1. **(50 points) Calculator GUI Design**

   Design a class **Calculator** that extends class **JFrame,** and implement the following functions:

   1) Implement a basic graphical user interface using Java Swing. A calculator GUI example is shown in Fig. 1;

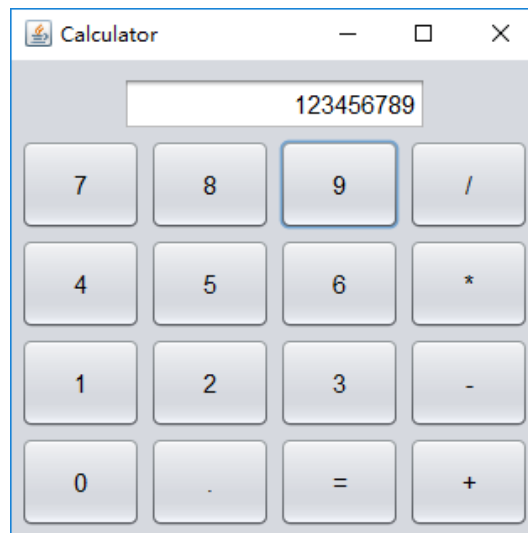   2) Implement basic arithmetical operations, including *add*, *subtract*, *multiply* and *divide* operations.

Fig. 1: Example of calculator GUI design.

Fig. 2: Chatting example.

2. **(50 Points) A Simple Chatting Socket Program**

   Review the programs Socket Client and Socket Server for chatting that you learned in the lecture (slide 12-13). And modify the programs using Java Thread to show the same result. A

running example is shown in Fig. 2.

An example of the main method in the Client:

```
-----
public static void main(String args[]) {
    Client c1 = new Client();
    c1.start();
}
-----
```

3. **(Bonus Question: 20 points) FTP Server and Client**

Design a FTP server and client using Socket programming. The following functions should be implemented:

1) Implement a FTP server to response the client requests, including showing the file catalog, uploading and downloading files;

2) Implement a client side with GUI to download files from FTP server and upload local files. (tips: you can use **javax.swing.JFileChooser** when selecting a local file to upload. An example is given in Fig.3.).
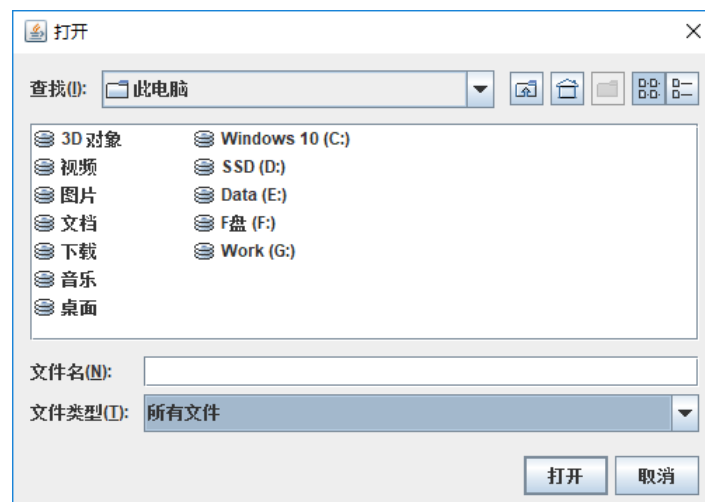

Fig. 3: JFileChooser example.