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Water quality monitoring data transmission network design

Zixu Zhang

School of Communication Engineering, Xi dian University of Electronic Science and Technology, Xi'an, Shaanxi , 710126, China

20012100088@stu.xidian.edu.cn

Abstract. With the continuous advancement of electronic technology and the introduction of new concepts, people's demands on life are increasing and the concept of intelligent automation is gaining popularity. With the continuous consumption of the source of life, people's concern about fresh water resources is also increasing. With the theme of intelligent detection, a water quality online monitoring system that integrates detection and monitoring is designed. The system can monitor temperature, humidity, water level and turbidity in real time, and can transmit monitoring values through wireless module. Users can use mobile applications to view the data detected at this time, which is very convenient. The system hardware design includes STM32 system processor circuit, temperature and humidity sensor module, water level monitoring module, WIFI module, and turbidity monitoring module design.

Keywords: STM32, WIFI, temperature and humidity, water level, turbidity.

1. Introduction

1.1. Design background

With China's rapid socio-economic development and accelerated urbanization and industrialization, large amounts of urban and industrial wastewater flow into rivers, lakes and reservoirs, causing serious pollution of surface and groundwater. The land area of the Earth is small and mostly water, so the Earth can still be a water planet. But despite the fact that water makes up most of the land area, freshwater resources are very small, with only 1% of the land globally[1] . With the destruction of industrialization and people's lack of economy, when many fresh waters are icebergs, only one percent of the region's fresh water resources become increasingly scarce[2] . With the development of high technology such as electronics, sensor technology, computer technology, and modern communication technology, security technology has gradually developed. People are also becoming concerned about saving water resources and dealing with polluted water[3] . The state and society have also gradually increased their attention and support for water quality testing, and technicians are constantly updating their testing techniques, and more and more testing programs are available .[4]

1.2. Design status and significance

As the problem of food and clothing has been solved, the quality of life has also improved. People are more concerned about safety, including life safety and food safety, especially water quality safety. At

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this time, the combination of electronic technology and people's needs has given rise to a new concept of online water quality testing. In a large IoT city, the smart points connecting each house separately form a large smart city framework. In this large framework, the intelligent monitoring of water quality is the most basic and important point. The country is also actively supporting and developing technologies and methods in this field, and smart testing has become the theme of the times. Water quality monitoring focuses on specific aquifers (e.g. rivers, lakes, reservoirs, oceans)[5] . Several water quality parameters are measured and analyzed, and the types and concentrations of pollutants are measured and evaluated. Scientists must not only manage sources of pollution, but also deal with water pollution incidents on an emergency basis[6] . In addition, the government has developed a development plan to support the data of the Ministry of Environmental Protection and to enhance the protection of the aquatic environment. In order to address China's Water Pollution Crisis, monitoring water quality and enhancing the protection and management of the water environment should be considered first.

Currently, the world attaches great importance to water quality monitoring, and countries have developed water quality standards and water quality monitoring standards according to the actual situation. Water quality standards and technical standards for monitoring water quality are also being developed[7] . For example, the national surface water quality standards (GB 3838.ANE 2002), national groundwater quality standards (GB/T 1448.93) and water quality monitoring standards (SDL 27.84), water quality results are not timely[8] . In view of this situation, real-time water quality monitoring system is particularly important. Fixed point of water quality by a specific water quality detector detection, the point of water quality information obtained by the microsystem processor and real-time transmission to the LCD module. The system will display the water quality in real time, and can be viewed online at[9] . Online water quality monitoring system is designed for the security risk of water quality, such as some water quality parameters: temperature, turbidity, humidity, water level, etc.[10] .

2. Solution design of the system

2.1. System main modules

2.1.1. Processor. The STM32F103RCT6 is the STM32F103 family of microprocessors from Italian Semiconductor. the STM32 has a maximum frequency of 72MHz, access to zero spare memory, and is based on the Harvard framework with triple pipelining capabilities. Its high processing efficiency ensures that it can handle water meter data recovery and load data efficiently in real time. the STM32 comes with 64k bytes of flash memory. It has multiple low-power modes: standby, active shutdown, and shutdown modes. Peripheral device clocks can be turned off individually. In the shutdown mode, the power consumption of STM32 is only about 4.5uA, which can fully meet the requirements of intelligent control power supply and achieve and ensure the low power consumption characteristics of the whole system.

2.1.2. Wireless communication module. The Esp8266ex is a complete integrated WLAN networking solution that can run standalone or as a slave on another MCU host. If the Esp8266ex is equipped with an application processor as the only application processor on the device, it can be booted directly from external flash memory. Memory helps to improve system performance and reduce memory requirements. If the esp8266ex is responsible for WLAN adapter tasks, it can be added to any microcontroller-based project. Simply connect via SPI/SDIO or I2C/UART. In addition to the WLAN functionality, the esp8266ex integrates a 32-bit processor and Tensilia l106 Drill Series SRAM with powerful processing and storage options. lexin provides a software development kit (SDK) with several example codes. esp8266ex 122200Grad2; internal integration includes an antenna switch, RF balanced-un The ESP8266 module is very small (19mm*29mm) and the module is connected externally via six rows of pins spaced 2.54mm apart, making it easy for each person to install in their

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own device; compared to the TC35i compared to the TC35i, the ATK-ESP8266 has a smaller size, higher speed, lower power consumption and richer frequency band.

2.1.3. Temperature and humidity monitoring module. In conventional standard signal measurement systems, technical problems such as incorrect ordering of information (e.g., conversion of errors to variables and circuit bias in circuits) must be addressed in surprising ways. In addition, normal observation sites are weak electromagnetic environments that generate strong signal interference, and analog temperature signals are prone to distortion, distortion and designation. The results show that the temperature measurement scheme is effective against new digital temperature disturbances in the system; the solution to these problems is an effective solution that is well suited for new digital thermal sensors and lower, more accurate and higher voltages, as well as for a wider range of cable applications and networks

2.2. System architecture

The system consists of a monitoring terminal and a mobile APP. Monitoring terminal is responsible for monitoring water quality data. After connection, WIFI communication automatically connects and transmits the collected data to the mobile APP through wireless transmission. users can view the measurement data in real time at any time. At the same time, the monitoring system can be installed dry cell and battery power. The two power supplies can be automatically switched, or only one power supply can be installed. The feeding methods are various. The schematic block diagram of the system is shown below.

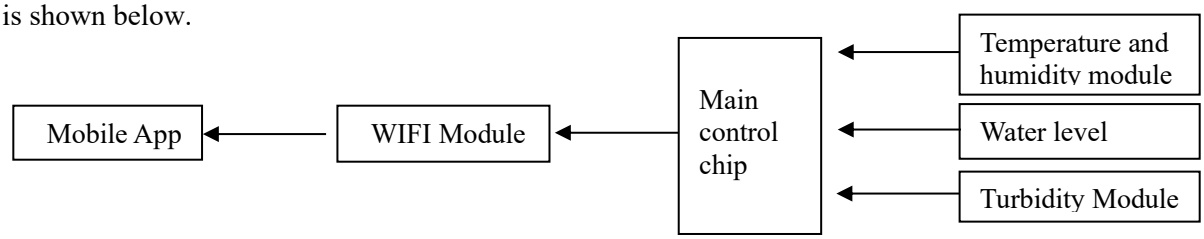

Figure 1. System architecture.

The monitoring terminal of the system consists of the main control chip, temperature and humidity module, water level module, turbidity module and WIFI module, and the WIFI module and cell phone APP for communication.

2.2.1. Main processor system circuit. The STM 32 series and STM 323c 8t 6 models were used as the main chips for the system to acquire sensor data and process the data through algorithms. components required for the STM 32 system also included a start-up mode selection circuit, vibration recovery circuit, etc. to connect the two ADC interfaces to the sensors during the circuit design. Lights and buttons were added to the design. The design requires system and external circuitry.

The microcontroller can adjust the clock frequency. This is because such microcontrollers have high action voltages corresponding to various action speeds, and it is difficult to obtain a fixed voltage output from the power supply. This is especially true for batteries, because the discharge time produces a reduced voltage. This macroprocessor can provide 32 free I/Os, but this design requires a matrix keyboard, so this design solves a very important problem.

2.2.2. Temperature and humidity module. The STM32 temperature and humidity measurement module and the pinout of the interface circuit are shown in Fig. The SHT20 operates in external power mode and the STM32 uses PA0 to communicate with the SHT20. When the temperature measurement program is running, the value is read only when the temperature is 1. The temperature measurement is then called from the read program. The single line, low level and high level interfaces of the microcontroller are used to read the data.

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2.2.3. Water level monitoring module. The water level monitoring module mainly uses the three-diode current amplification principle. When the three diode substrates are guided to the positive D at the level, a certain amount of current is generated between the three diode substrates and the emitter electrode. The power supply is used to obtain a reading converter. When the liquid level directs the three diode substrates to the positive electrode, the module uses mainly the current amplification principle of the three diodes. A current of one magnitude is generated between the three diode bottoms and the emitter electrode and a number of currents are generated between the collector and emitter electrodes of the three transistors. The current generated by the resistors can be used to purchase ad converters.

2.2.4. Turbidity detection module. The TS-300B turbidity sensor measures the turbidity of wash water (suspended solids counter). Based on the optical principle, the sensor is used to measure the turbidity of wastewater or the concentration of other substances and receives light-emitting diodes and photodiodes at specific wavelengths. kie turbidity sensor works on the principle that when light passes through a certain amount of water, the degree of light penetration depends on the amount of dirt in the water. As the amount of dirt increases, the amount of light passing through the water sample decreases. The turbidity sensor measures the amount of light passing through to calculate the turbidity of the wash water. The sensor provides these turbidity measurements to the washing machine or dishwasher controller, which determines the duration of each wash cycle. These determinations are based on a comparison between the measurements of purified water (measured at the beginning of the wash cycle) and the measurements of wash water at the end of the wash. Measuring the turbidity of the wash water saves energy when washing less dirty clothes and the washing machine can only wash for as long as necessary, thus saving energy for the end user.

2.2.5. WIFI module interface. The communication between the WIFI module and the STM32 uses the serial communication interface 232. RS-232 uses a differential signal +2v + 6v + 0 negative logic. 6v minus 2v means 1. RS 232a 2 children and 4 children. In RS 232 communication networks, the host communication mode is typically used, i.e., a host with multiple receivers. When connected to an RS-232 communication link, the "A" and "B" ends of each interface are easily connected to a pair of flags. However, the common-mode voltage range of the transceiver is 7+12v (RS-232) and the network usually forgets to work properly only when the above conditions are met. The stability and reliability of communication and promote further damage to the interface and 2:emi problem: The common mode of the output signal of the transmission unit section is a low resistance feedback channel ("ben signal field"), which does not require the final feedback circuit of the source. As a form of radiation and large antennas, the bus acts as an external electromagnetic wave radiation.

3. Conclusion

The water quality detection transmission network system designed in this paper uses STM32 microcontroller as the control core. According to the actual function of the circuit, the circuit can be divided into STM32 system processor circuit, temperature and humidity sensor module, water level monitoring module, WIFI module, turbidity monitoring module, and the specific circuit design of the unit is realized. Although the main task has been completed, the design A basically meets the requirements and objectives. More research and development is needed in order to improve many functions. In the future, Li-ion batteries will have higher power ratios, more convenient sizes and more complete energy storage and monitoring systems. During the layout design process, there are many problems in the production process. I understand the importance of selecting and understanding the equipment in order to avoid unnecessary projects and save time when designing simulations.

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