Design of Intelligent Detection System Based on Bionic Robot Snake

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Abstract: Bionic robot can constantly adapt to the new requirements and environmental changes, to explore the dangerous areas to provide effective solutions for bionic robot can adapt to all kinds of complex terrain, such as the battlefield demining, detects, blasting, mine rescue, and debris detection pipeline maintenance and alien surface detection, its performance is superior to the traditional crawling track, has very broad application prospects in many fields In this paper, a seven-joint snake-like robot structure similar to sinusoidal waveform is proposed to realize the autonomous detection function of the bionic robot snake. It can automatically avoid obstacles, automatically collect the data of the surrounding environment, and transmit the data to the mobile app to realize real-time monitoring

1. Introduction

In the bionic robotics, the emergence of the robot snake can provide the freedom and flexibility of the biological snake. With high degree of freedom, it will play an important role in many fields. In the future world, the bionic robot snake can detect, monitor and fight on the battlefield, and can also be used for target tracking and environmental data monitoring.

2. System Framework and Working Principle

This paper proposes a snake-like robot is similar to sine wave 7 joint structure, snake wiggling with eight steering gear, and some auxiliary motor drive it forward, human body infrared flame use temperature and humidity sensors and photosensitive resistance surrounding environment data, using wireless module for wireless monitoring, buzzer alarm, and use the OLED and five keys and a serial port debug finally achieved the design of bionic robot autonomous detection function, it can realize automatic obstacle avoidance, automatically collect environment data, and data transfer to mobile phones, can realize the function of real-time monitoring The STM32f103ZET6 microcontroller is designed to drive the steering motor and ultrasonic specific structural functions, as shown in Figure 1.

3. The Hardware Design

This design mainly includes circuit are respectively: WIFI module interface, stm32f103zet6

SCM smallest system, dht11 module interface, photosensitive resistance 18650 charge and discharge circuit, ams1117-5 V voltage regulator circuit, ams1117-3.3 V voltage regulator circuit, five key circuit, the human body infrared interface, flame sensor interfaces, ultrasonic module interface, oled module interface, buzzer module, motor driver interface, steering gear set of interfaces (see figure 1)

Fig.1 System Hardware

In this design, the use of the two kinds of voltage chip, one is the FP6291 booster chip, through to the 18650 lithium-ion batteries, booster to complete 5 V voltage output is another AMS1117-3.3 V chip, this chip can be stable for the system to provide constant voltage of 3.3 V ESP8266WIFI module selection is LeXin ESP8266, belongs to the enterprise for the LeXin information technology co., LTD., just burn write Gagent firmware on module, can quickly achieve remote control device M2M access data statistical analysis interface function such as service OTA upgrade a third party The firmware supports SoC scheme and secondary development, which can greatly save the cost. The time steering gear used for simplified development is SG90's 180 digital steering gear, and the 90G small steering gear is light and affordable, which can complete the functions required for this project. Meanwhile, it is also suitable for those control systems that need constant change of Angle and can be maintained.

4. The Software Design

Single chip MCU receives the human body infrared sensor, the flame sensor, temperature and humidity sensor and ultrasonic module and the data of photosensitive resistance, through algorithm processing, into the circulation after judgment, single chip microcomputer to respond, drive motor, steering gear set, a buzzer, and the data display on the OLED screen, at the same time, can make ESP8266 module, data transmission and reception, after wit a cloud platform to transmit data to the mobile phone APP, on mobile phones after operation, data feedback to wit a cloud platform, again through ESP8266 modules are sent to the single chip MCU, MCU to respond control architecture is shown in figure 2.
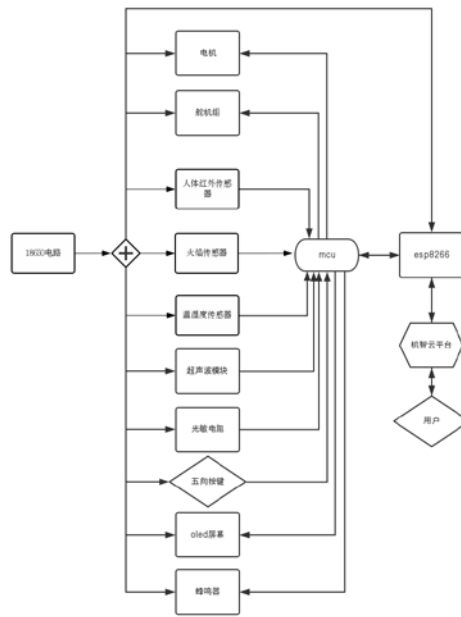
Fig.2 Logic Structure of Control System

5. The Design Effect

In this design, and used in the project according to the chip manual pick the basic circuit, draw the schematic diagram and complete the PCB board, send the manufacturer for PCB production, welding and debugging of hardware circuit is completed, witty cloud platform to achieve the WiFi remote viewing bionic robot detection of environmental factors, at the same time, also has realized the PC to control the operating under a machine ESP8266WIFI module is to draw and send the factory plate, fly in the ointment is that the motor module and oled display module and some sensors without drawing on the circuit diagram.

6. Conclusion

In the design of the great advantages of the whole system is: simple structure, convenient operation, comprehensive detection information, take up the space is little, convenient debugging, has high practicability, can be applied to many fields, the project relative to other bionic machine, the cost is not high, the price is low, the follow-up can still be optimized, after the snake body packaging, broad market prospect and application field.

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