Events and Their Handling

Object Oriented Programming
2022 First Semester
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1 Event driven

2 Example: ColorChoice

Today's program

https://github.com/oop-mc-saga/ColorChoice

Event Driven

- Events in GUI applications are generated by
    - mouse, keyboard, changes in widgets, etc.
- Mechanisms driven by events are called *Event Driven*.
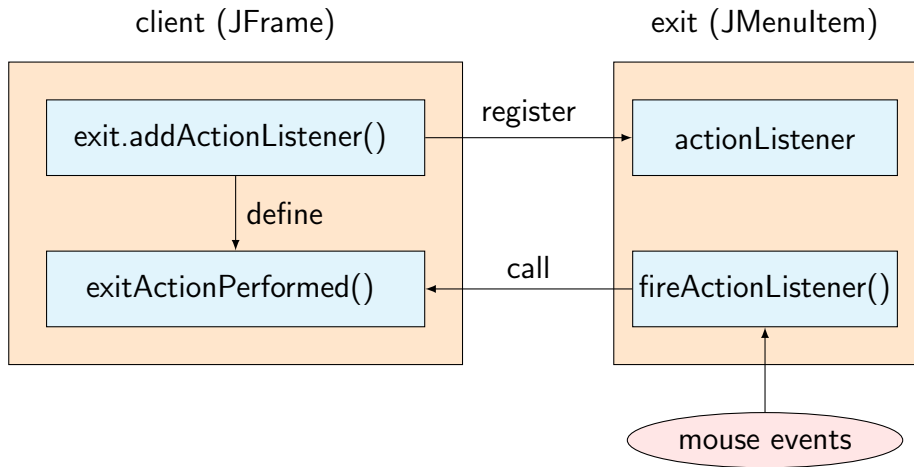- Event driven mechanisms are common in GUI applications

Event Driven in Java

- Event classes are defined as extensions of
  `java.util.EventObject`.
- `EventListener` (receiver of events) classes are defined as
  extensions of `java.util.EventListener`.
- `EventListener` instances have descriptions how to handle
  events.

Actions in `guiWithAction`
Examples of events and event handling

- `guiWithAction` responds to button events.
- Registering actionListener
  - JFrame: `exit.addActionListener()`
  - JMenuItem: Register as an instance of `ActionListener`
- Event handling
  - JFrame: call `exitActionPerformed()`
  - JMenuItem: call `actionPerformed()` in `fileActionListener()`

client (JFrame)

exit (JMenuItem)

exit.addActionListener() — register → actionListener

define ↓

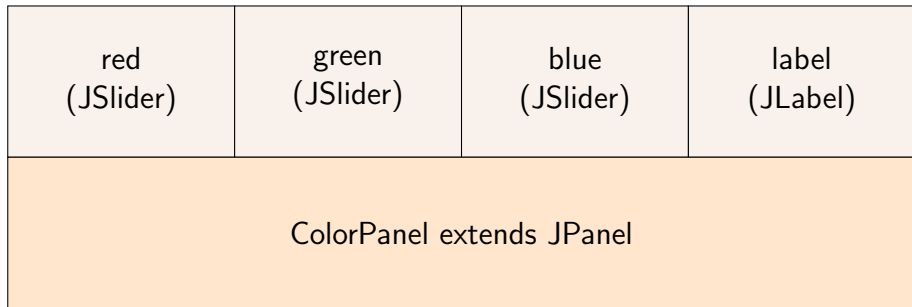exitActionPerformed() ← call — fireActionListener()

↑

mouse events

Actions in event generators

- An instance or a list of instances of action listeners
- addActionListener() method registers listeners
- At an event
  - Notify event to listeners through fileActionListener()

Example: ColorChoice

- Specify color by rgb components
- Use slider
  - JSlider class
  - Generate ChangeEvent
- Place three color sliders
  - Place JSlider instances in JPanel
  - JPanel does not generate ChangeEvent
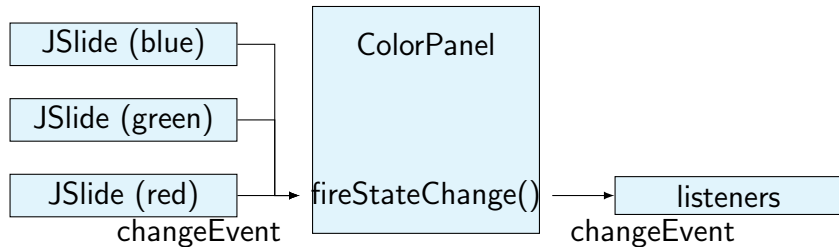 - Need to define event handling mechanisms

Widget composition

red (JSlider)	green (JSlider)	blue (JSlider)	label (JLabel)
ColorPanel extends JPanel			

Class design for ColorPanel class

- List of changeListener instances
- fireStateChange() method
  - notify changes to listeners
- Three JSlider instances for rgb
  - Each stateChange() calls fireStateChange() method

Event propagation in ColorPanel

ColorPane

```
1   public ColorPanel() {
2       initComponents();
3       listeners = new ArrayList<>();
4       setColor();
5       redSlider.addChangeListener(e->fireStateChanged(e));
6       greeSlider.addChangeListener(e->fireStateChanged(e));
7       blueSlider.addChangeListener(e->fireStateChanged(e));
8   }
```

Define actions as calling fileStateChanges() at state change
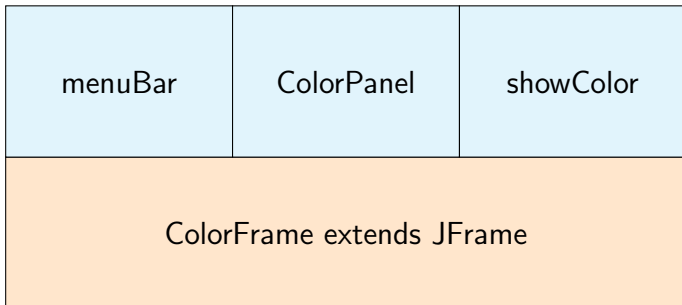events of sliders.

ColorPane

```
1   /**
2    * Add change listener
3    *
4    * @param listener
5    */
6   public void addChangeListener(ChangeListener listener) {
7       listeners.add(listener);
8   }
9
10  /**
11   * Notify listeners of event
12   *
13   * @param e
14   */
15  protected void fireStateChanged(ChangeEvent e) {
16      setColor();
17      listeners.forEach(li -> li.stateChanged(e));
18  }
```

Notify an event to listeners at state change events.

```
 1   /**
 2    * Get color values from three sliders and set color
 3    */
 4   private void setColor() {
 5       int r = redSlider.getValue();
 6       int g = greeSlider.getValue();
 7       int b = blueSlider.getValue();
 8       color = new Color(r, g, b);
 9       setLabel(r, g, b);
10   }
```

Widgets in ColorFrame

Exercise

Get color from `Colors` and set the color to `colorPanel` (see quiz).