

Design of Intelligent Vehicle Model for Unmanned Cloud Shopping Mall

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Abstract:

As an innovative attempt in the new retail industry, cloud shopping malls can not only improve the operational efficiency of shopping malls, but also provide customers with a more convenient shopping experience. This article select STC89C52 as micro-controller, use APP and IP camera to control intelligent tablet car. In the end, the manuscript discusses the entire process of intelligent vehicle engineering practice in unmanned cloud shopping malls, from conception, design to implementation.

Keywords — Put your keywords here, keywords are separated by comma.

I. INTRODUCTION

Intelligent vehicles for unmanned shopping malls are applied in unmanned cloud shopping malls^{[1][2]}. It is a shopping mall where users use their mobile phones for visual remote shopping at home or out of town^{[3][4]}. It uses virtual reality technology to improve the remote shopping experience.

The car can automatically retrieve goods from the mall remote control the smart car through a mobile app. Some paper have proposed different approaches for this smart car, for example:

1) some author uses ultrasonic sensors, cameras, electromagnetic sensor, IR sensor, and uses computer vision technologies, line-following approach to enable shopping carts to perceive the surrounding environment, identify products, navigate autonomously^{[5][6]}.

2) Some paper use VR technology to provide customers with personalized shopping experiences. For example, using mobile phones to simulate the real mall environment through VR technology, real-life modeling technology, and 3D technology^{[7]-[12]}.

The paper includes three main parts : (1) the autonomous smart cart (2) the IP camera and APP (3) the auto shopping system .

The remainder of the paper is structured as shown: section 2 presents the hardware design method of the proposed smart cart system. Section 3 presents the software design of the smart car. Section 4 presents experimental results and discussion ,and the conclusion concludes the paper.

II. THE HARDWARE DESIGN OF THE SMART CAR

The autonomous smart cart has four parts as shown in Fig.1.

MCU part: Use 51 micro controller to control the electric motor of the car, managing its forward, backward, turning and other actions. Adjust the motor speed through PWM (Pulse Width Modulation) signal to achieve smooth driving and steering.

Product identification part: Use cameras and IR sensor modules to identify feature products. The 51 micro-controller processes these input signals and

feeds back the recognition results to the system to achieve product tracking and recording.

Motion control part:use two Hip4082 or L298N,to drive four wheel:left front wheel,right front wheel,left reel wheel and right reel wheel.

WIFI module:to send remote control signal.Sometimes it can be replaced by BLUETOOTH module.

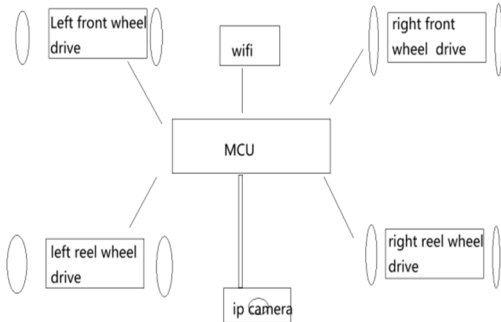


Fig. 1 . Block diagram of the smart car

Auxiliary module includes the auto shopping system and the motion driving system.

A. the auto shopping system

The auto shopping system realize when smart car send IR signal, the shopping system use servo motor move the goods into the car. It main parts are shown in Fig.2.

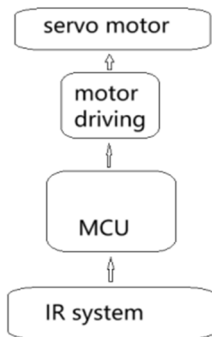


Fig. 2 . Block diagram of the shopping system

In a demo, the servo motor select SD3010,the motor driving module uses L298N.MCU uses STC89C52RC.IR sensor use IR module.

B. the motion driving system

The motion driving system uses the motor driving IC HIP4082,the electrical schematic diagram of motor driven IC HIP4082 is shown in Fig.3.The PCB is shown in Fig.4.

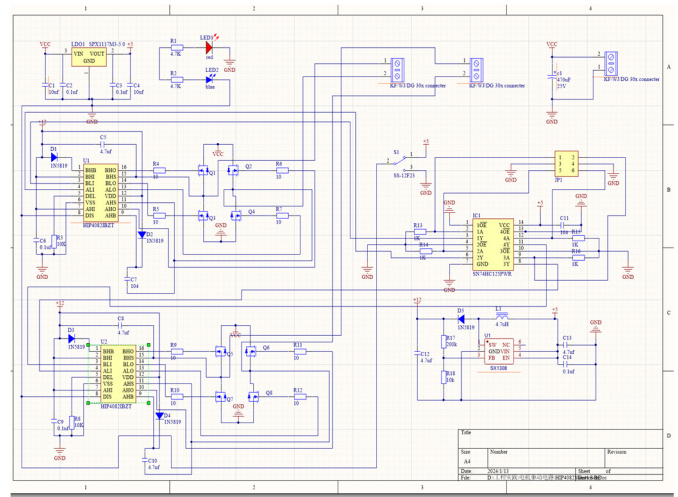


Fig. 3 . Electrical schematic diagram of motor driven IC HIP4082

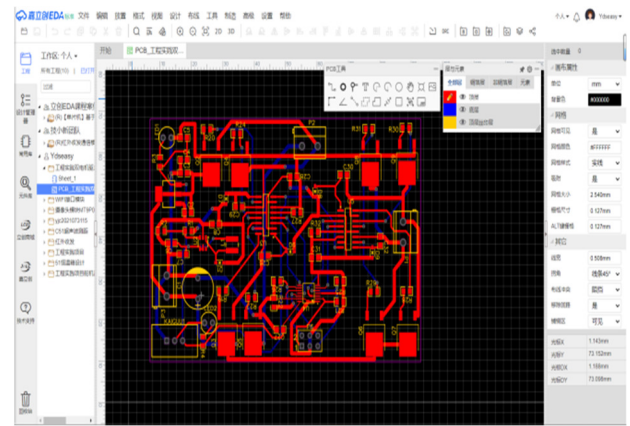


Fig. 4 .The PCB of motor driven system

IV THE SOFTWARE OF DESIGN OF THE SMART CAR

The software of car has the following functions:

1. Control sensor to detection,;
2. Drive motor moving,for example, to control the movement of the shopping cart, including functions such as forward, backward, and steering.
3. Display :displays the current status of the shopping cart, shopping list, prices, and other information.
4. Communication : communicates with the user's mobile phone or terminal to achieve remote control, settlement, and other functions.

The APP in the smart phone is shown in Fig.5.

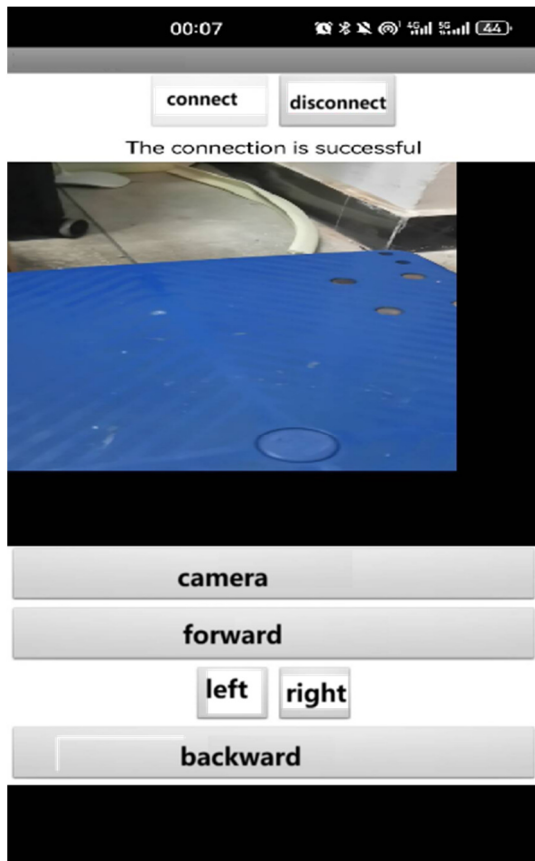


Fig. 5 .The APP of smart car driven system

The measurement is undertaken in the following steps:

1) Functional testing: The operation function of the smart shopping cart has been tested multiple times to ensure that all functions of the shopping cart are functioning properly.

2) Performance testing: The stability of the shopping cart has been tested in various environments. Capable of achieving high stability performance and ensuring stable operation of the shopping cart.

3) Security testing: The safety performance of the shopping cart has been verified to meet the relevant security requirements and standards.

V. CONCLUSIONS

This paper has presented the design and prototyping of an innovative smart shopping cart system. The autonomous capability of the system was achieved using remote control that were processed and used to trigger the mobility of the cart.

After testing ,the smart car can achieve most of the functions, but there are some limitations and some initial ideas were not realized.

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