

In order to directly show the technology, we make an EEG smart car.

The smart car uses brain-computer interactive technology thus the operator wearing EEG could operate the smart car through EEG. The smart car could carry out the specific action like moving mode and moving direction according to the real-time data and program.

**研究思路**

1.信号采集：利用mindwave装置采集人类脑电信号，通过串口，将蓝牙信号传输到电脑上；2.信号处理：并用利用c#语言，根据人类特定动作产生的特定脑电波，按照峰值大小不同进行归纳整理出两 种特定动作人类的脑电波（眨眼和挥拳）；将两种脑电波作为小车动作的触发条件，每一种脑电波对应小车 的一种动作（眨眼—右转，挥拳—左转）；3.信号输出：通过电脑的串口，用蓝牙信号将小车与电脑连接，将动作信号传输给小车，小车运动。Research ideas

1. Signal acquisition:

Mindwave-EEG signals (Bluetooth) computer- c # language(Bluetooth)- car

（The Mindwave devices collect human EEG signals then the signal transmits them to the computer through the serial port; ）

2. Signal processing:

（According to some generated actions we collect human brain waves, and use c # language to induct and reorganize the Brainwaves.

Collect two kinds of EEG signal to trig movements, while each one corresponds to a specific action of the smart car: blink - turn right, fist - Turn left; ）

3. Signal output:

（Through the computer's serial port, the Bluetooth signal connect the car and the computer, then the computer send the action instruction to operate the smart car.）

**研究方法**

1. 利用mindwave收集脑电信号； 2.测试不同人的脑电信号，得出脑电信号峰值的范围； 3.利用c#程序编写串口间的蓝牙信号传输； 4.利用Arduino程序编写小车特定动作的指令； 5.利用c#程序编写脑电信号峰值的筛选。

Research Methods

1. Using Mindwave collecting EEG signals;
2. Testing several people’s signals and normalizing peak value into a specific range;
3. Using C# programming communication module between Bluetooth signals;
4. Using Arduino programming specific instructions for the EEG smart car;
5. Using C# programming filter module for peak value.

**项目进程**

Part I : 前期准备 确定以Arduino作为小车搭建的基础平台； 采买相关硬件软件。Part II : 初期学习 用元件板搭建小车，学习Arduino的运行方式，编写Arduino应用程序； 学习使用mindwave。Part III : 中期调试 用C#编写mindwave应用程序，并进行调试； 对程序进行测试，收集数据并处理。Part IV : 后期比对 将测试所得数据与特定疾病的脑电波特征峰值进行比对，确定可用峰值及其特性； 将mindwave数据输出与小车运动模块进行连接，使小车可以接收脑电信号进行比对。Project progress

Part I: Preparation

Assure Arduino as the basic platform for building the smart car;

Purchase related hardware and software.

Part II: Learning

Learn how Arduino works and write application program;

Learn how to use Mindwave.

Part III: Commission

Use C# programming application and debug;

Test the program, collect data and analyze them.

Part IV: Comparison

Compare EEG signals between collected ones and peak value of specific diseases to check the peak value and its characteristics;

Connect the Mindwave data output module and smart car movement module to ensure the smart could receive data then do the comparison progress.

**项目成果**

1. 编写出可以获取、处理、输出实时采集脑电波数据的程序2. 编写出控制小车移动的程序3. 通过实验发现了可以使脑电波产生明显变化的特定行为4. 编写出可以分析某些行为产生的脑电数据并使其控制小车移动的程序Project achievement

1. Write a program that can acquire, process and output real-time brain wave data;

2. Write a program to control the movement of the smart car;

3. Find the specific action which could bring an obvious change in EEG;

Through the experiment found that some specific behavior can make significant changes in brain waves

4. Write a program that can analyze EEG data generated by certain behaviors and allow them to control the movement of the smart car

**参考文献**

https://www.arduino.cc/http://blog.csdn.net/u013472838/article/details/52300875?locationNum=2&fps=1http://neurosky.com/biosensors/eeg-sensor/季忠，秦树人，彭丽玲——脑电信号的现代分析方法，重庆大学学报（自然科学版），2002-25(9)

实验数据

Experiment Data

挥拳眨眼

Fist and 3 blinks

综合数据

Integrated data