Object Oriented Analysis & Design
面向对象分析与设计

Lecture_09 GOF 设计模式（一）

1）单实例　　2）适配器　　3）外观　　4）观察者

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5、GOF设计模式四: 观察者模式Observer（一）

- 现实中遇到的问题
  - 当有许多不同的客户都对同一数据源感兴趣，对相同的数据有不同的处理方式，该如何解决?

5.1 定义: 观察者模式

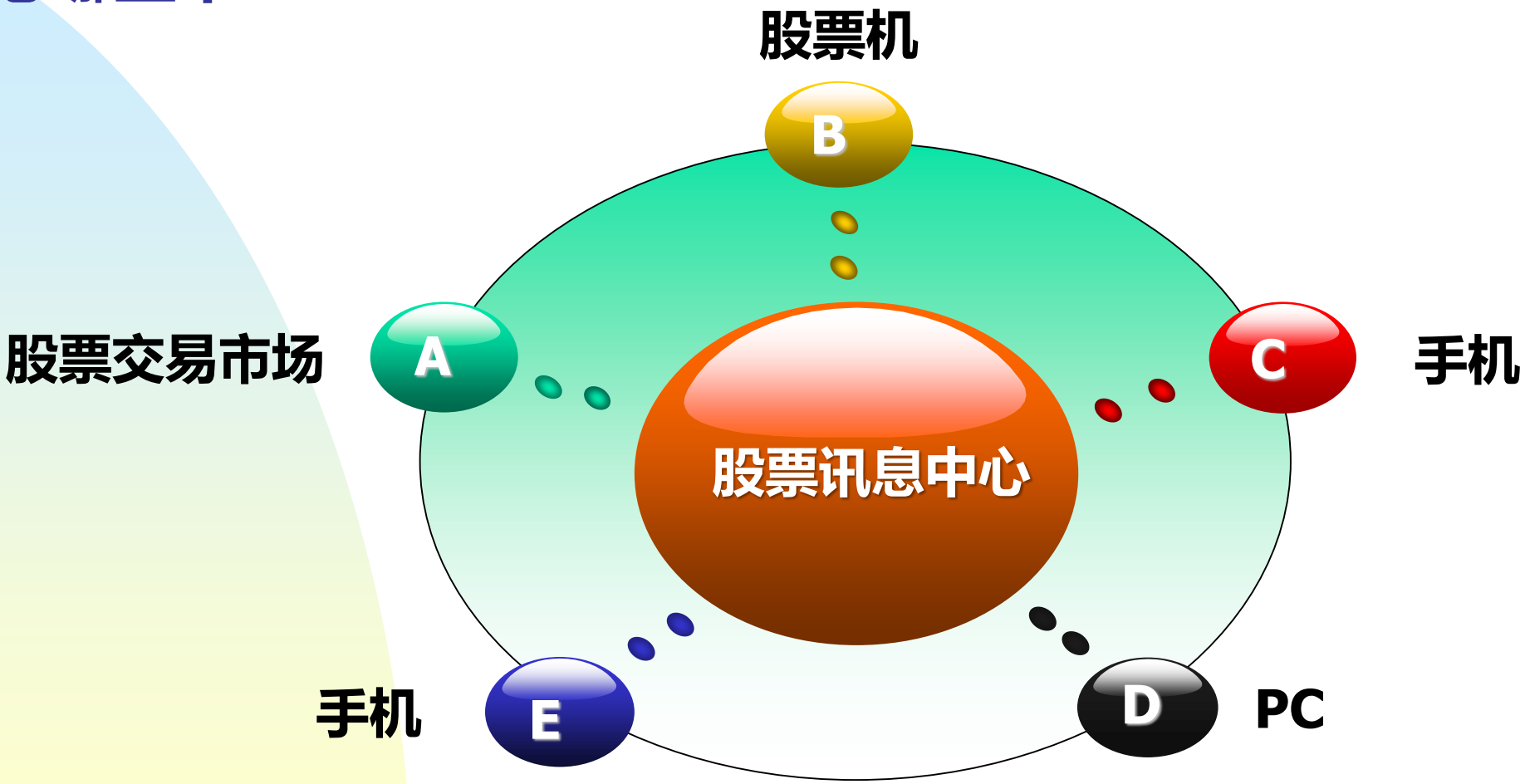
- 观察者模式 Observer

  - 定义对象之间的一对多依赖关系，当一个对象改变状态时，所有依赖于它的对象都会自动获得通知

    Define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically

5.2 观察者模式案例: 股票市场

信息哪里来?



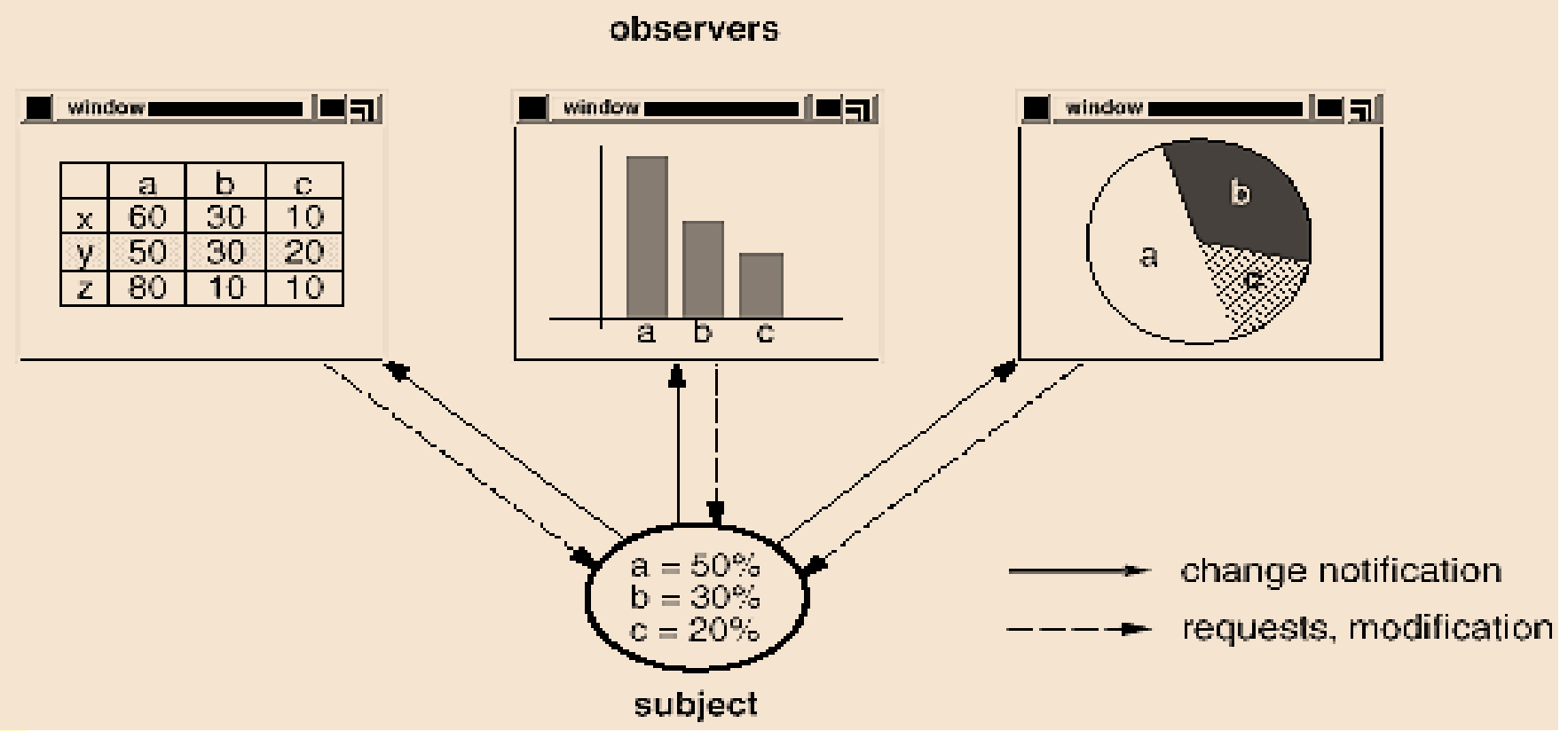
这就是一个典型的 Observer 设计模式的理念

5.2 观察者模式案例

- 观察者模式又叫做发布-订阅（Publish/Subscribe）模式
- 模型-视图（Model/View）模式
- 源-监听器（Source/Listener）模式

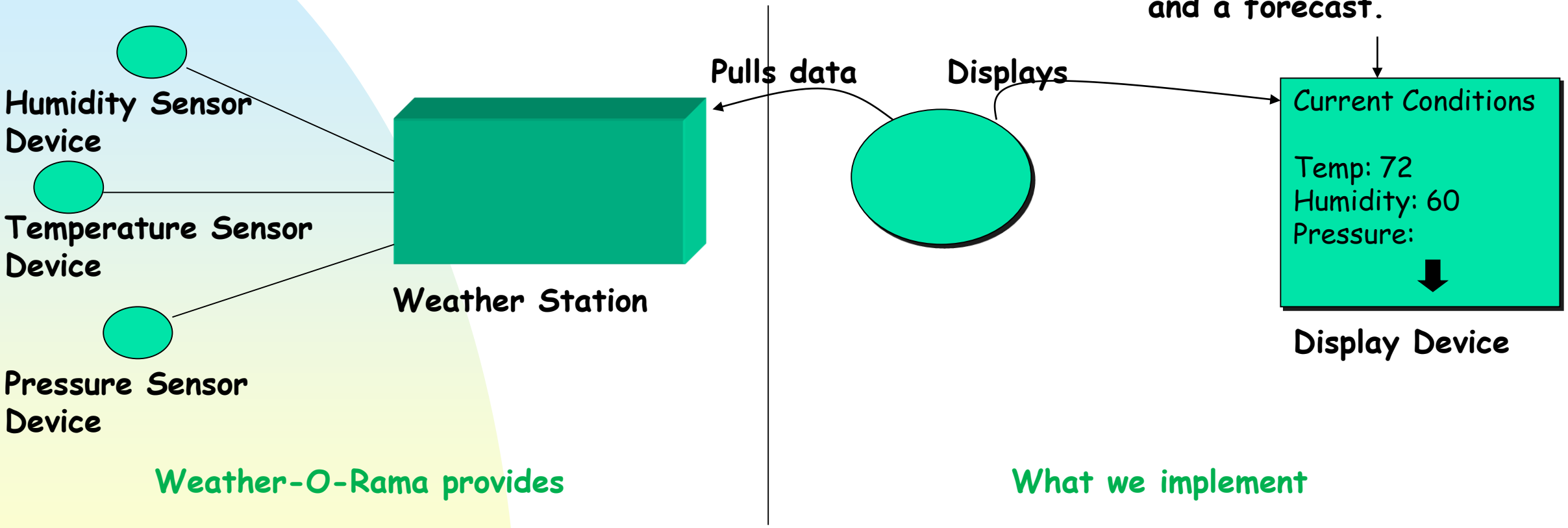
你能举几个生活中可以应用观察者模式的例子?

Auctions\彩票、教学、报纸、期刊订阅



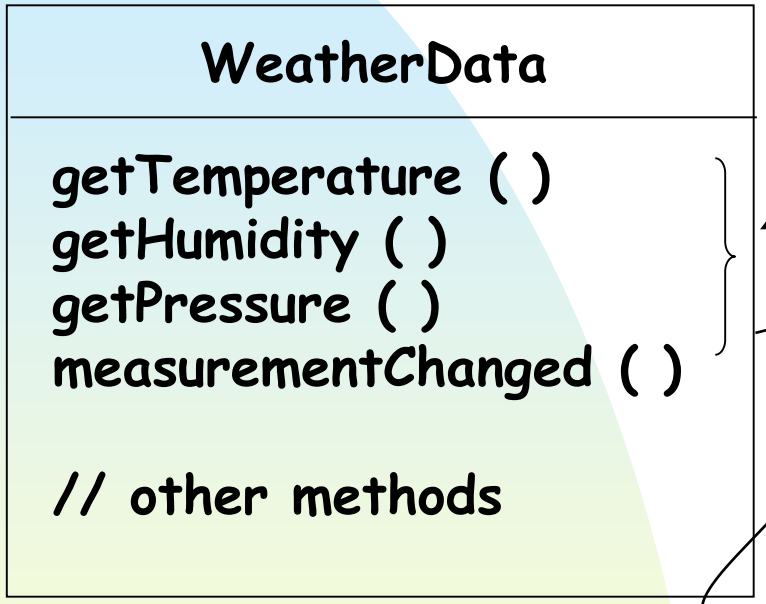
5.3 观察者模式案例 The Weather-O-Rama(公司名)

Current conditions is one of three different displays. The user can also get weather stats and a forecast.



The Job: Create an app that uses the WeatherData object to update three displays for 当前数据current conditions, 统计数据 weather stats, and a 预测数据 forecast

5.3 观察者模式案例 The Weather-O-Rama



These three methods return the most recent weather measurements for temperature 温度, humidity 湿度, and pressure 气压 respectively

We don't care HOW these variables are set; the WeatherData object knows how to get updated information from the Weather Station

A clue: what we need to add!

```
/*
  * This method gets called whenever the
  * measurements have been updated.
  * /
 public void measurementsChanged ( ){
        // Your code goes here
 }
```

5.3 观察者模式案例: 说明

- The WeatherData class has getter methods for three measurement values: temperature, humidity, and pressure
- The measurementsChanged ( ) method is called anytime new weather measurement data is available
  - We don't know or care how this method is called; we just know that it is
- We need to implement three display elements that use the weather data:
  - a current conditions display
  - a statistics display
  - and a forecast display

  These displays must be updated each time WeatherData has new measurements
- The system must be expandable ！！
  - -- other developers can create new custom display elements and users can add or remove as many display elements as they want to the application

5.3 观察者模式案例：一种较差的实现方案

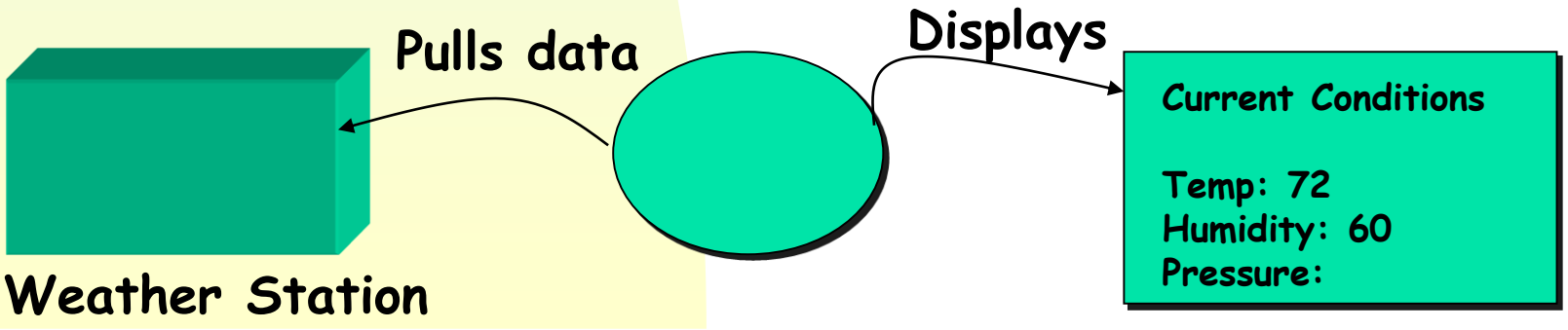
```
public class WeatherData {
    // instance variable declarations
    public void measurementsChanged ( ) {
        float temp = getTemperature ( );
        float humidity = getHumidity ( );
        float pressure = getPressure ( );

        currentConditionsDisplay.update (temp, humidity, pressure);
        statisticsDisplay.update (temp, humidity, pressure);
        forecastDisplay.update (temp, humidity, pressure);
    }
    // other WeatherData methods here
}
```

Grab the most recent measurements by calling the WeatherData's getter methods (already implemented)

Now update the displays.

Call each display element to update its display, passing it the most recent measurements.



5.3 观察者模式案例：一种较差的实现方案，错在哪里?

```
public class WeatherData {
    // instance variable declarations
    public void measurementsChanged ( ) {
        float temp = getTemperature ( );
        float humidity = getHumidity ( );
        float pressure = getPressure ( );

        currentConditionsDisplay.update (temp, humidity, pressure);
        statisticsDisplay.update (temp, humidity, pressure);
        forecastDisplay.update (temp, humidity, pressure);
    }
    // other WeatherData methods here
}
```

Area of change, we need to encapsulate this.

By coding to concrete implementations we have no way to add or remove other display elements without making changes to the program.

At least we seem to be using a common interface to talk to the display elements...they all have an update ( ) method that takes temp, humidity and pressure values.

5.4 观察者模式即将到来 Time for the Observer!

- 报纸 / 杂志的订阅模式 The Newspaper or Magazine subscription model
  - A newspaper publisher goes into business and begins publishing newspapers
  - You subscribe to a particular newspaper, and every time there is a new edition, its gets delivered to you. As long as you remain a subscriber, you get new newspapers
  - You unsubscribe when you don't want the newspapers anymore -- and they stop being delivered
  - While the publisher remains in business
    - people, hotels, airlines etc constantly subscribe and unsubscribe to the newspaper
- 气象数据（温度 \ 湿度 \ 气压）三个客户（当前 \ 统计 \ 预测）是否也可以类似地处理呢?
- 这种方式是否能够提炼出一种可以反复使用的解决方案呢?
  - 是的 观察者模式 Observer!

- 本讲结束