COMPUTER GRAPHICS (CCG3013)

LESSON 7

USER INTERFACES AND INTERACTIONS: PART II

COURSE OUTLINE

Lesson	Topic
1	Introduction to computer graphics
2	Graphics hardware and software
3	Geometry in 2D graphics
4 & 5	Geometry in 3D graphics
6 & 7	User interfaces and interactions
8	Colour
9	Lighting and rendering
10 & 11	Motion and animation
12	Surface shadings

ASSESSMENTS

Structure	Marks (%)	Hand-out	Hand-in
Assignment 1 (Individual)	30	Week 1(Unofficial) Week 3(Official)	Week 6
Assignment 2 (Group up to four only)	30	Week 1(Unofficial) Week 3(Official)	Week 12
Final examination	40	Exam week	

LEARNING OUTCOMES

1. Explore font libraries available and their application.
2. Setup a font library for text rendering.
3. Explore user interface (UI) libraries available and their application.
4. Setup a UI library for UI rendering and interactions.

CONTENT

No.	Topics	Duration (Minutes)
1	Mini lecture 1: Graphics user interfaces	15
2	Exercise 1	10
3	Break	10
4	Mini lecture 2: UI libraries	15
5	Exercise 2	10

MINI LECTURE 1
GRAPHICS USER INTERFACES

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GRAPHICS USER INTERFACES

1. GUI in short.

2. It allows user to interact with the interfaces using inputs.

3. An interface is a space where information exchange for two or more components in a computer system.

4. A user interface (UI) also refers to either an interactable graphics element, a widget or a control.

EVENT-HANDLERS IN OPENGL

1. Keyboard event-handlers

    (a) glutKeyboardFunc

    (b) glutSpecialFunc

2. Mouse event-handlers

    (a) glutMouseFunc

    (b) glutPassiveMotionFunc

    (c) glutMotionFunc

EXERCISE 1

This activity will takes about 10 minutes.

1. Identify five input devices for a computer system.

2. Name five common UI elements.

INPUTS

Mouse

Keyboard

Touchscreen

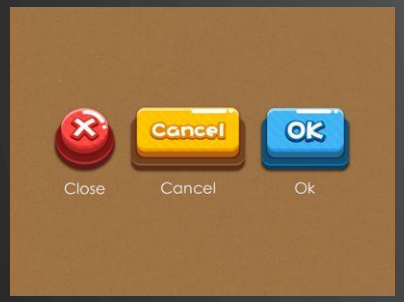
Joysticks

Time of Flight (TOF) camera

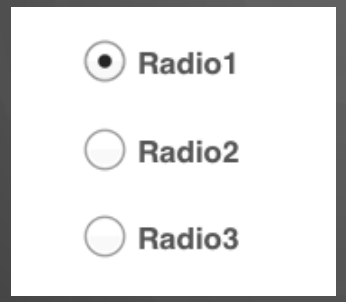
Iris scanner

Fingerprint scanner

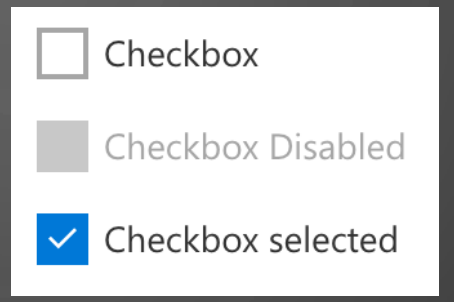
UI ELEMENTS



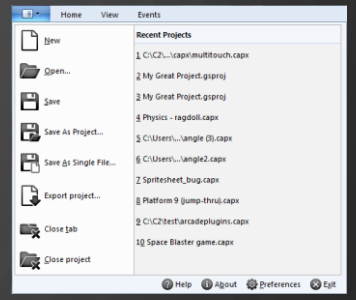
Buttons



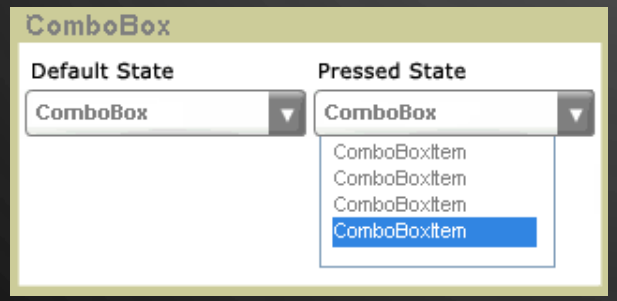
Radio buttons



Checkbox



Menu



Selection/Down drop list/ComboBox

Sliders

Spinners

BREAK

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MINI LECTURE 2
UI LIBRARIES

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UI LIBRARIES

UI libraries to be covered included.

(a) GLUI,

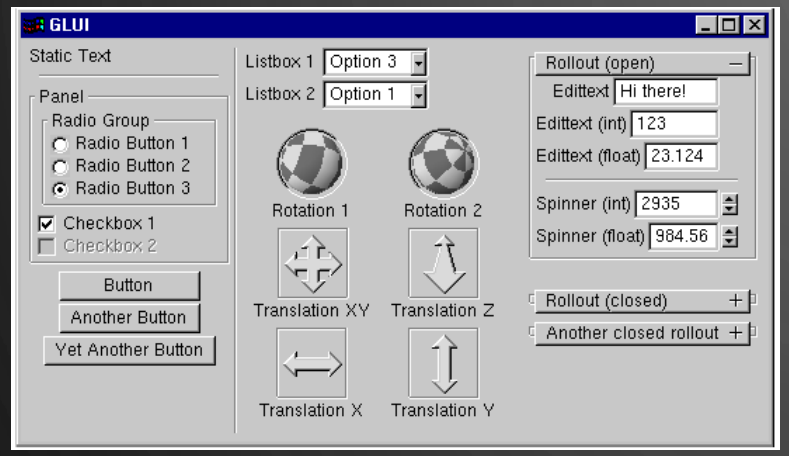
(b) PUI, and

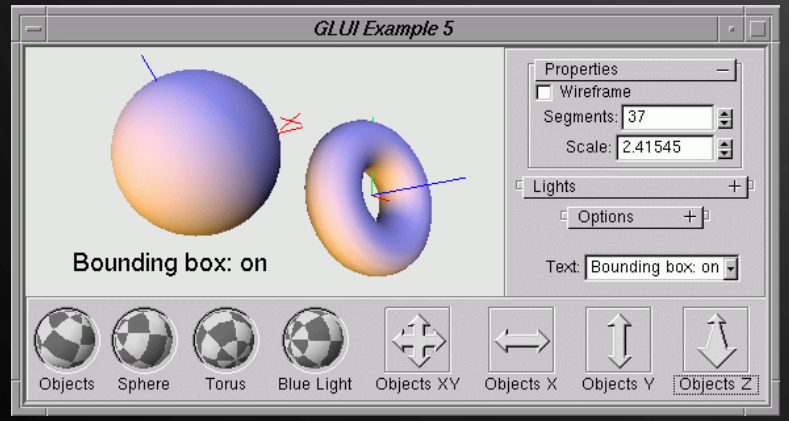
(c) MFC.

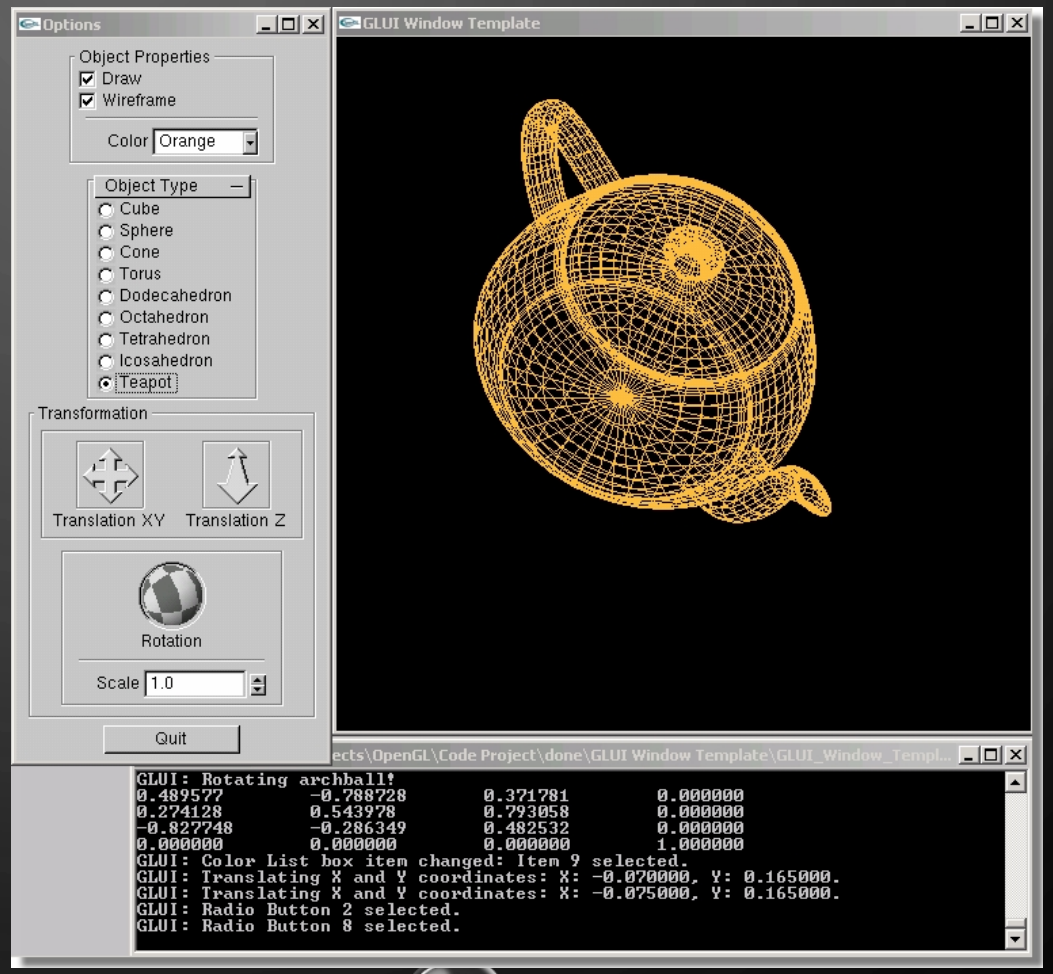
GLUI

1. It stands for OpenGL user interface library.
2. It built on top of GLUT.
3. Written by Paul Rademacher.
4. It provides the basic controls to interact with the OpenGL window.
5. Controls included buttons, checkboxes, radio buttons, spinners, etc.
6. Free download based on GNU lesser general public license (LGPL).

GLUI DEMO


GLUI
Static Text
Panel
Radio Group
Radio Button 1
Radio Button 2
Radio Button 3
Checkbox 1
Checkbox 2
Button
Another Button
Yet Another Button
Listbox 1
Option 3
Listbox 2
Option 1
Rotation 1
Rotation 2
Translation XY
Translation Z
Translation X
Translation Y
Rollout (open)
Edittext
Hi there!
Edittext (int)
123
Edittext (float)
23.124
Spinner (int)
2935
Spinner (float)
984.56
Rollout (closed)
Another closed rollout

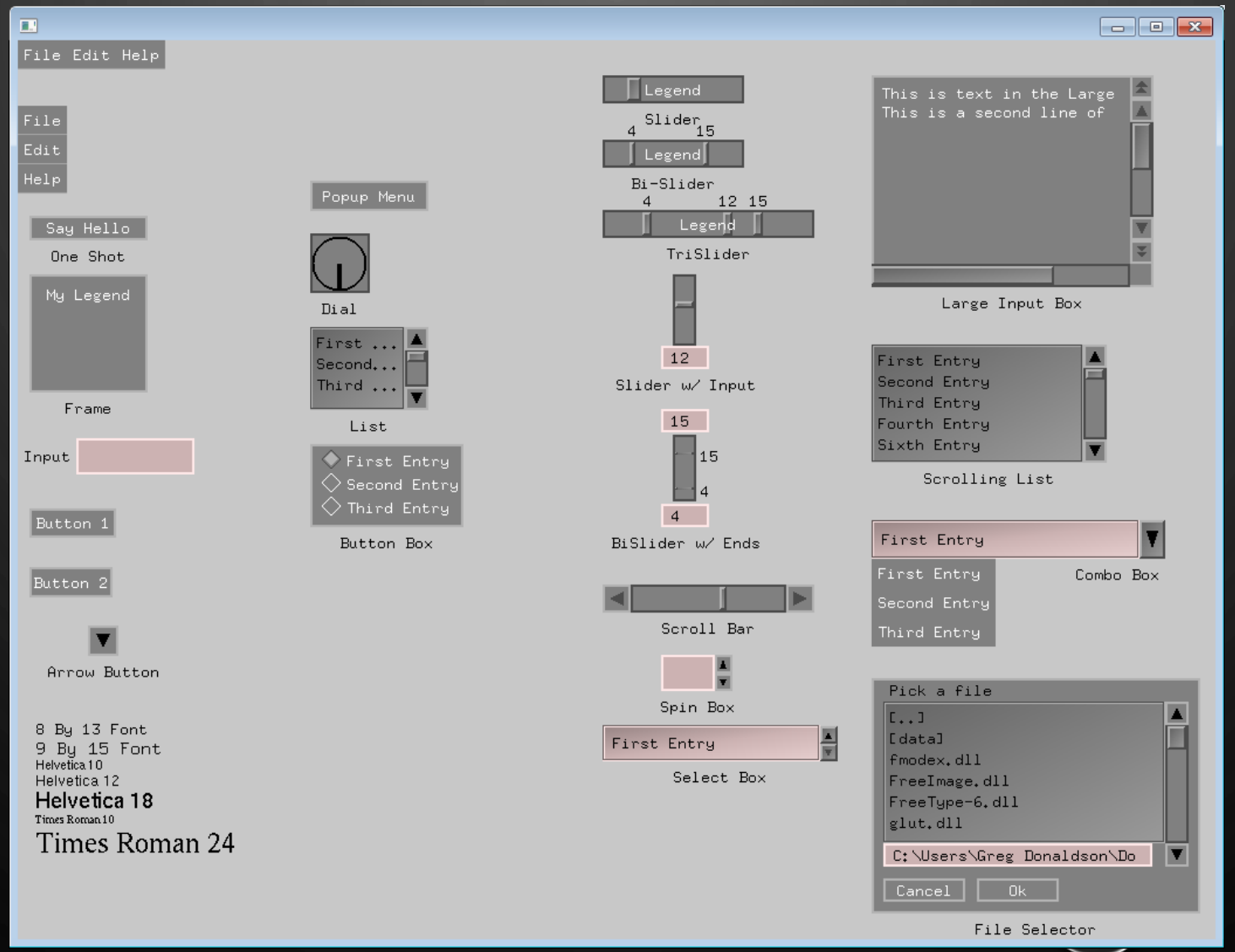

GLUI Example 5
Bounding box: on
Properties
Wireframe
Segments:
37
Scale:
2.41545
Lights
Options
Text:
Bounding box: on
Objects
Sphere
Torus
Blue Light
Objects XY
Objects X
Objects Y
Objects Z


Options
Object Properties
Draw
Wireframe
Color
Orange
Object Type
Cube
Sphere
Cone
Torus
Dodecahedron
Octahedron
Tetrahedron
Icosahedron
Teapot
Transformation
Translation XY
Translation Z
Rotation
Scale
1.0
Quit
GLUI Window Template
GLUI: Rotating archball!
0.489577 -0.788728 0.371781 0.000000
0.274128 0.543978 0.793058 0.000000
-0.827748 -0.286349 0.482532 0.000000
0.000000 0.000000 0.000000 1.000000
GLUI: Color List box item changed: Item 9 selected.
GLUI: Translating X and Y coordinates: X: -0.070000, Y: 0.165000.
GLUI: Translating X and Y coordinates: X: -0.075000, Y: 0.165000.
GLUI: Radio Button 2 selected.
GLUI: Radio Button 8 selected.

PLIB

1. It stands for Picoscopic User Interface.
2. Developed by Steve Baker.
3. PUI is now part of PLIB.
4. It renders a set of widgets built based on OpenGL and C++.
5. Free download based on GNU lesser general public license (LGPL).
6. Demo for the library.

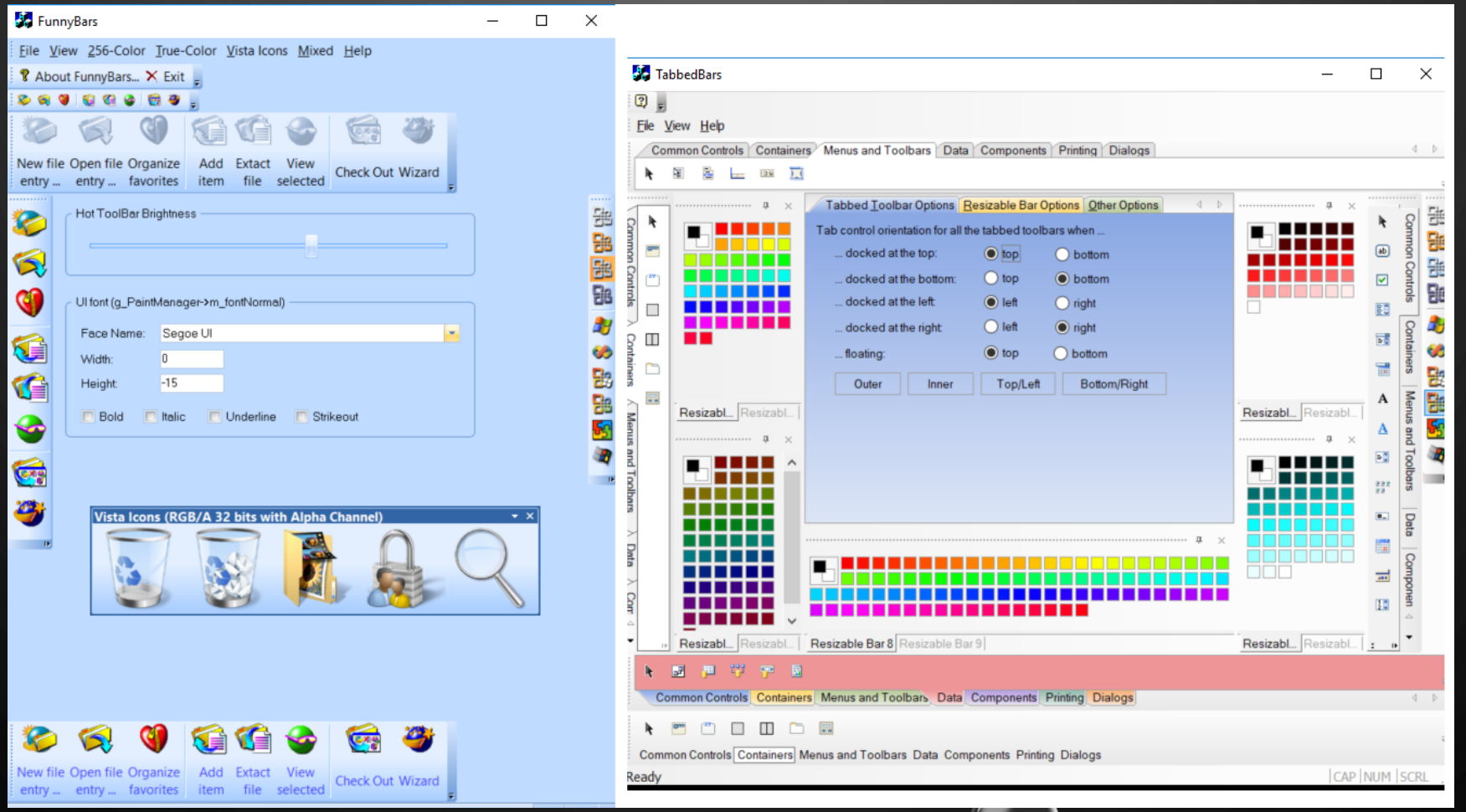
PUI DEMO


File Edit Help
File
Edit
Help
Say Hello
One Shot
My Legend
Frame
Input
Button 1
Button 2
Arrow Button
8 By 13 Font
9 By 15 Font
Helvetica 10
Helvetica 12
Helvetica 18
Times Roman 10
Times Roman 24
Popup Menu
Dial
First ...
Second...
Third ...
List
First Entry
Second Entry
Third Entry
Button Box
Legend
Slider
4
15
Legend
Bi-Slider
4
12 15
Legend
TriSlider
12
Slider w/ Input
15
15
4
4
BiSlider w/ Ends
Scroll Bar
Spin Box
First Entry
Select Box
This is text in the Large
This is a second line of
Large Input Box
First Entry
Second Entry
Third Entry
Fourth Entry
Sixth Entry
Scrolling List
First Entry
First Entry
Second Entry
Third Entry
Combo Box
Pick a file
[..]
[data]
fmodex.dll
FreeImage.dll
FreeType-6.dll
glut.dll
C:\Users\Greg Donaldson\Do
Cancel
Ok
File Selector

MFC

1. It stands for Microsoft Foundation Class library.
2. Written in object-oriented C++.
3. It is meant for desktop applications in Windows.
4. It is proprietary owned by Microsoft®.
5. Demo for the library.

MFC DEMO


FunnyBars
File View 256-Color True-Color Vista Icons Mixed Help
About FunnyBars... Exit
New file entry ... Open file entry ... Organize favorites Add item Extact file View selected Check Out Wizard
Hot ToolBar Brightness
UI font (g_PaintManager->m_fontNormal)
Face Name: Segoe UI
Width: 0
Height: -15
Bold Italic Underline Strikeout
Vista Icons (RGB/A 32 bits with Alpha Channel)
TabbedBars
File View Help
Common Controls Containers Menus and Toolbars Data Components Printing Dialogs
Tabbed Toolbar Options Resizable Bar Options Other Options
Tab control orientation for all the tabbed toolbars when ...
... docked at the top:
... docked at the bottom:
... docked at the left:
... docked at the right:
... floating:
Outer Inner Top/Left Bottom/Right
Resizable Bar 8 Resizable Bar 9
Ready
CAP NUM SCRL

EXERCISE 2

This activity will takes about 10 minutes.

1. Identify five UI libraries which are not from the lecture.

2. For each identified UI library, find the following details.

    (a) Developer(s),

    (b) Programming language used to develop,

    (c) License, and

    (d) Latest version

REFERENCES

Main reference:

Hajek, D. (2019). Introduction to Computer Graphics 2019 Edition. Independently Published.

Additional reference:

Marschner, S. and Shirley, P. (2021). Fundamentals of Computer Graphics, 5th Edn. CRC Press: Taylor's & Francis.