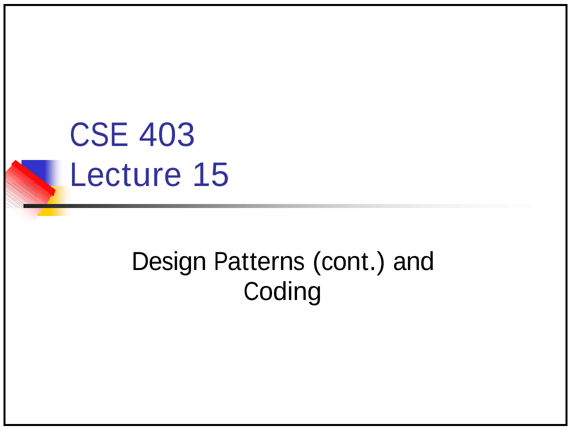
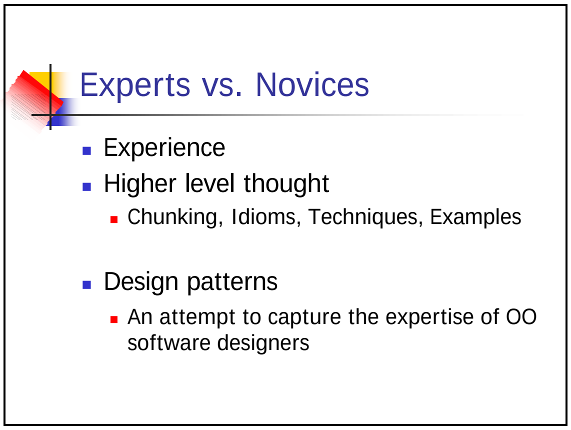


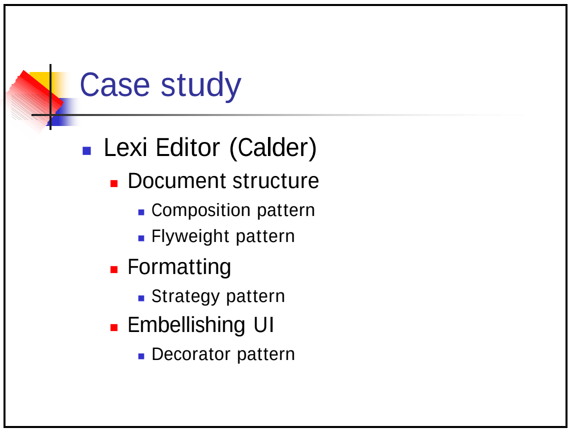
# CSE 403
# Lecture 15

Design Patterns (cont.) and
Coding



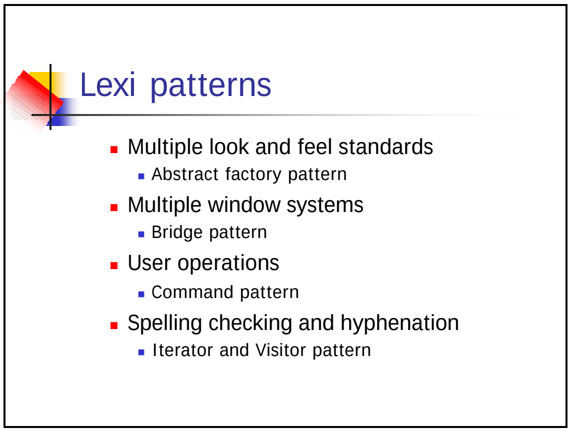
## Experts vs. Novices

- Experience
- Higher level thought
  - Chunking, Idioms, Techniques, Examples
- Design patterns
  - An attempt to capture the expertise of OO software designers



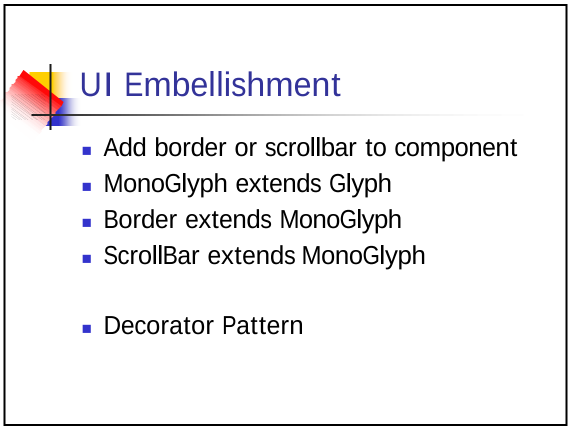
## Case study

- Lexi Editor (Calder)
  - Document structure
    - Composition pattern
    - Flyweight pattern
  - Formatting
    - Strategy pattern
  - Embellishing UI
    - Decorator pattern



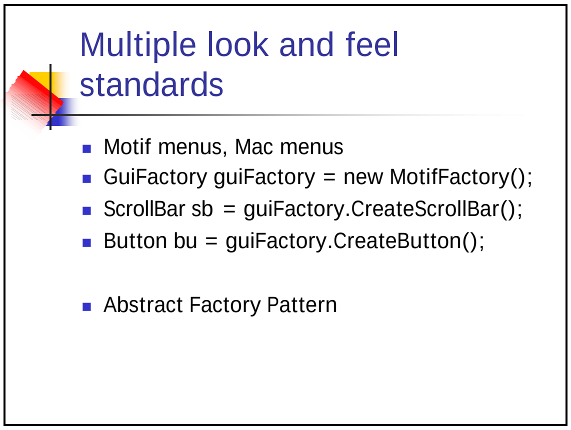
## Lexi patterns

- Multiple look and feel standards
  - Abstract factory pattern
- Multiple window systems
  - Bridge pattern
- User operations
  - Command pattern
- Spelling checking and hyphenation
  - Iterator and Visitor pattern



## UI Embellishment

- Add border or scrollbar to component
- MonoGlyph extends Glyph
- Border extends MonoGlyph
- ScrollBar extends MonoGlyph
- Decorator Pattern



## Multiple look and feel standards

- Motif menus, Mac menus
- GuiFactory guiFactory = new MotifFactory();
- ScrollBar sb = guiFactory.CreateScrollBar();
- Button bu = guiFactory.CreateButton();
- Abstract Factory Pattern

## Supporting Multiple Window Systems

- Window Class Hierarchy
- WindowImp Class Hierarchy
  - Extend WindowImp for each different system
  - Avoid polluting Window Class with system dependencies
- Bridge Pattern
  - Link between Window and WindowImp

## User commands and spell check/hyphenation

- User commands
- Command Pattern
  - Includes Undo functionality
- Spell check and hyphenation
  - Iterate over words of document
  - Iterator Pattern and Visitor pattern

## Classification of patterns

- Creational
  - Abstract factory, builder, factory method, prototype, singleton
- Structural
  - Adapter, bridge, composite, decorator, façade, flyweight, proxy
- Behavioral
  - Chain of responsibility, command, interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor

Original GoF patterns

## Code

- “Where the rubber meets the road”
- The code defines what actually happens when you run a program
  - No matter what the requirements are, no matter what the design is, no matter what the documentation says

## Guidelines

- In general, you can’t generalize about the best way to program
- In theory, there is no difference between theory and practice
- A good programmer will write good programs in any language; a bad programmer will write bad programs in any language

## The problem

- In any language, there are many ways to do effectively the same thing
  - `if ((a==b) && (c==d))` …
  - `if (a==b) if (c==d) ..`
- Tons of examples
  - Error codes via return values or parameters?
  - Null terminated strings vs. explicit lengths
  - `for` vs. `while` vs. `repeat` loops

## The question

- When you have lots of choices of how to do things, how do you choose?
- Can you make better and worse choices?
  - Absolutely
- Why is this true?
  - Sometimes equivalent pieces of code aren't equivalent, but in subtle ways
  - When someone (maybe you) reads it later on, some approaches may be more clear

## IOCCC

- International Obfuscated C Code Contest
  - `http://www.ioccc.org/`

```
int i;main(){for(;i["]<i;++i){--i;}"];read('-'-'-',i+++"hell\
o, world!\n",'/'/'/'));}read(j,i,p){write(j/p+p,i---j,i/i);}
```

## A better example ☺

```
#include <stdio.h>
char *T="IeJKLMaYQCE]jbZRskc[SldU^V\\X\\|/_<[<:90!\"$434-./2>]s",
K[3][1000],*F,x,A,*M[2],*J,r[4],*g,N,Y,*Q,W,*k,q,D;X(){r [r [r[3]=M[1 -
(x&1)][*r=W,1],2]=*Q+2,1]=x+1+Y,*g++=((((x& 7) -1)>>1)-
1)?*r:r[x>>3],(++x<*r)&&X();}E(){A||X(x=0,g =J ),x=7&(*T>>A*3),J[(x[F]-
W-x)^A*7]=Q[x&3]^A*(*M)[2 +( x&1)],g=J+((x[k]-W)^A*7)-
A,g[1]=(*M)[*g=M[T+=A ,1 ][x&1],x&1],(A^=1)&&(E(),J+= W);}l(){E(--q&&l
() );}B(){*J&&B((D=*J,Q[2]<D&&D<k[1]&&(*g++=1 ), !(D-W&&D-9&&D-
10&&D-13)&&(!*r&&(*g++=0) ,* r=1)||64<D&&D<91&&(*r=0,*g++=D-
63)||D >= 97&&D<123&&(*r=0,*g++=D-95)||!(D-k[ 3]
)&&(*r=0,*g++=12)||D>k[3]&&D<=k[ 1] -1&&(*r=0,*g++=D-47),J++));}j(
){ putchar(A);}b(){(j(A=(*K)[D* W+ r[2]* Y+x]),++x<Y)&&b();}t ()
{(j((b(D=q[g],x=0),A=W) ), ++q<(*(r+1)<Y?*(r+1): Y) )&&t();}R(){(A=(t( q=
0),'\n'),j(),++r [2 ]<N)&&R();}O() {( j((r[2]=0,R( )) ),r[1]-=q) && O(g-=-q) ;}
C(){( J= gets (K [1]))&&C((B(g=K[2]),*r=!(!*r&&(*g++=0)),(*r)[r]=g-
K[2],g=K[2 ],r[ 1]&& O()) );;} main (){C ((l( (J=( A=0) [K], A[M] =(F= (k=(
M[!A ]=(Q =T+( q=(Y =(W= 32)- (N=4 )))) +N)+ 2)+7 )+7) ),Y= N<<( *r=! -
A)) );;}
```

## Coding standards

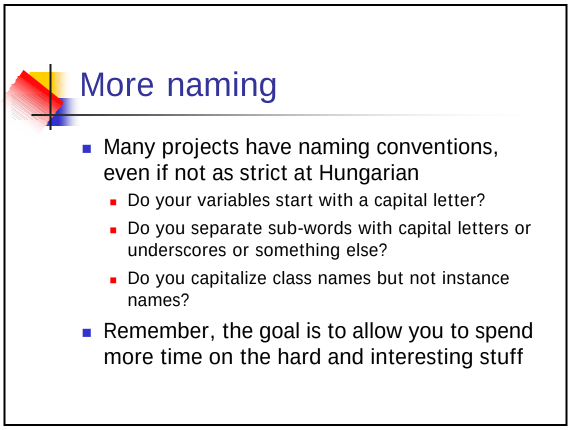
- Many projects have standards to which every member is supposed to adhere
  - These are almost always written standards
  - Adherence is usually an informal issue, but sometimes is done through inspections and in some cases using compliance checking tools
- Goals include making it faster to write code (fewer decisions) and making it easier to read code (less context switching)

## Language-specific

- Coding standards are almost always language-specific
- Many of the examples (today) are in C/C++
  - GNU's coding standards, *Writing Solid Code*
- In some cases, a better language would alleviate the need for the standard
- But standards are always useful, regardless of language

## Standards can cover…

- Layout guidelines
  - Parameters, variable declarations, etc.
  - Indentation (spaces, tabs, etc.)
  - Long expressions
- Naming schemes
- Commenting guidelines
- Restrictions on usage of the language



## More naming

- Many projects have naming conventions, even if not as strict at Hungarian
  - Do your variables start with a capital letter?
  - Do you separate sub-words with capital letters or underscores or something else?
  - Do you capitalize class names but not instance names?
- Remember, the goal is to allow you to spend more time on the hard and interesting stuff