

# Design of ROS interactive host computer based on TCP communication

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## Abstract

**This project takes the 4-wheeled robot as the practice platform. In the ROS system under Ubuntu18, based on the TCP communication protocol, the MFC plug-in in VS Studio is used to design and implement the interactive communication host computer interface between windows and ROS.**

## Keywords

**TCP; Socket; MFC.**

## 1. Introduction

With the introduction of the concept of Industry 4.0, "Made in China 2025" is deployed to comprehensively promote the implementation of the strategy of manufacturing a strong country. Industrial production lines are also gradually transforming towards intelligence. The intelligent interface of the host computer is widely used in the industry to realize the monitoring of various information of the robot. Coordinating and cooperating to plan the entire robot in this non-contact way is one of the current research hotspots in robotics.

In response to this problem, this paper designs and implements the interface between the host computer on the windows side and the ROS side, which can timely and accurately feed back all kinds of information about the robot, such as speed, angular velocity, and real-time coordinates. The experimental test results show the effectiveness and feasibility of the design implementation scheme.

## 2. Communication Theory

Communication problems mainly include the issuance of commands, the interaction of information, and the feedback of equipment conditions. The primary condition for communication is to uniquely identify a process. Communication in the network requires the use of the TCP/IP protocol suite. The "ip address" of the network layer can uniquely identify the host in the network, and the "protocol + port" of the transport layer can be unique. Identifies the application in the host. In this way, the triplet can be used to identify the process of the network, and the process communication in the network can use this flag to interact with other processes. Applications that use the TCP/IP protocol usually use application programming interfaces: UNIX BSD sockets and UNIX System V TLI to communicate between network processes. For now, almost all applications use sockets. And our solution this time is also done using sockets. Socket originated from Unix, and one of the basic philosophies of Unix/Linux is that "everything is a file", which can be operated in the mode of "open open, read and write write/read, close close".

### 2.1. TCP/IP & Socket

TCP/IP, Transmission Control Protocol/Internet Protocol, is an industry standard set of protocols designed for wide area networks. Socket is a middleware abstraction layer that communicates between the application layer and the TCP/IP protocol suite. It is a set of

interfaces. In the design mode, Socket is actually a facade mode, which hides the complex TCP/IP protocol family behind the Socket interface. For users, a set of simple interfaces is all that is needed. Let the Socket organize the data to meet the specified requirements. protocol.

### 3. Experimental Platform Construction

#### 3.1. Download and installation of Visual Studio

Download the Community 2022 version directly from the official website and install all the tools and features you need, including MFC application development and Linux and embedded development using C++.

#### 3.2. Download and installation of VMware virtual machine

Find the official website, download the free version of VMware Workstation, and complete the installation and debugging through the tutorial on the Internet.

#### 3.3. Ubuntu download, installation and debugging

Find and download and install the Ubuntu20.04.4LTS version through the network.

### 4. Interface Design

#### 4.1. Build an MFC application project

In order to present the interactive interface, choose to use visual studio to create MFC application, and choose to program based on dialog mode.

#### 4.2. Add the required controls

First, in the created project interface, through the toolbox, add the required buttons, edit boxes, text and other controls. And enter the corresponding name for each button.

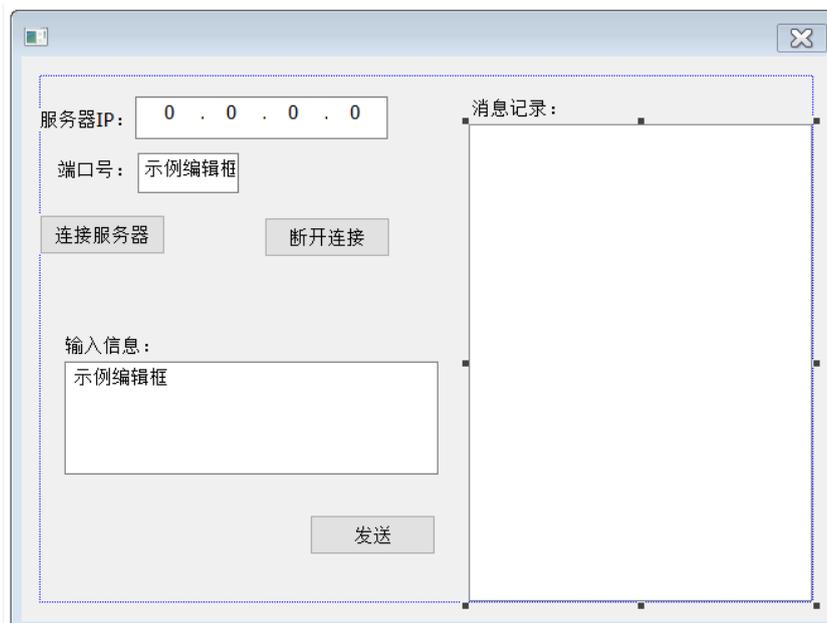


Figure 1: Interface Design

#### 4.3. Add a class

To implement socket communication, create a client Socket object with a class name of ChatClient, project/class wizard/add class/MFC class, and the base class is CAsyncSocket. After the creation is complete, you will find that the corresponding classes, header files, and source file resource files are automatically generated.

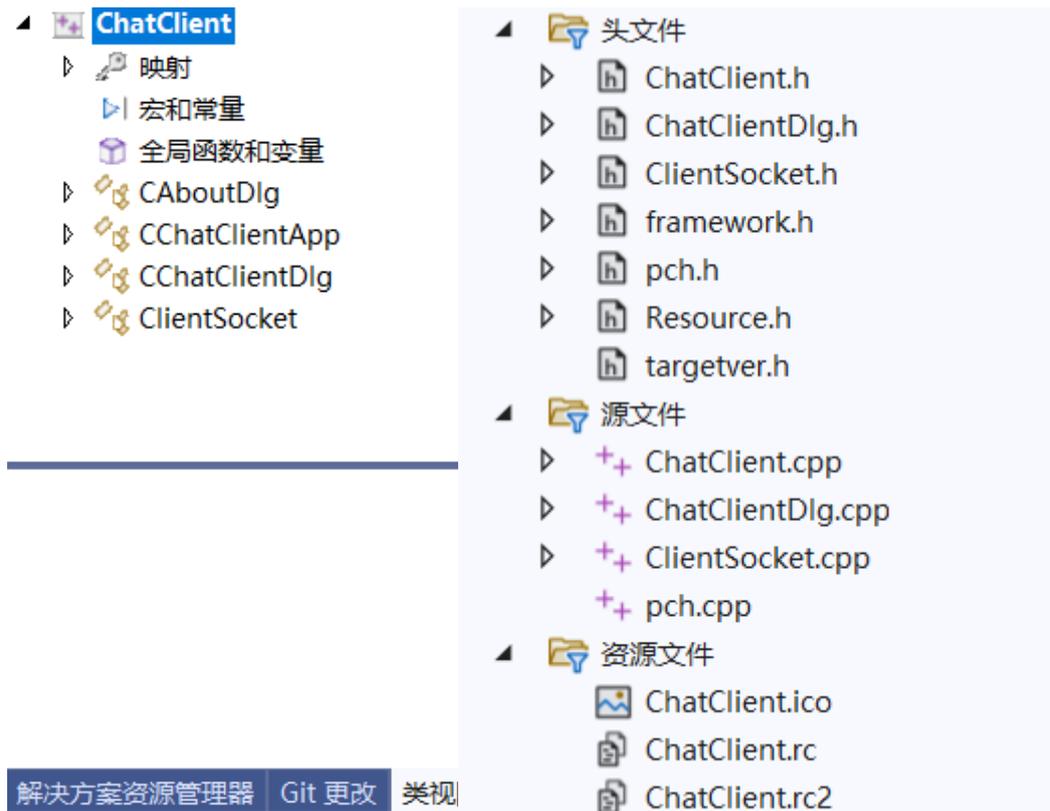


Figure 2: Add a class

#### 4.4. Associated variables

In order to refer to the contents of the text box, it is necessary to add associated variables to the corresponding controls, and define the variable name and variable type.



Figure 3: Associated variables

#### 4.5. Add button code

Double-click the button control or right-click to select the property interface, and add the corresponding code to realize the function of the button. a. connect server button b. disconnect button c. send button .

### 4.6. Write a function to respond to network events

Because we have added a Socket class before, so now we only need to add the corresponding network response function to create a complete socket. Among them, because the information needs to be read and displayed from the text box, the pointer will be used to obtain the content of the corresponding control and the control to be displayed.

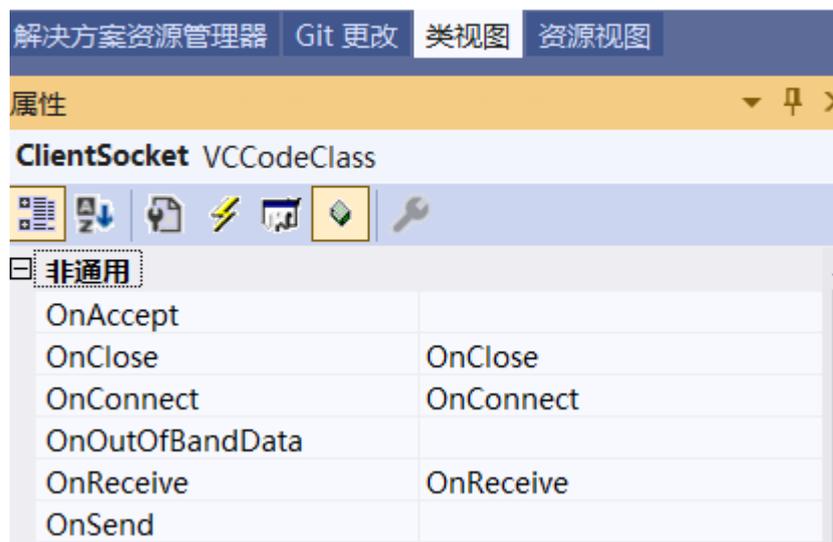
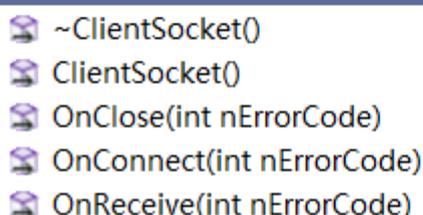
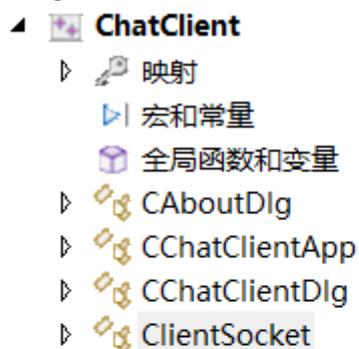


Figure 4: Write a function to respond to network events

### 5. Concluding remarks

The experimental test results show the effectiveness and feasibility of the design implementation scheme, which can be used in actual production work.

## References

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