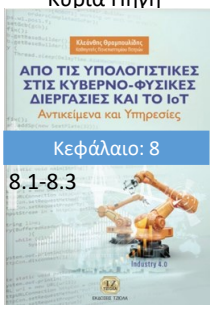
Αντικειμενοστρεφής Προγραμματισμός (Object-Oriented Programming)

(CEID_NNY106)

Αλληλεπίδραση Ανθρώπου Μηχανής
Human Computer Interaction

Κύρια Πηγή



Graphical User Interface (Gui)

Abstract Window Toolkit (**awt**)

RPN Calculator Gui

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Java

High-level programming language

Java is a high-level, class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible. Wikipedia

Designed by: James Gosling

First appeared: May 23, 1995; 27 years ago

Paradigm: Multi-paradigm: generic, object-oriented (class-based), functional, imperative, reflective, concurrent

Human – Computer Interaction

120 80 + 10 30 * + =

Human

library Case study

Machine

RPN engine components

- Operand
- Stack
- Adder
- Multiplier
- Subtractor
- Divider
- ResultPresenter

graphical user interface (GUI)

```
Microsoft Windows [Version 10.0.18362.418]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\thram>
```

- GUI: a type of **computer human interface**. It solves the **blank screen problem** that confronted early computer users.
- At a conceptual level, a **computer human interface** is a "means by which people and computers communicate with each other". One can make an **analogy** between a computer system's GUI and a car's steering wheel.
- It is **the look and feel of a program**
  - In computer science terms, the GUI is a visual operating display that the computer presents on the monitor to the computer operator. More specifically, a GUI is a specification for the **look and feel of the computer system**.
- Makes the program easier to use
  - A program interface that takes advantage of the computer's graphics capabilities to **make the program easier to use**. Well-designed graphical user interfaces can free the user from learning complex command languages. On the other hand, many users find that they work more effectively with a command-driven interface, especially if they already know the command language.
- GUI usually have common characteristic such as windows, icons, menus, and push-buttons (WIMP).

An IoT Gui

Gui

Human

Sseg-TemperaturePcbServer

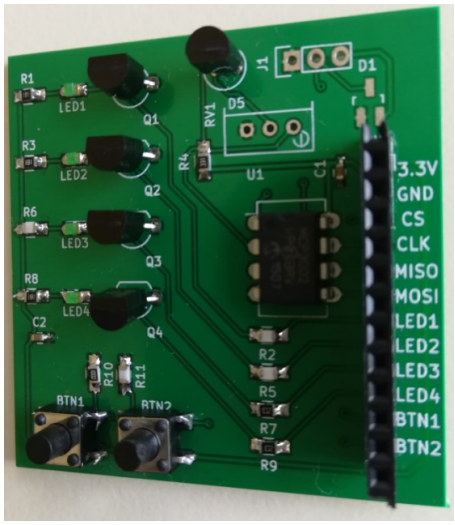
An IoT case study

Server IP: 150.140.189:8080

Temp	19,61	GetVal					
LED1	ON	GetStatus	On	Off			
LED2	OFF	GetStatus	On	Off			
LED3	OFF	GetStatus	On	Off			
LED4	OFF	GetStatus	On	Off			
Button1	open	local	GetStatus	open	close	set-local	set-remote
Button2	open	local	GetStatus	open	close	set-local	set-remote

?

TemperaturePcb



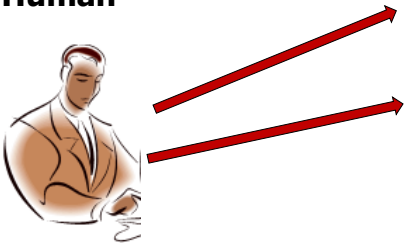
Οργάνωση Διάλεξης

- **Internal vs. external messages**
- Abstract window toolkit (awt)
  - Frame
  - Button
  - TextField
- GUIs στην Java

Internal vs. External messages

120 80 + 10 30 * + =

Human



RPN engine components

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- Stack
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- Divider
- ResultPresenter

ΕΣΩΤΕΡΙΚΑ ΜΗΝΥΜΑΤΑ

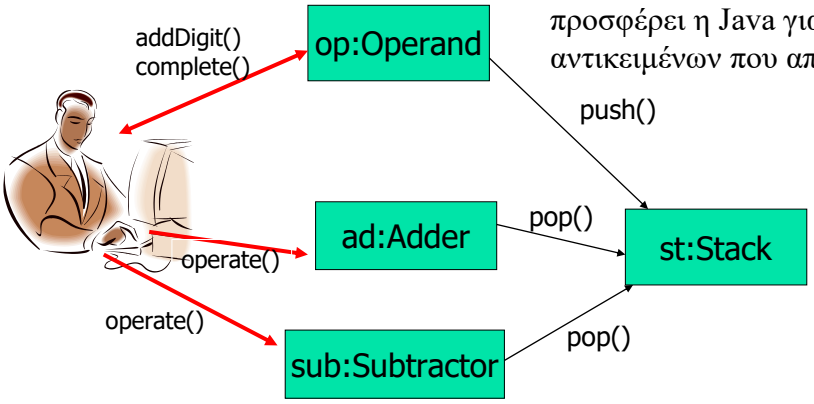
Ανάλογα με την φύση των αντικειμένων αποστολέα και παραλήπτη σε μία ανταλλαγή μηνύματος διακρίνουμε

α/α	Αποστολέας	Παραλήπτης
1	στιγμιότυπο	στιγμιότυπο
2	κλάση	στιγμιότυπο
3	στιγμιότυπο	κλάση
4	κλάση	κλάση

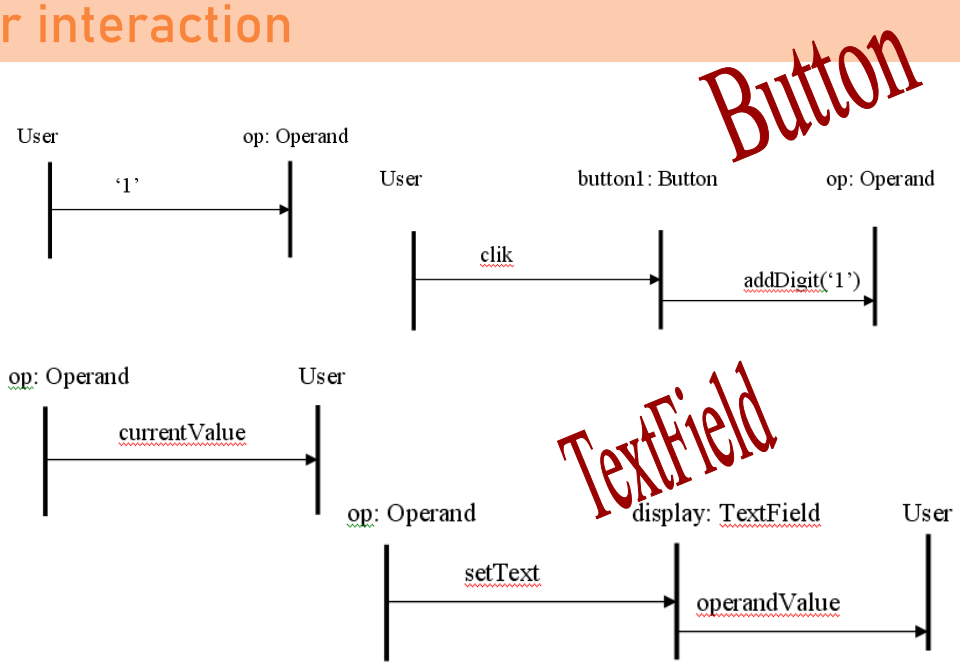
Δες το παράδειγμα του φούρνου μικροκυμάτων

Εξωτερικά μηνύματα

- Θεωρείστε την αλληλεπίδραση της εφαρμογής σας με τον χρήστη.
- Μπορείτε να υλοποιήσετε την αλληλεπίδραση αυτή χρησιμοποιώντας τους μηχανισμούς που προσφέρει η Java για αλληλεπίδραση μεταξύ των αντικειμένων που απαρτίζουν την εφαρμογή;



User interaction

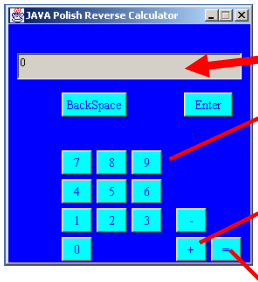


Gui responsibilities

120 80 + 10 30 * + =

Machine

Human



RPN engine components

- Operand
- Stack
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Οργάνωση Διάλεξης

- Internal vs. external messages
- **Abstract window toolkit (awt)**
  - Frame
  - Button
  - TextField
- GUIs στην Java

Το πακέτο awt (abstract window toolkit)

- παρέχει ένα σύνολο από αντικείμενα:
  - κλάσεις,
  - interfaces,
  - exceptions και
  - Errors.

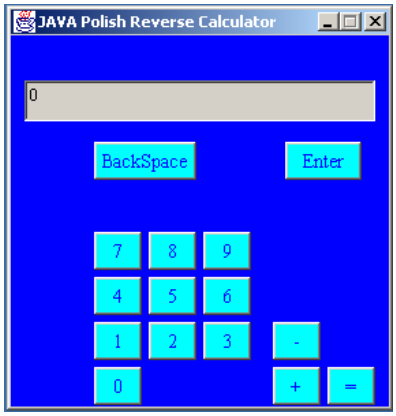
Java 8: package java.awt
Java 9. module java.desktop

τα αντικείμενα αυτά μας επιτρέπουν να υλοποιήσουμε την αλληλεπίδραση εφαρμογής-χρήστη.

Χαρακτηριστικές κλάσεις του awt

Classes	**Classes**	**Interfaces**
AWTEvent	**Menu**	*ActiveEvent*
Button	MenuBar	*Composite*
Checkbox	MenuComponent	*MenuContainer*
CheckboxMenuItem	MenuItem	*Paint*
Choice	**PopupMenu**	*PrintGraphics*
Cursor	**Rectangle**	*Shape*
Event	Robot	
Font	**Scrollbar**	
Frame	**TextField**	
Label	Window	
List		

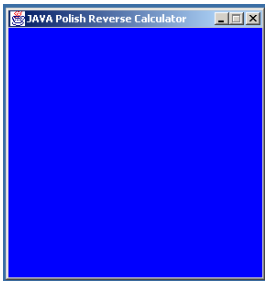
Example: RPN Calculator Gui



- Χρησιμοποιήστε το awt για να δημιουργήσετε μία γραφική διεπαφή για την αριθμομηχανή αντίστροφης Πολωνικής σημειογραφίας

Iteration 1 – Build Frame

- Αναπτύξτε ένα πρόγραμμα που θα εμφανίζει το παραπλεύρως πλαίσιο.
- Αξιοποιήστε την κλάση Frame.



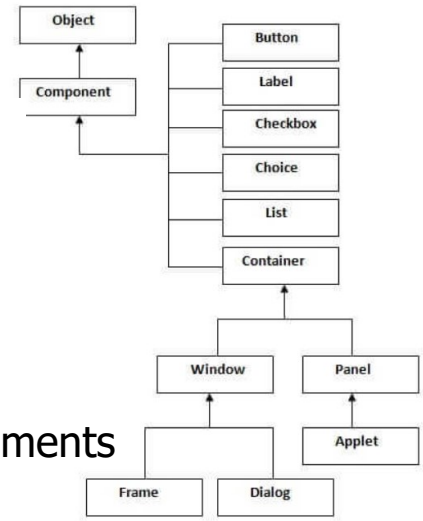
Class Frame

- A Frame is a top-level window with a title and a border.

java.awt

Class Frame

java.lang.Object
  └ java.awt.Component
    └ java.awt.Container
      └ java.awt.Window
        └ java.awt.Frame



- public class **Frame** extends Window implements MenuContainer

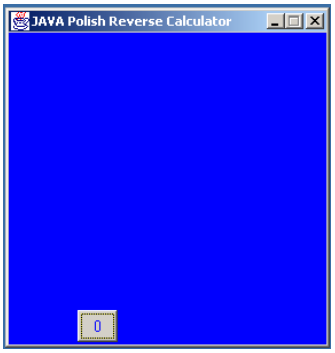
Frame(String title)
Constructs a new, initially invisible Frame object with the specified title.

CalculatorGui Class

```
import java.awt.*;
import java.awt.event.*;
public class CalculatorGui extends Frame{
      public CalculatorGui(){
            super("JAVA Polish Reverse Calculator");
            this.setLayout(null);
            // public void setFont(Font f)      To set the font of this container.
            // public void setBackground(Color c)     To set the background color of this component.
            // public void setSize(Dimension d)            - w=283, h=297
                  // To resize this component so that it has width d.width and height d.height.
            // public void setLocation(int x, int y)        - x = 50, y =100
                  //Moves this component to a new location. The top-left corner of the new location is
                  //specified by the x and y parameters in the coordinate space of this component's parent.
            //public void setVisible(boolean b)
                  //To show this Window
            // public void toFront()
                  //If this Window is visible, brings this Window to the front and may make it the focused Window.
            //void setResizable(boolean resizable)
                  //Sets whether this frame is resizable by the user.
            this.addWindowListener(new CloseWindowAndExit());
            }
    }
class CloseWindowAndExit extends WindowAdapter  {
   public void windowClosing (WindowEvent closeWindowAndExit){
     System.exit(0);
    }
 }
```


Iteration 2 – Add a Button

- Προσθέστε στο πλαίσιο που αναπτύξατε το κουμπί 0
- Χρησιμοποιήστε την κλάση Button



java.awt

Class Button

java.lang.Object
└ java.awt.Component
└ java.awt.Button

- This class creates a labeled button.
- **The application can cause some action to happen when the button is pushed.**
- public class **Button** extends Component implements Accessible

  Button(String label)

  Constructs a button with the specified label.

Appending a button

```
import java.awt.*;
import java.awt.event.*;
public class CalculatorGui extends Frame{

  public CalculatorGui(){
    super("JAVA Polish Reverse Calculator");
    ...
    this.addWindowListener(new CloseWindowAndExit());


    button0=new Button("0");
    // public void setBounds(Rectangle r)            - x=64, y=265, w=35, h=28
          //Moves and resizes this component to conform to the new bounding rectangle r. This
    component's     //new position is specified by r.x and r.y, and its new size is specified by
    r.width and r.height
    button0.setFont(...);
    button0.setBackground(...);
    button0.setForeground(...);

    // Append button0 to the end of this CalculatorGui container.
    }
}
```


Class Container

java.awt
Class Container

java.lang.Object
└ java.awt.Component
└ java.awt.Container

public class **Container** extends
Component

A generic Abstract Window Toolkit(AWT) container object is a component that can contain other AWT components.

Components added to a container are tracked in a list. The order of the list will define the **components' front-to-back stacking order** within the container. If no index is specified when adding a component to a container, it will be added to the end of the list (and hence to the bottom of the stacking order).

public Component **add**(Component comp)

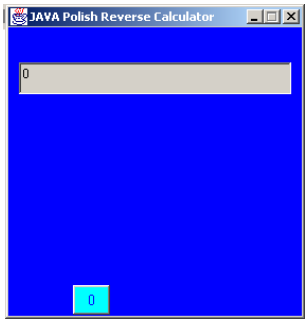
Appends the specified component to the end of this container.

Δώστε μια υλοποίηση της WindowsApp η οποία θα αξιοποιεί την παραπάνω λειτουργικότητα της Container.

example

Iteration 3 – Add a TextField

- Προσθέστε στο πλαίσιο που αναπτύξατε ένα instance της TextField όπως φαίνεται στο παρακάτω σχήμα.



java.awt
Class TextField

java.lang.Object
└ java.awt.Component
└ java.awt.TextComponent
└ java.awt.TextField

- A TextField object is a text component that allows for the editing of a single line of text.

public class **TextField** extends TextComponent

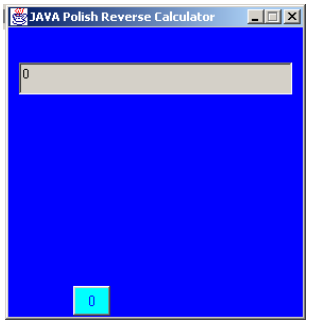
TextField(String text, int columns)
Constructs a new text field initialized with the specified text to be displayed, and wide enough to hold the specified number of columns.

Appending a TextField

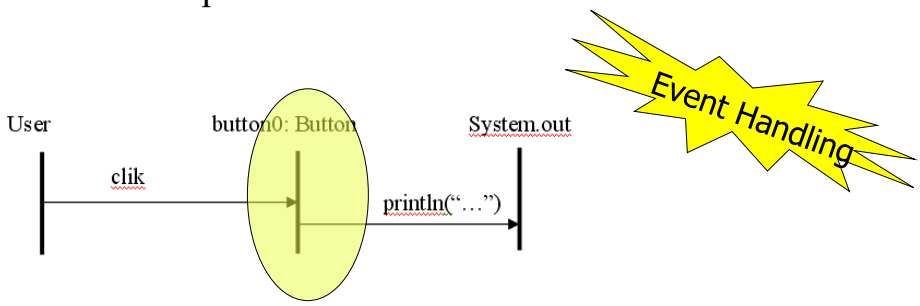
```
import java.awt.*;
import java.awt.event.*;
public class CalculatorGui extends Frame{

   public CalculatorGui(){
    super("JAVA Polish Reverse Calculator");
    …
    display = new TextField("0",14);
    display.setEditable(false);  //disable editing
   // public void setBounds(Rectangle r)   - x=13, y=55, w=257, h=30
        //Moves and resizes this component to conform to the new bounding rectangle r. This component's
        //new position is specified by r.x and r.y, and its new size is specified by r.width and r.height
    // Append display to the end of this CalculatorGui container.
   }
}
```

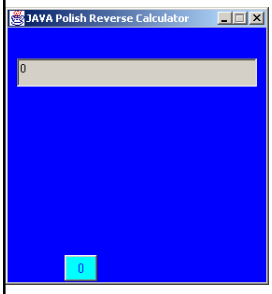
Iteration 4 – Define the Action of Button



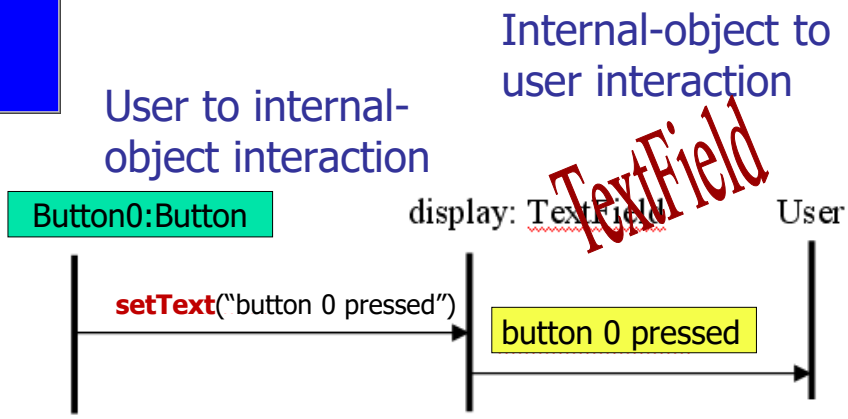
- Define the action to happen when the button is pushed
- Τροποποιήστε την εφαρμογή ώστε πατώντας το κουμπί 0 να τυπώνεται στην οθόνη το μήνυμα "button 0 pressed".



Iteration 5 – Set ":*Button*" to display … a message to ":*TextField*"



- Τροποποιήστε την εφαρμογή ώστε πατώντας το κουμπί 0 να τυπώνεται το μήνυμα "button 0 pressed" στο display της γραφικής διεπαφής.



Οργάνωση Διάλεξης

- Internal vs. external messages
- Abstract window toolkit (awt)
  - Frame
  - Button
  - TextField
- **GUIs στην Java**
  - **awt**
  - **swing**
  - **swt**

Java's GUI tool kits

- **AWT**
  - Abstract Windows Toolkit (AWT) is the original Java GUI tool kit introduced with JDK 1.0.
- **Swing**
  - Java Swing was an attempt to solve most of AWT's shortcomings. In Swing, Sun created **a very well-engineered, flexible, powerful** GUI tool kit. Unfortunately, this means Swing takes **time to learn**, and it is sometimes **too complex** for common situations. Was introduced by Sun in J2SE 1.2
- **SWT**
  - Standard Widget Toolkit (SWT) is a low-level GUI tool kit comparable in concept to AWT. The builders of SWT learned from the AWT and Swing implementations and tried to build a system that had the advantages of both without their disadvantages.

Why is there more than one Java™ GUI tool kit? The best answer is that **one size does not fit all**, nor is there a one-size-fits-all GUI tool kit to be invented soon. Each tool kit offers advantages and disadvantages that make selecting one more appropriate, given your needs and intended audience.

Πηγή: **SWT, Swing or AWT: Which is right for you?** *What to consider when choosing a GUI tool kit for new applications* *link*

AWT

(Abstract Windows Toolkit) is the original Java GUI tool kit.

- AWT's main advantages are that
  - it comes standard with every version of Java technology, including Java implementations in old Web browsers, and
  - it is very stable.
- This means
  - you do not need to install it,
  - you can depend on it being available everywhere you find a Java runtime environment, and
  - it will have the features you expect.

SWING

SWING

- also known as a part of the *Java Foundation Classes* (JFC),
  - was an attempt to solve most of AWT's shortcomings.
  - In Swing, Sun created a very well-engineered, flexible, powerful GUI tool kit. Unfortunately, this means **Swing takes time to learn**, and **it is sometimes too complex for common situations**.
  - Swing is built on parts of AWT. All Swing parts are also AWT parts. Swing **uses the AWT event model** and support classes, such as Colors, Images, and Graphics.
  - far more extensive than that supplied by AWT and compares well to the SWT set.

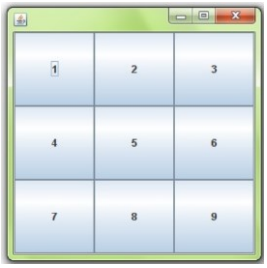
SWT

- **Low-level GUI**
  - Standard Widget Toolkit (SWT) is a low-level GUI tool kit comparable in concept to AWT.
- **Makes building GUIs easier**
  - JFace is a set of enhanced components and utility services to make building GUIs with SWT easier.
- **Was built on AWT and Swing advantages**
  - The builders of SWT learned from the AWT and Swing implementations and tried to build a system that had the advantages of both without their disadvantages. In many ways, they succeeded.

Πηγή: **SWT, Swing or AWT: Which is right for you?** *What to consider when choosing a GUI tool kit for new applications* *link*

GridLayout class

- is a layout manager that lays out a container's components in a rectangular grid.
  - The container is divided into equal-sized rectangles, and one component is placed in each rectangle.



- **GridLayout()**
  - creates a grid layout with one column per component in a row.
- **GridLayout(int rows, int columns)**
  - creates a grid layout with the given rows and columns but no gaps between the components.
- **GridLayout(**int rows, int columns, int hgap, int vgap)
  - creates a grid layout with the given rows and columns alongwith given horizontal and vertical gaps.

See also the Panel class