CS 580 Client-Server Programming
Spring Semester, 2006
Doc 21 Some GUI
Apr 13, 2006

References

Rettig, Marc. Interface Design When You Don't Know How, Communications of the ACM, Jan. 1992, Vol. 35, No. 1, pp. 29-34

Rettig, Marc. Prototyping for Tiny Fingers, Communications of the ACM, April. 1994, Vol. 37, No. 4, pp. 21-27

Domain-Driven Design, Eric Evans, 2004, Addison-Wesley

Patterns of Enterprise Application Architecture, Martin Fowler, 2003, Pearson Education

User Interface Design for Programmers, Joel Spolsky, 2001 http://www.joelonsoftware.com/navLinks/fog0000000247.html

Recommended Reading – Designing GUIs

User Interface Design for Programmers, Joel Spolsky, 2001

> There is a printed longer version of the book. The on-line version is free and will get you started.

Design of Everyday Things, Donald Norman, 1990

> This is an excellent book, is entertaining and only costs $12 new at Amazon. Anyone that designs or builds anything has to read this book.

These books do not cover the mechanics building a GUI. They do not cover which fonts and colors to use. They just get you started thinking about the really important questions related to GUI design.

Software Structure with UI & Database

Tiers – parts of program run on different machines

Layers – parts of program run on same machine

Layers

Presentation – Display of Data

Domain – Logic related to purpose of the application

Data Source – Communication with data source

Keep the presentation & domain layers separate

GUI code should not contain domain logic

In simple cases different methods in one class may handle presentation and domain logic

A single method does either presentation or domain logic

Can you test the domain logic with automated unit testing

Time Date Domain Layer

```
public class TimeDateClient{
        private static final char CARRIAGE_RETURN = (char) 13;
        private static final char LINE_FEED = (char) 10;
        String server;
        int serverPort;

        public TimeDateClient(String serverNameOrIP, int port){
                server = serverNameOrIP;
                serverPort = port;}

public String date() throws IOException  {  return sendMessage("date");}

public String time() throws IOException{   return sendMessage("time"); }

public String sendMessage(String message) throws IOException{
        Socket serverConnection = new Socket(server, serverPort);
        writeMessage(message, serverConnection);
        byte[] result = readMessage(serverConnection);
        serverConnection.close();
        return new String(result);
        }
```

```
private byte[] readMessage(Socket serverConnection) throws IOException
                {
                UpToFilterInputStream in = new UpToFilterInputStream(
                                new BufferedInputStream(
                                                serverConnection.getInputStream()));
                byte[] result = in.upTo(LINE_FEED);
                return result;
                }
```

```
private void writeMessage(String message, Socket serverConnection)
                throws IOException
        {
        OutputStream out = new BufferedOutputStream(
                                                serverConnection.getOutputStream());
        out.write((message + CARRIAGE_RETURN).getBytes());
        out.flush();
        }
```

Now add a GUI that uses Domain layer

Smart UI Pattern

“the separation of UI and domain is so often attempted and so seldom accomplished that its negation deserves a discussion”

Eric Evans, Domain-Driven Design

The Pattern

Put all business logic into user interface

Divide the application into different small user interfaces

Use relational databases as back end

Use automated UI building and visual programming tools

Smart UI Pattern

Advantages

High and immediate productivity for simple applications
Little training need by the developer
Short development time for small modules

Disadvantages

No reuse – code gets duplicated
Integration of applications difficult
Very difficult to add new functionality to existing application
Difficult to build complex applications

GUI Clients & Servers

GUI Clients

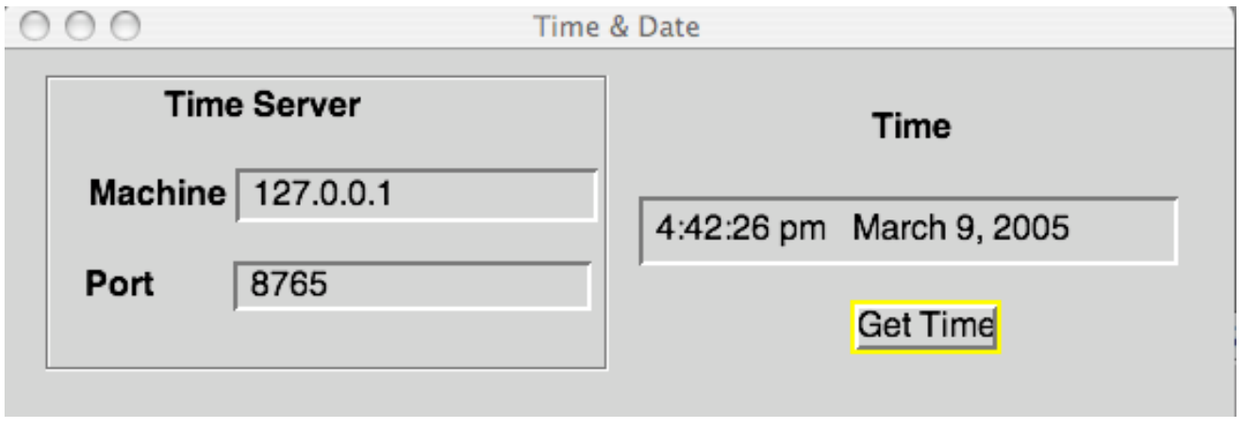
- Used to get work done
- Good when they help people get work done

Users do not care about the client-server protocol

Don’t expose the user to the client-server protocol

Build the GUI to help people accomplish a task, not just to perform the client-server protocol

Example: Time Date Client



Protocol has two messages

Date

Time

Client has one button to get time & date

Interface Design When You Don't Know How

Basic Rule for Good Visual Design

Hire a graphic/GUI designer

Basic Rule for Almost Everything Else

Painstakingly follow established standards

What Makes a Good GUI?

A user interface is well-designed when the program behaves exactly how the user thought it would

Deleting a file on a Mac

Move it to the trash can!

How do you unmount floppies & external hard drives?

Move it to the trash can

But users think this will delete or erase it

Mental Models & Users

Users don’t read the manual

More text on the screen - fewer people will read it

Users have a mental model of how your program works

Make sure your program fits their mental model

Users think the trash can deletes things

The Process of Creating a GUI

Plan ahead

Use bite-sized chunks

Abandon the waterfall life cycle in favor of iterative design

Conduct user testing early and often

Focus on the users' needs and involve them in the process

Come up with good, testable usability goals

Hire a graphic designer

Why iterative design?

But we don't have time to redo the GUI!

Prototype the GUI?

Problems with Software Prototypes

Software Prototypes take too long to build and change

Testers tend to comment on "fit and finish" issues

Developers resist changes

Managers ship the prototype

Software Prototypes set false expectations

Single bug in a software prototype can halt a test

Use Paper Prototypes

Paper Prototype Kit

White paper
- Unlined
- Heavy enough to endure repeated testing and revisions

5-by-3-inch cards
- Use as construction material
- Taking notes

Adhesives
- Tape: clear, colored, double-backed, etc.
- Glue sticks
- Post-It glue
- White correction paper

Markers
- Colored pens and pencils
- Highlighters
- Fine and thick markers

Sticky note pads

Acetate sheets

Scissors,

X-acto knives,

straightedges,

Band-Aids

White-out

Build A Paper Prototype

Do it fast

Construct Models, not illustrations

Test your Prototype with Users

Preparing for a Test

Select your users

- Know the demographics of your users
- Testers should represent the whole range of users

Prepare test scenarios

Practice

Conducting a Test

Greeter

Welcomes users

Puts users at ease

Computer

Runs the computer

Facilitator

Runs the test

Gives users instruction

Encourage the user to express their thoughts

Observer

Takes notes

The Test

Video tape the test

Before starting the test, explain the process to the user

Debrief the user after the test

Evaluate the Results