Approfondimento

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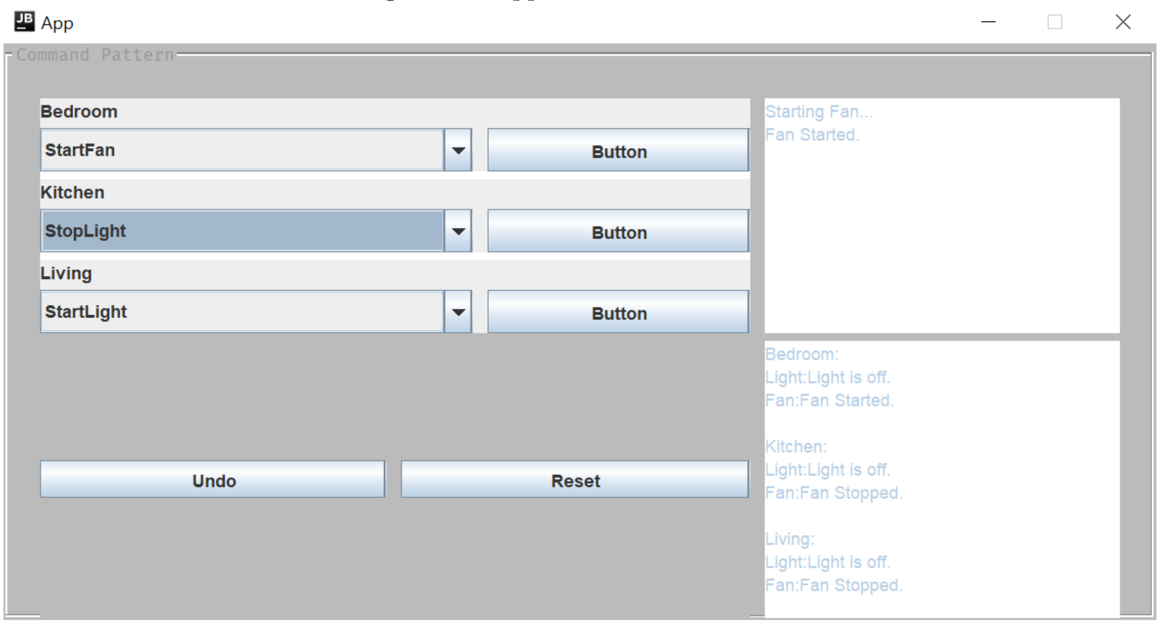
1 Introduzione

Il progetto scelto approfondisce il design pattern **Command** in particolare si è incentrato nello sviluppo di un applicazione con interfaccia grafica che simula una SmartHome. In questa SmartHome si hanno tre telecomandi che rappresentano tre stanze (**Bedroom**,**Kitchen** e **LivingRoom**) e per ogni stanza si hanno due Receiver **Fan** e **Light** che devono poter rispondere ai comandi rispettivamente **Start/Stop** e **turnOn/turnOff**.
Il problema consiste nella progettazione di una classe **SmartHomeRemote**, in grado di inoltrare richieste verso oggetti che saranno noti solo in fasi successive di sviluppo. Inoltre per l'implementazione della funzione **undo** è stato aggiunto uno oggetto **Stack** per mantenere in memoria le operazioni effettuate. L'applicazione permette di selezionare la stanza e il comando da eseguire.L'ultimo comando eseguito viene mandato in output e una **JTextArea** permette di visualizzare lo status della SmartHome.Inoltre è possibile fare undo sulle ultime operazioni eseguite o resettare completamente l'applicazione.

Figure 1: L'applicazione in esecuzione



```
Starting Fan...
Fan Started.
```

```
Bedroom:
Light:Light is off.
Fan:Fan Started.

Kitchen:
Light:Light is off.
Fan:Fan Stopped.

Living:
Light:Light is off.
Fan:Fan Stopped.
```

2 Codice

```
// Command.java

package com.filmon.businesslogic;

public interface Command {
    public String execute();
    public String undo();
}
```

```
// SmartHomeRemote.java

package com.filmon.businesslogic;

public class SmartHomeRemote {
    private Command command;

    public void setCommand(Command command) {
        this.command = command;
    }

    public String buttonPressed() {
        return command.execute();
    }
    public String undoPressed() {
        return command.undo();
    }
}
```

```java
// Fan.java

package com.filmon.businesslogic;

import java.util.Stack;

public class Fan {
    private boolean state = false;
    private Stack<Boolean> previousStates = new Stack<Boolean>();

    public String start() {
        previousStates.add(state);
        if(!state) {
            state = true;
            return status();
        }else
            return "Fan is unchanged";

    }
    public String stop() {
        previousStates.add(state);
        if(state) {
            state = false;
            return status();
        }else
            return "Fan is unchanged";

    }
    public String undo(){
        boolean ps;
        if(!previousStates.isEmpty()) {
            ps = previousStates.pop();
            if (ps == state) {
                return "Undoing nothing";
            } else {
                state = ps;
                return status();
            }
        }
        return "Undoing nothing";
    }
    public String status(){
        if(state){
            return "Fan Started.";
        }
        return "Fan Stopped.";
    }
}
```

```
// Light.java

package com.filmon.businesslogic;

import java.util.Stack;

public class Light {
    private boolean state = false;
    private Stack<Boolean> previousStates = new Stack<Boolean>();

    public String turnOn() {
        previousStates.add(state);
        if(!state) {
            state = true;
            return status();
        }else
            return "Light␣is␣unchanged";
    }

    public String turnOff() {
        previousStates.add(state);
        if(state) {
            state = false;
            return status();
        }else
            return "Light␣is␣unchanged";
    }
    public String undo(){
        boolean ps;
        if(!previousStates.isEmpty()) {
            ps = previousStates.pop();
            if (ps == state) {
                return "Undoing␣nothing";
            } else {
                state = ps;
                return status();
            }
        }
        return "Undoing␣nothing";
    }
    public String status(){
        if(state){
            return "Light␣is␣on.";
        }
        return "Light␣is␣off.";
    }
}
```

```
// StartFanCommand.java

package com.filmon.businesslogic;

public class StartFanCommand implements Command {
    private Fan fan;

    public StartFanCommand(Fan fan) {
        this.fan = fan;
    }
    @Override
    public String execute() {
        String temp;
        temp = "Starting Fan...\n";
        return temp + fan.start();
    }
    @Override
    public String undo() {
        String temp;
        temp = "Undoing...\n";
        return temp + fan.undo();
    }
}

// StopFanCommand.java

package com.filmon.businesslogic;

public class StopFanCommand implements Command{
    private Fan fan;

    public StopFanCommand(Fan fan) {
        this.fan = fan;
    }
    @Override
    public String execute() {
        String temp;
        temp = "Stopping Fan...\n";
        return temp + fan.stop();
    }
    @Override
    public String undo() {
        String temp;
        temp = "Undoing...\n";
        return temp + fan.undo();
    }
}
```

```
// TurnOnLightCommand.java

package com.filmon.businesslogic;

public class TurnOnLightCommand implements Command{
    private Light light;

    public TurnOnLightCommand(Light light) {
        this.light = light;
    }
    @Override
    public String execute() {
        String temp;
        temp = "Turning␣on␣Light...\n";
        return temp + light.turnOn();
    }
    @Override
    public String undo() {
        String temp;
        temp = "Undoing...\n";
        return temp + light.undo();
    }
}

// TurnOffLightCommand.java

package com.filmon.businesslogic;

public class TurnOffLightCommand implements Command {
    private Light light;

    public TurnOffLightCommand(Light light) {
        this.light = light;
    }
    @Override
    public String execute() {
        String temp;
        temp = "Turning␣off␣Light...\n";
        return temp + light.turnOff();
    }
    @Override
    public String undo() {
        String temp;
        temp = "Undoing...\n";
        return temp + light.undo();
    }
}
```

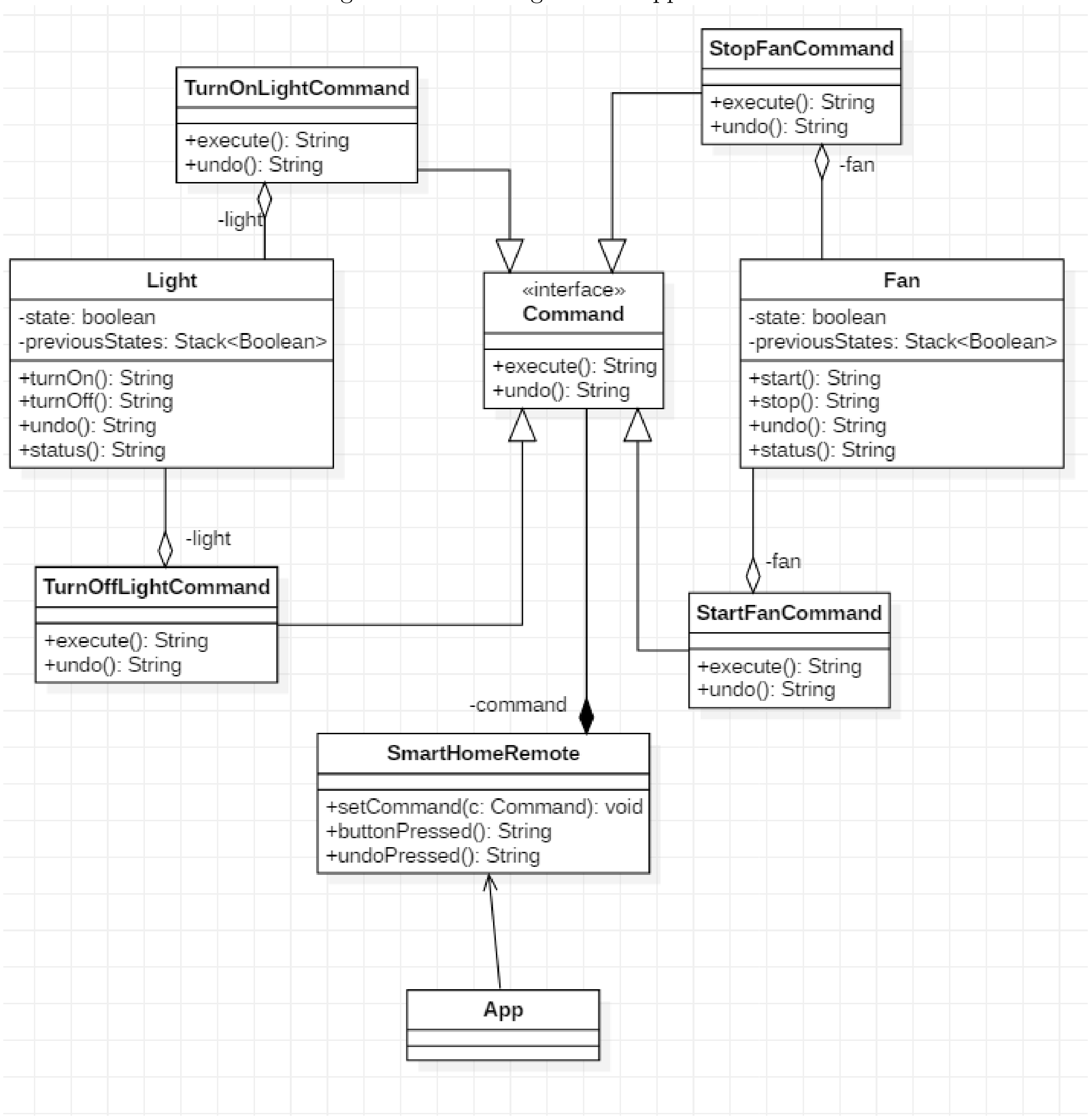
```java
// App.java

package com.filmon;

import com.filmon.businesslogic.*;

import javax.swing.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.util.Stack;

public class App {
    private JPanel panelMain;

    private JButton buttonBed;
    private JButton buttonKitchen;
    private JButton buttonLiving;

    private JComboBox<COMMAND> comboBoxBed;
    private JComboBox<COMMAND> comboBoxKitchen;
    private JComboBox<COMMAND> comboBoxLiving;

    private JButton buttonUndo;
    private JButton buttonReset;

    private JTextArea textAreaOutput;
    private JTextArea textAreaStatus;

    private Stack<SmartHomeRemote> shrs;
    private Light bedLight;
    private Fan bedFan;
    private Light kitchenLight;
    private Fan kitchenFan;
    private Light livingLight;
    private Fan livingFan;

    private SmartHomeRemote bedRemote;
    private SmartHomeRemote kitchenRemote;
    private SmartHomeRemote livingRemote;
    private enum COMMAND {
        StartLight,
        StopLight,
        StartFan,
        StopFan
    }
    public App() {
        reset();
```

```
buttonBed.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent actionEvent) {
        textAreaOutput.setText(bedRemote.buttonPressed());
        shrs.add(bedRemote);
        update();
    }
});
buttonKitchen.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent actionEvent) {
        textAreaOutput.setText(kitchenRemote.buttonPressed());
        shrs.add(kitchenRemote);
        update();
    }
});
buttonLiving.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent actionEvent) {
        textAreaOutput.setText(livingRemote.buttonPressed());
        shrs.add(livingRemote);
        update();
    }
});

comboBoxBed.addItem(COMMAND.StartLight);
comboBoxBed.addItem(COMMAND.StopLight);
comboBoxBed.addItem(COMMAND.StartFan);
comboBoxBed.addItem(COMMAND.StopFan);

comboBoxKitchen.addItem(COMMAND.StartLight);
comboBoxKitchen.addItem(COMMAND.StopLight);
comboBoxKitchen.addItem(COMMAND.StartFan);
comboBoxKitchen.addItem(COMMAND.StopFan);

comboBoxLiving.addItem(COMMAND.StartLight);
comboBoxLiving.addItem(COMMAND.StopLight);
comboBoxLiving.addItem(COMMAND.StartFan);
comboBoxLiving.addItem(COMMAND.StopFan);

comboBoxBed.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent actionEvent) {
        Command command;
        switch (comboBoxBed.getSelectedIndex()){
            case 0:
                command = new TurnOnLightCommand(bedLight);
```

```
                    break;
                case 1:
                    command = new TurnOffLightCommand(bedLight);
                    break;
                case 2:
                    command = new StartFanCommand(bedFan);
                    break;
                default:
                case 3:
                    command = new StopFanCommand(bedFan);
                    break;
            }
            bedRemote.setCommand(command);
        }
    });
    comboBoxKitchen.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent actionEvent) {
            Command command;
            switch (comboBoxKitchen.getSelectedIndex()){
                case 0:
                    command = new TurnOnLightCommand(kitchenLight);
                    break;
                case 1:
                    command = new TurnOffLightCommand(kitchenLight);
                    break;
                case 2:
                    command = new StartFanCommand(kitchenFan);
                    break;
                default:
                case 3:
                    command = new StopFanCommand(kitchenFan);
                    break;
            }
            kitchenRemote.setCommand(command);
        }
    });
    comboBoxLiving.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent actionEvent) {
            Command command;
            switch (comboBoxLiving.getSelectedIndex()){
                case 0:
                    command = new TurnOnLightCommand(livingLight);
                    break;
                case 1:
                    command = new TurnOffLightCommand(livingLight);
                    break;
                case 2:
                    command = new StartFanCommand(livingFan);
                    break;
                default:
                case 3:
                    command = new StopFanCommand(livingFan);
                    break;
            }
            livingRemote.setCommand(command);
        }
    });
    comboBoxBed.setSelectedItem(COMMAND.StartLight);
    comboBoxKitchen.setSelectedItem(COMMAND.StartLight);
    comboBoxLiving.setSelectedItem(COMMAND.StartLight);

    textAreaOutput.setEnabled(false);
    textAreaStatus.setEnabled(false);
    buttonUndo.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent actionEvent) {
            SmartHomeRemote undoRemote;
            if (!shrs.isEmpty()){
                undoRemote = shrs.pop();
                textAreaOutput.setText(undoRemote.undoPressed());
                update();
            }
        }
    });
    buttonReset.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent actionEvent) {
            reset();
            comboBoxBed.setSelectedItem(COMMAND.StartLight);
            comboBoxKitchen.setSelectedItem(COMMAND.StartLight);
            comboBoxLiving.setSelectedItem(COMMAND.StartLight);
        }
    });
}
private void reset(){
    shrs = new Stack<>();
    bedLight = new Light();
    kitchenLight = new Light();
    livingLight = new Light();

    bedFan = new Fan();
    kitchenFan = new Fan();
    livingFan = new Fan();
```

```
        bedRemote = new SmartHomeRemote();
        kitchenRemote = new SmartHomeRemote();
        livingRemote = new SmartHomeRemote();

        textAreaOutput.setText("");
        textAreaStatus.setText("");
    }
    private void update(){
        textAreaStatus.setText(
                "Bedroom:␣\n" +
                "Light:"+bedLight.status()+"\n"+
                "Fan:"+bedFan.status()+"\n\n"+
                "Kitchen:␣\n" +
                "Light:"+kitchenLight.status()+"\n"+
                "Fan:"+kitchenFan.status()+"\n\n"+
                "Living:␣\n" +
                "Light:"+livingLight.status()+"\n"+
                "Fan:"+livingFan.status()+"\n"
                );
    }
    public static void main(String[] args)  {

        JFrame frame = new JFrame("App");
        frame.setContentPane(new App().panelMain);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.pack();
        frame.setVisible(true);
        frame.setResizable(false);
    }
}
```

Figure 2: Class Diagram dell'applicazione


TurnOnLightCommand
+execute(): String
+undo(): String
-light
Light
-state: boolean
-previousStates: Stack<Boolean>
+turnOn(): String
+turnOff(): String
+undo(): String
+status(): String
-light
TurnOffLightCommand
+execute(): String
+undo(): String
StopFanCommand
+execute(): String
+undo(): String
-fan
«interface»
Command
+execute(): String
+undo(): String
Fan
-state: boolean
-previousStates: Stack<Boolean>
+start(): String
+stop(): String
+undo(): String
+status(): String
-fan
StartFanCommand
+execute(): String
+undo(): String
-command
SmartHomeRemote
+setCommand(c: Command): void
+buttonPressed(): String
+undoPressed(): String
App