Design of Intelligent Shading System Suitable for Parenting Products

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Abstract

With the development of science and technology, if you want to provide a more safe and healthy growth environment for babies, simple human protection is far from enough. And as smart home is gradually accepted by the public, smart home does bring people a more convenient life In daily life, proper exposure to the sun can help nutrients be quickly absorbed and used, so that babies can better explore this new world, but direct sunlight will bring great harm to babies' eyes This product is an intelligent shading system, which can be connected with the smart home system and the Internet. Based on specific seasons, time periods and different geographical locations, the position of the sun and light intensity can be determined, so as to adjust the shading Angle in time, so that babies can bask more scientifically.

1. Introduction

Since ancient times, people always yearn for light, hate the dark, from primitive man to the invention of Edison electric lamp, people always use a variety of ways to get light. If you want to give babies a really safe growth environment, it is difficult to achieve by human care alone, but the rational use of science and technology will create a more scientific and safe environment for babies. However, with the development of modern society and economy and the progress of science and technology, the unreasonable use of light has brought a terrible disaster -- light pollution, which will not only harm adults, but also affect the healthy growth of babiesp[1].

Numerous studies have linked light pollution to high rates of myopia and cataracts in humans. The human eye produces visual scene just like the camera takes a photo. The structure of the eyeball from the cornea to the crystal is like the lens, and the retina is like the film. The error of any structure will lead to visual disorder, such as the photo will not be clear, the photo will not be real or virtual, or the film will not be exposed and displayed. The person works and lives in the white bright environment for a long time, each structure of the eye will be affected, the function of retinal photoreceptor cells will be inhibited, causing visual fatigue and sharp decline in vision, and the incidence of cataract increases greatly.

Additional, a few parents to build showily, sweet domestic atmosphere, the choice is colourful and very the lamp that grabs an eye is acted the role of and bright dazzling pink wall. But do not know, it is these "dazzling light" harm their own or even children's vision health. The strong light that alternates light and shade stimulates eyeground in turn to make optic nerve fatigue, cause vision to drop. Someone has done an interesting survey: before the age of 2, children who have the habit of turning on the light to sleep, the myopia rate is 55%, while children who have the habit of turning off the light to sleep, the myopia rate is only 10%. Therefore, parents should pay more attention to the protection of babies' eyes, and the intelligent shading system can help parents pay attention to the problem of light exposure to babies.

2.The Hardware Design

And the invention is a smart baby bassinet adaptive intelligent lighting system, can be

connected with the smart home system, and links to the Internet, more specific season, time, different geographical position, to determine the position of the sun, and the light intensity, so as to timely adjust the Angle of window, let the baby more scientific in the sun[2].

The invention consists of STM32F767IGT6 minimum system, AP3216C light environment sensor, MG995 steering gear, 7-inch RGB color touch screen, 4-pin button and cradle curtain. The COMMON IO port of STM32F767 simulates the IIC timing sequence and drives the AP3216C optical environment sensor. Thus detecting ambient light intensity (ALS).

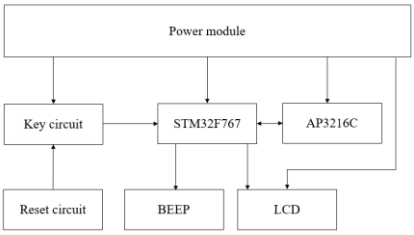

Fig.1.Hardware design drawing

2.1.*Embedded main control chip*

The STMicroelectronics STM32F7 32-bit MCU+FPU uses a high-performance ARM® Cortex® -m7 32-bit RISC core, operating at up to 216MHz. The Cortex-M7 kernel has single-floating-point unit (SFPU) accuracy, supports all ARM single-precision data processing instructions and data types, implements a complete DSP instruction set and memory protection unit (MPU) for enhanced application security[3].

Features, kernel: ARM 32-bit Cortex-M7 CPU with FPU, Adaptive Real-time accelerator (ART Accelerator ™), and L1 cache (4KB data cache and 4KB instruction cache), So there is no need to wait when executing code from embedded flash and external memory), operating frequency up to 216MHz, MPU, 462 DMIPS/ 2.14DMIps /MHz (Dhrystone 2.1) DSP instruction and other features[4].

It has up to 1MB of flash memory, and has 1024 bytes of OTP memory, SRAM: Flexible external memory controller with up to 32 bit data bus flexible external memory controller with up to 32 bit data bus SRAM, PSRAM, SDRAM/LPSDR SDRAM and NOR/NAND memory. And dual-mode Quad SPILCD parallel interface, compatible with 8080/6800 mode. [5]LCD-TFT controller (resolution up to XGA) with dedicated Chrom-Art Accelerator ™ enables enhanced Graphic Content Creation (DMA2D) clock, reset and power management for 1.7V to 3.6V application power and I/O, POR, PDR, PVD and BOR.

Fig.2. STM32F767IGT6 main control chip

2.2.*Host computer design*

AP3216C is a three-in-one environmental sensor that integrates: Ambilent Light Aensors (ALS), Proximity Sensor (PS), and an Infrared Radiation LED(IR LED) The chip is connected to FOGA through IIC interface.

The IIC interface of AP3216C supports up to 400KHz communication rate and supports multiple working modes (ALS, PS+IR, ALS+PS+IR, etc.)[3]. Built-in temperature compensation circuit, operating temperature support -30~80℃. The ambient light sensor has a 16-bit resolution and the proximity sensor has a 10-bit resolution. The infrared sensor has a 10-bit resolution in an ultra-small package (4.12.41.35mm).

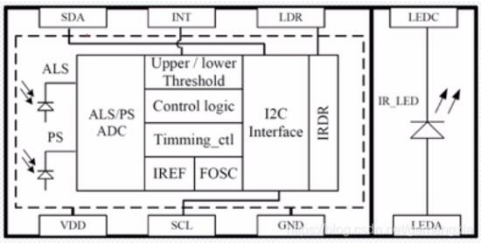

Fig.3.AP3216C diagram

2.3. *The detection system and feedback*

The detection system and feedback system are composed of circulating pump, encoder, 4-pin button, AP3216C optical environment sensor, MG995 steering gear and 7-inch RGB color touch screen. This is also the most important part of the robot[6]. It works as follows：

(1). Sensor initialization: initialize IIC; Reset AP3216C(at least 10ms); Write a byte 0X03.
(2). Read data: loop (6) reads all the sensor data, each cycle of six data in buf [I] in the array, by manipulating the: * als = ((under-16 buf) [3] < < 8) | buff [2]
The ALS value can be obtained (by moving the fourth element of the loop array 8 bits to the left or the third element as the address of the ALS value)
4 pin button and STM32F767 minimum system common IO link, used to set trigger shading threshold, control menu options, etc..
7 inch RGB color touch screen for displaying light intensity, cradle curtain position and other information.
The steering wheel of MG995 steering gear is connected with the cradle curtain, and the curtain can be raised or lowered by rotating.
STM32F767IGT6 minimum system through IO output PWM control steering gear movement, according to whether the ALS value is greater than the set threshold, control steering gear positive and negative rotation or stop.

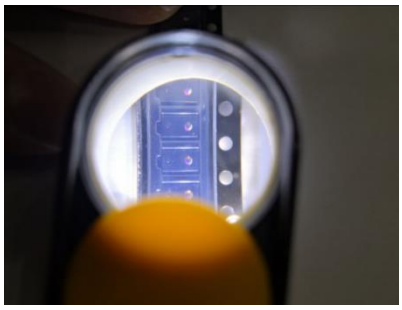

Fig.4.AP3216C

3.Software Design

The decision-making of the robot is completed by Jetson nano sending instructions to the lower computer after data processing and analysis. The lower computer preprocesses the data according to the feedback value given by each sensor module, and then returns it to the upper computer. The software design block shows in Fig.5.

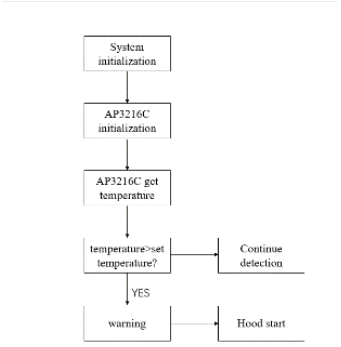

Fig.5.The software design

4.Test

After our test, the robot can simulate the shading of sunlight under normal conditions; And it can simulate the shading situation of different time, different seasons and other environmental factors according to the setting of wireless AD hoc network design.

5.Conclusion

Through the solution of artificial intelligence, study the light induction of shading shed, and combine with the simulation of Internet intelligent learning. The intelligent shading system is developed. It is of great significance in the field of Internet of things and smart home. The invention achieves intelligent shading simulation through light induction, which not only provides a safer guarantee for the growing environment of babies, but also expands the field and provides a new idea for the Internet of things.

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