

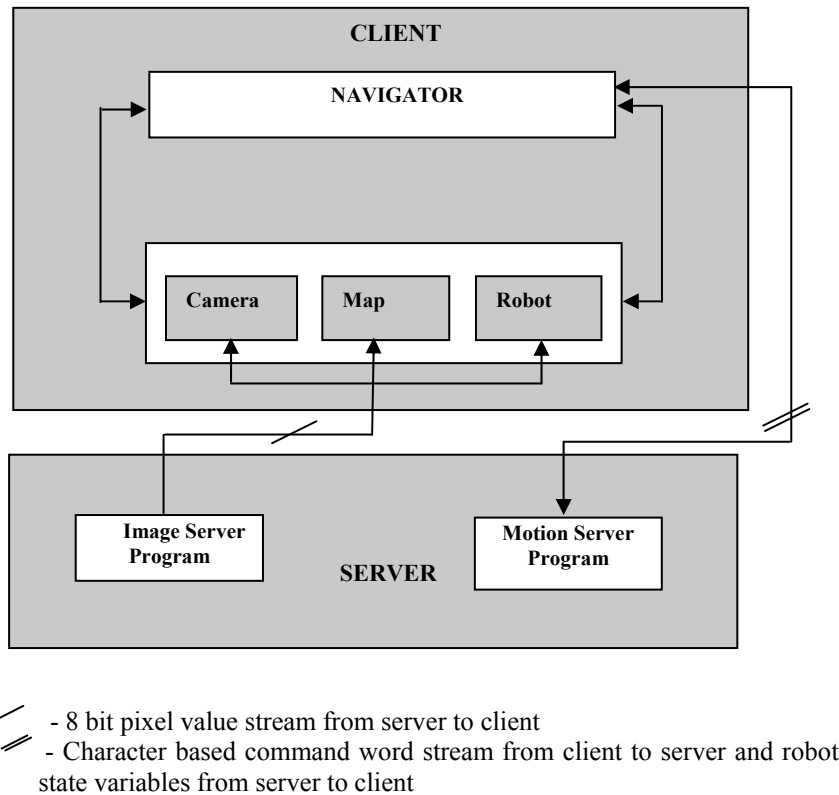
# 12 A Complete Program for Autonomous Navigation

## 12.1 Introduction

This chapter discusses the design of a complete navigator program using a client–server architecture for the mobile robot Pioneer 2-DX in a multi-platform system, where the server works on Linux and clients run on the Windows environment. Robot control is achieved through the client–server architecture as shown in Fig. 12.1. The image server program is written in C++ [Swan, 2000; Klander, 2000], and runs on the server for sending the images taken by the framegrabber to the client; and the robot motion server program executes the motion commands on the server and sends low-level commands to the motors. Secondly, the navigator client program is elaborated, which is developed using Java. The program directory layout in the robot’s onboard computer is as follows.

```
/home/  
  motion/  
    Makefile           the description file for make  
    Server             the motion server executable  
    Socket.h           header file for Socket class  
    Socket.cpp          Socket class definition file  
    Socket.o            object file generated after compilation  
    ServerSocket.h      header file for ServerSocket  
    ServerSocket.cpp     ServerSocket class definition file  
    ServerSocket.o       object file generated after compilation  
    SocketException.h   header file for socket exceptions  
    simple_server_main.cpp source code for the motion server  
    simple_server_main.o object file generated after compilation  
  vision/  
    trialserver         Black & white and Color image server  
    trialserver.cpp      image server source file
```

trialserver.o	object file generated after compilation
image	RLE encoded image server for <b>Navigator</b>
imageserver.cpp	RLE encoded image server code
imageserver.o	object file generated after compilation



**Fig. 12.1.** Client–server architecture for robot navigation and exploration

## 12.2 The ImageServer Program

The image server program opens a listening socket on port 4325 of the robot’s onboard computer. On receiving a request from the navigator client, the program opens the vision system for continuous video and by using a simple run-length encoding algorithm [Jahne, 1997] compresses the black and white image from the left camera and transfers the image data over the network to the client computer. In the navigator client the image is dis-