Detection and Treatment of Drinking Water and Oxygen Content in the Plateau Based on Development Board

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Abstract. Using CC2530 development board, based on the Qinghai-Tibet Plateau, taking Qinghai University as a sample point to analyze the changes of human drinking water and the influence of oxygen content on human health and developing intelligent health system suitable for plateau climate. With the help of the development board to get the local humidity and temperature, the use of json protocol encapsulates the elevation of different regions of the information and basic information of the city, with reference to modern medicine and natural science data, derived drinking water and temperature and humidity of the formula and oxygen content Calculation formula with altitude, the regional real-time data visualization. At the same time to provide a moment of the optimum amount of drinking water and the current considerations of oxygen content, reducing the impact of altitude, temperature, humidity and climate and other factors on human health in the plateau.

Introduction

The temperature difference between day and night in the northwest plateau area is large, the humidity is greatly reduced, and the air is thin, creating a unique landscape and delicious food. At present, the country has made great efforts to develop the tourism industry in the northwestern region and improved the quality of education so that people who travel and study in the western plateau region will gradually increase their population. The non-adaptability of foreigners to the plateau environment may lead to different degrees of adverse reactions [1].

In this paper, the questionnaire and medical experiments in the form of surveys in central and eastern regions of Qinghai area to changes in drinking water and air oxygen content on human health effects, combined with computer technology and CC2530 development board [2] and the existing medical and natural science research as a result, a smart health system designed for the plateau climate has been designed.

Design

Principle Analysis

Using CC2530 development board to get the local temperature and humidity, reference to the existing materials of contemporary medicine and natural science, formulating the algorithm formula, according to the real body of water loss to calculate how much water the body needs daily intake to maintain the basic human needs. Using json protocol to encapsulate the altitude information in different regions [3], this paper makes its own json protocol based on the existing altitude information table, and obtains the information such as city code, pinyin, city name and province. Depending on the city, get the altitude and the province of the area. Json protocol format as shown in Figure 2-1:
Due to the different environment, the body's oxygen content will change with the altitude changes. When people live in lower elevations, their body oxygen levels are around 95%, but they live in the plateau or in areas with low oxygen levels, with oxygen levels in the human body about 50% -70%. This paper mainly uses BeiDou Navigation System or Google Maps to obtain the current elevation information in real time, parses the data of elevation, encapsulates the json protocol, obtains the city's altitude according to the city's name or number, and uses the formula of oxygen to calculate the current oxygen content. According to the relationship between the oxygen content of the environment and the oxygen content of the human body, the author analyzes whether the human body discomfort occurs in the current environment and gives the best suggestion and the corresponding solution.

**Principle Analysis of Drinking Water.** From a medical point of view, the human body in addition to invisible water every day to add about 1500ml-2000ml[4]. And people most suitable humidity range is relative humidity of 45% -60%, the most suitable temperature is 22 degrees -26 degrees[5]. The body's water intake is divided into apparent intake and invisible intake, of which drinking water is a significant intake, but by eating, fruits, vegetables and other ways to intake of water invisible intake. The form of water is also divided into apparent loss of water loss and invisible water loss, which exclude abnormal water loss pattern, skin, respiration, lung loss of water as invisible water loss. There are mainly four ways to discharge the body's moisture: the skin evaporates (including dominant dehydration and insignificant dehydration), the daily discharge of water is about 400ml; breath out of the water, about 400ml daily; with the feces The daily discharge of water about 200 ml; by renal excretion of urine, daily urine output of about 1350 ml. Therefore, by using questionnaires and medical experiments, taking Qinghai University as a research object, the formula for calculating the change of drinking water amount and body water shortage after all middle and eastern students on campus came to the Loess Plateau was calculated. The apparent and invisible water loss as the body's daily water intake. Calculate the difference between the human body exhaled gas and the incoming gas humidity can get the body's daily loss of water for how much. Calculate the human daily excretion and rejection of lost water and daily due to dry weather and temperature changes caused by the loss of water to get the body a day of water loss, and ultimately get a relatively accurate formula for calculating the amount of water loss[6]. According to the analysis shows that human water loss and the environment are closely linked, especially with the environment temperature and humidity. When the temperature is too low, the human skin pores will shrink, metabolism will speed up, it will reduce the loss of water in the skin. When the temperature is too high, the human skin will open the pores, sweat the way the body temperature regulation, which will speed up the loss of water in the skin.

The above materials can know the relationship between water loss and temperature and humidity of the human body as follows:

\[
water = 5100 - 31 \times chartdata2
\]  

(1)

**Principle Analysis of Oxygen Content.** When people in the central or western regions come to higher elevations, nausea, vomiting and other reactions may occur because the local air oxygen content can not meet the human body's demand for oxygen[7]. This is the so-called plateau reaction. In this paper, the relationship between oxygen content in the air and oxygen content in the human
body is obtained. Elevation and oxygen content of which the relationship shown in Figure 2-2, the figure shows:

1) altitude of 0 meters, air oxygen content decreased by 0%, air oxygen content of 20.95%, 0% of the oxygen content of 100% elevation;
2) altitude of 100 meters, oxygen content of air decreased by 0.16%, air oxygen content of 20.79%, 0% of the oxygen content of 99.2%;
3) altitude of 1000 meters, air oxygen content decreased by 1.6%, air oxygen content of 19.35%, 0 of 92.4% of the oxygen content;
4) altitude of 5000 meters, air oxygen content decreased by 8%, air oxygen content of 12.95%, 0% of the oxygen content of 61.8%;
5) altitude of 10000 meters, air oxygen content decreased by 16%, air oxygen content 4.95%, 0 of 23.6% oxygen content;
6) altitude 130930 meters, air oxygen content decreased 20.95%, air oxygen content 0%, 0% of the oxygen content of 0;

The resulting formula for altitude and oxygen is:

\[ \text{oxy} = 100 - 0.00104 \times \text{alt} \]  

Sensor Selection

Use the CC2530 development board to read the temperature and humidity data of the temperature and humidity sensor SHT10. The development board is shown in Figure 2-3.
Through the development board will be sampled data conversion and then displayed on a PC, which read temperature and humidity is the use of CC2530's I/O (P1.0 and P1.1) serial data transmission. This is because the SHT10 is a highly integrated temperature and humidity sensor chip that provides fully calibrated digital output. The sensor consists of a capacitive polymer moisture sensor, a temperature sensing element made of energy gap material, and a seamless connection to the 14-bit A/D converter and serial interface circuitry on the same chip. The circuit diagram of temperature and humidity sensor is shown in Figure 2-4. The sensor consists of a capacitive polymer wetting element and an energy gap temperature measuring element, and is connected with a 14-bit A/D converter and a 2-wire digital interface seamlessly integrated in a single chip, making the product has the advantages of low power consumption, fast response, anti-interference ability [9].

![Temperature and humidity sensor circuit](image)

**Figure 2-4.** temperature and humidity sensor circuit [10].

**System Implementation**

Using IAR Embedded Workbench [11] and Visual studio 2015 as the development platform, the local temperature and humidity are obtained through the CC2530 development board. The acquired real-time detection data is shown in Figure 3-1.

It can be seen from the curve of temperature and humidity that the temperature and humidity acquired by the sensor change in real time as the external environment changes, and the time unit of the horizontal axis is second (s). Access to temperature and humidity, according to the human body needs water and temperature and humidity of the relationship between the formula, the body's real-time water demand shown in Figure 3-2.

![Temperature and humidity curve](image)

**Figure 3-1.** Temperature and humidity curve.

![Drinking water demand](image)

**Figure 3-2.** Figure of human water demand.
With the temperature and humidity curve and the body water demand figure found that the curve of drinking water changes with the temperature and humidity changes in real time [12]. For the oxygen content of the air, the current elevation information of the city is obtained through the json protocol, and the local oxygen content information is obtained from the altitude information. Through the oxygen content of the air how much to determine whether the impact on the human body in the current environment [13]. The relationship between elevation and oxygen content is shown in Figure 3-3. The figure shows that the current city is Xining. The elevation of the city is 2295 meters and the current oxygen content is 76%. Since the current area is at a high altitude. The area is not suitable for strenuous exercise [14].

![Figure 3-3. Altitude and oxygen diagram.](image)

After each small module function is implemented, the results are displayed in the MFC dialog via TeeChart Pro. The main interface as shown in Figure 3-4:

![Figure 3-4. The main interface.](image)

**Conclusion**

Based on the development of CC2530 development board in the plateau region at a time the optimum amount of drinking water and the current detection of oxygen considerations, including CC2530 circuit board as a tool to obtain temperature and humidity through the body's moisture content and temperature and humidity to calculate the human body in the current environment Real-time drinking water. Json protocol to get the current elevation information of the city, the conversion formula to calculate the local oxygen content, and then for the first time to enter the plateau region to do a guide. However, the value of the altitude is not obtained by the GPS in real time, but based on the current elevation of the city as a reference altitude, the conclusion of the data will be a certain error. This is also the next problem to be solved in this article.
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