# Lecture 7 - Java Graphical User Interface (GUI): JavaFX - Part IV

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CSC-1004: Computational Laboratory Using Java
Course Page: [Click]

## Events in JavaFX

An event in JavaFX represents an action triggered by user interaction, such as:

- Clicking a button.
- Pressing a key.
- Moving the mouse.
- Resizing a window.
- Dragging an object.

Each event is represented by an instance of the Event class or its subclasses.

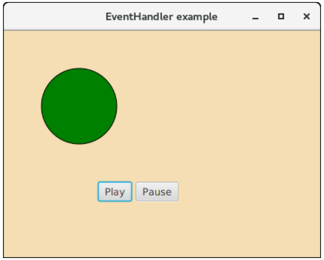
## Events in JavaFX

The JavaFX event model consists of:

- Event Source: The component generating the event (e.g., `Button`, `TextField`).
- Event Object: Contains information about the event (e.g., `MouseEvent`, `KeyEvent`).
- Event Target: The node receiving the event.
- Event Handler: A method that processes the event.

# Events in JavaFX

Assume we have an application that includes a Circle, along with Stop and Play buttons, all grouped together using an object, as shown below.



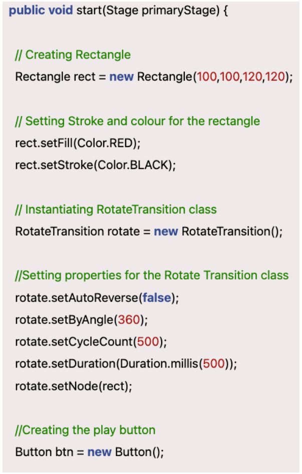
If you click on the play button, the event source node will be the play button, and the object will be the MouseEvent, and the target will be the circle.

## JavaFX Event Handling: Convenient Methods

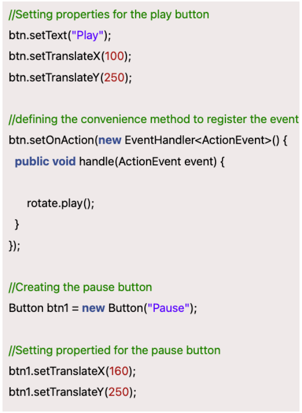
- JavaFX provides convenient methods to **handle events** (create and register event handlers to respond to KeyEvent, MouseEvent, Action Event, and Drop Events).
- **Node** class contains various Event Handler properties which can be set to the user-defined Event Handlers using the **setter methods** defined in the class.
- Setting the EventHandler properties of the Node class to user-defined event handlers will register the handlers to receive the corresponding event types.

## JavaFX Event Handling: Convenient Methods

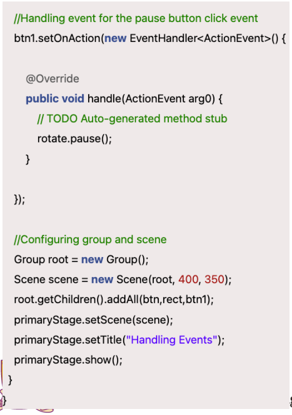
The EventHandler registered with the setOnAction() method is called when the Play button is clicked and it is set to rotate the rectangle on the screen.



```
public void start(Stage primaryStage) {

 // Creating Rectangle
 Rectangle rect = new Rectangle(100,100,120,120);

 // Setting Stroke and colour for the rectangle
 rect.setFill(Color.RED);
 rect.setStroke(Color.BLACK);

 // Instantiating RotateTransition class
 RotateTransition rotate = new RotateTransition();

 //Setting properties for the Rotate Transition class
 rotate.setAutoReverse(false);
 rotate.setByAngle(360);
 rotate.setCycleCount(500);
 rotate.setDuration(Duration.millis(500));
 rotate.setNode(rect);

 //Creating the play button
 Button btn = new Button();
```



```
//Setting properties for the play button
btn.setText("Play");
btn.setTranslateX(100);
btn.setTranslateY(250);

//defining the convenience method to register the event
btn.setOnAction(new EventHandler<ActionEvent>() {
 public void handle(ActionEvent event) {

    rotate.play();
 }
});

//Creating the pause button
Button btn1 = new Button("Pause");

//Setting propertied for the pause button
btn1.setTranslateX(160);
btn1.setTranslateY(250);
```

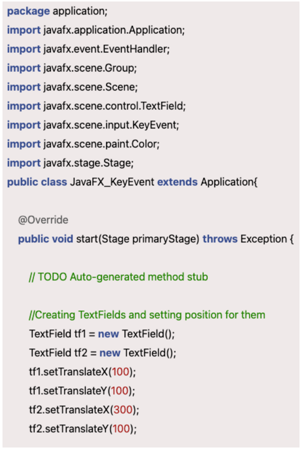


```
//Handling event for the pause button click event
btn1.setOnAction(new EventHandler<ActionEvent>() {

  @Override
  public void handle(ActionEvent arg0) {
    // TODO Auto-generated method stub
    rotate.pause();
  }

});

//Configuring group and scene
Group root = new Group();
Scene scene = new Scene(root, 400, 350);
root.getChildren().addAll(btn,rect,btn1);
primaryStage.setScene(scene);
primaryStage.setTitle("Handling Events");
primaryStage.show();
}
}
```

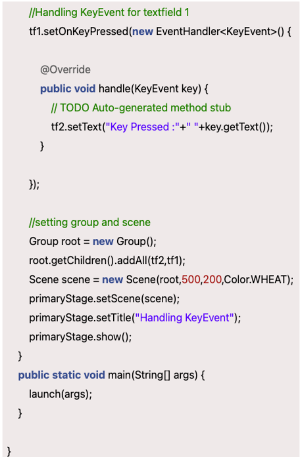
# JavaFX Event Handling: Convenient Methods

The **setOnKeyEvent()** method can register the Event Handler logic for the key event.

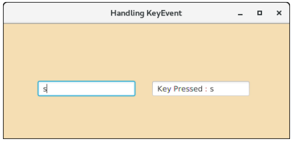
E.g., the key pressed in the first text field is set as the text in the second text field.



```java
package application;
import javafx.application.Application;
import javafx.event.EventHandler;
import javafx.scene.Group;
import javafx.scene.Scene;
import javafx.scene.control.TextField;
import javafx.scene.input.KeyEvent;
import javafx.scene.paint.Color;
import javafx.stage.Stage;
public class JavaFX_KeyEvent extends Application{

  @Override
  public void start(Stage primaryStage) throws Exception {

    // TODO Auto-generated method stub

    //Creating TextFields and setting position for them
    TextField tf1 = new TextField();
    TextField tf2 = new TextField();
    tf1.setTranslateX(100);
    tf1.setTranslateY(100);
    tf2.setTranslateX(300);
    tf2.setTranslateY(100);
```

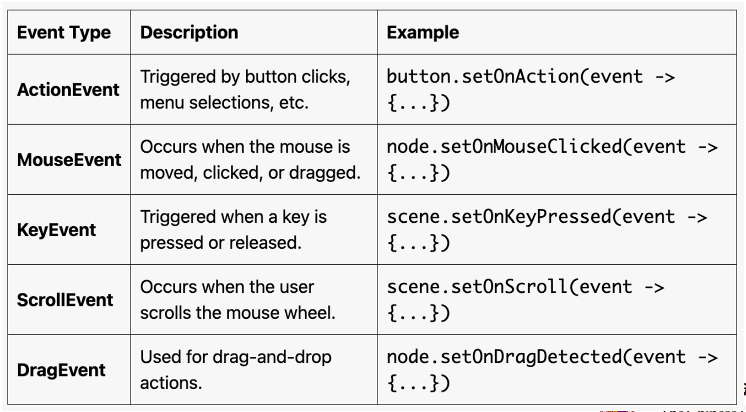


```java
    //Handling KeyEvent for textfield 1
    tf1.setOnKeyPressed(new EventHandler<KeyEvent>() {

      @Override
      public void handle(KeyEvent key) {
        // TODO Auto-generated method stub
        tf2.setText("Key Pressed :"+" "+key.getText());
      }

    });

    //setting group and scene
    Group root = new Group();
    root.getChildren().addAll(tf2,tf1);
    Scene scene = new Scene(root,500,200,Color.WHEAT);
    primaryStage.setScene(scene);
    primaryStage.setTitle("Handling KeyEvent");
    primaryStage.show();
  }
  public static void main(String[] args) {
    launch(args);
  }

}
```



# JavaFX Event Handling: Convenient Methods

JavaFX provides different types of event classes:



| Event Type | Description | Example |
|---|---|---|
| **ActionEvent** | Triggered by button clicks, menu selections, etc. | `button.setOnAction(event -> {...})` |
| **MouseEvent** | Occurs when the mouse is moved, clicked, or dragged. | `node.setOnMouseClicked(event -> {...})` |
| **KeyEvent** | Triggered when a key is pressed or released. | `scene.setOnKeyPressed(event -> {...})` |
| **ScrollEvent** | Occurs when the user scrolls the mouse wheel. | `scene.setOnScroll(event -> {...})` |
| **DragEvent** | Used for drag-and-drop actions. | `node.setOnDragDetected(event -> {...})` |

## JavaFX Event Handling: Event Handlers

- JavaFX facilitates us to use the **Event Handlers** to handle the events generated by Keyboard Actions, Mouse Actions, and many more source nodes.
- There can be more than one Event handlers for a single node.
- We can use single handler for more than one node and more than one event type.

# JavaFX Event Handling: Event Handlers

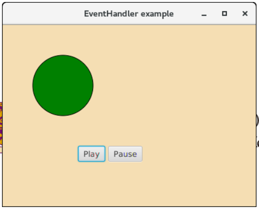
In the following example, same event handler is registered with two different buttons.

The event source is discriminated in the handle() method.

```java
public void start(Stage primaryStage) throws Exception {
    // TODO Auto-generated method stub
    //Creating Circle and setting the color and stroke in the circle
    Circle c = new Circle(100,100,50);
    c.setFill(Color.GREEN);
    c.setStroke(Color.BLACK);

    //creating play button and setting coordinates for the button
    Button btn = new Button("Play");
    btn.setTranslateX(125);
    btn.setTranslateY(200);

    // creating pause button and setting coordinate for the pause button
    Button btn1 = new Button("Pause");
    btn1.setTranslateX(175);
    btn1.setTranslateY(200);

    //Instantiating TranslateTransition class to create the animation
    TranslateTransition trans = new TranslateTransition();

    //setting attributes for the TranslateTransition
    trans.setAutoReverse(true);
    trans.setByX(200);
    trans.setCycleCount(100);
    trans.setDuration(Duration.millis(500));
    trans.setNode(c);
```

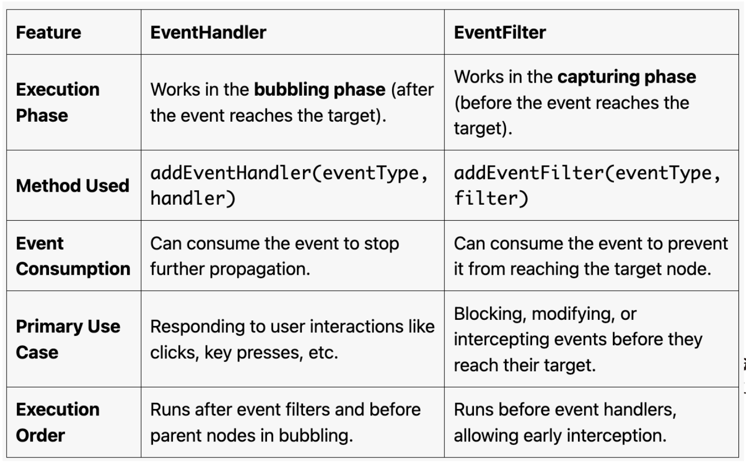
```java
//Creating EventHandler
EventHandler<MouseEvent> handler = new EventHandler<MouseEvent>() {

    @Override
    public void handle(MouseEvent event) {
        // TODO Auto-generated method stub

        if(event.getSource()==btn)
        {
        trans.play(); //animation will be played when the play button is clicked
        }
        if(event.getSource()==btn1)
        {
            trans.pause(); //animation will be paused when the pause button is clicked
        }
        event.consume();
    }

};

//Adding Handler for the play and pause button
btn.setOnMouseClicked(handler);
btn1.setOnMouseClicked(handler);
```

```java
    //Creating Group and scene
    Group root = new Group();
    root.getChildren().addAll(c,btn,btn1);
    Scene scene = new Scene(root,420,300,Color.WHEAT);
    primaryStage.setScene(scene);
    primaryStage.setTitle("EventHandler example");
    primaryStage.show();
}
public static void main(String[] args) {
    launch(args);
}
}
```



## EventHandlers v.s., EventFilters

In JavaFX, both EventHandlers and EventFilters are used to handle events, but they serve different purposes in the event-handling mechanism.



| Feature | EventHandler | EventFilter |
|---|---|---|
| **Execution Phase** | Works in the **bubbling phase** (after the event reaches the target). | Works in the **capturing phase** (before the event reaches the target). |
| **Method Used** | `addEventHandler(eventType, handler)` | `addEventFilter(eventType, filter)` |
| **Event Consumption** | Can consume the event to stop further propagation. | Can consume the event to prevent it from reaching the target node. |
| **Primary Use Case** | Responding to user interactions like clicks, key presses, etc. | Blocking, modifying, or intercepting events before they reach their target. |
| **Execution Order** | Runs after event filters and before parent nodes in bubbling. | Runs before event handlers, allowing early interception. |

## Question and Answering (Q&A)