SPRING 2023- BBM 104

PROJECT ASSIGNMENT 2

Smart Home System

Submitted by Sümeyra Koç

Department of Artificial Intelligence Engineering

Hacettepe University

Beytepe, Ankara 06800, Turkey, Fall 2022

sumeyrakoc@hacettepe.edu.tr

April, 2023

CONTENT

What Is The Problem

Creating smart models of three traditional household appliances (plus one non-traditional household appliance), having these models perform some operations in the household system according to the entered commands and producing outputs; are the main tasks requested in this project. In addition, time control management, such as the synchronization of the intelligent system with current time, is one of the main problems that developers are asked to solve.

What Is The Solution Approach

In this problem, if smart home devices are considered as objects, one of the OOP languages, which is the language of transferring real-life items to the code environment, is preferred as a code language. Java is one of these languages, and java was used in this project. Thanks to OOP, which allows devices to have two basic components (attributes and functions) that real-life substances have, devices could be in perfect connection and harmony with each other and the system, just like real-life objects.

What Problems Were Encountered and How Were They Solved

The fact that only methods and attributes can be created inside a class, apart from them, nothing else can be done inside the class, are the parts that force the developer. The fact that operations can only be performed within methods and that the outside of the method resembles a dysfunctional empty "space" are problems that are still at the stage of habituation.

In addition, declaring the object's class when creating an object and initializing it with an appropriate constructor are also parts that push the developer to get out of her comfort zone.

Benefits of The System

Humanity's search for comfort, which has increased recently with the rapid progress of technology, has carried ancient structures such as houses far beyond meeting the needs of humanity by just sheltering. It is not only the concept of comfort , besides: problems such as limited energy resources, increasing waste amounts with increasing population, have led to the development of smart home systems with energy-saving, zero-waste, powerful control systems.

The advantages of this smart home system are that it can make people live in more comfortable, more secure, more environmentally sensitive, more customizable and controllable homes.

Benefits Of the OOP

Is OOP necessary? It is inappropriate to discuss the necessity of using OOP in small projects, since this project remains at a very low level compared to real smart home system software, this project can be solved by applying any desired language and any method. But it would be appropriate to compare the methods applied and the effort and time spent between them.

OOP, because it is flexible and highly modularized, allows you to add additional parts to the program, easily replace or existing parts. It also has tools that provide security and confidentiality, such as privacy access modifier, which gives the project advantages such as preventing the code from being changed from the outside. Such advantages increase time savings while reducing the effort spent.

What Are The Four Pillars of OOP and UML

Encapsulation: It is the storage of the information of an object for security purposes and the provision of its relationship with the outside with getters and setters. Encapsulation is to make abstraction.

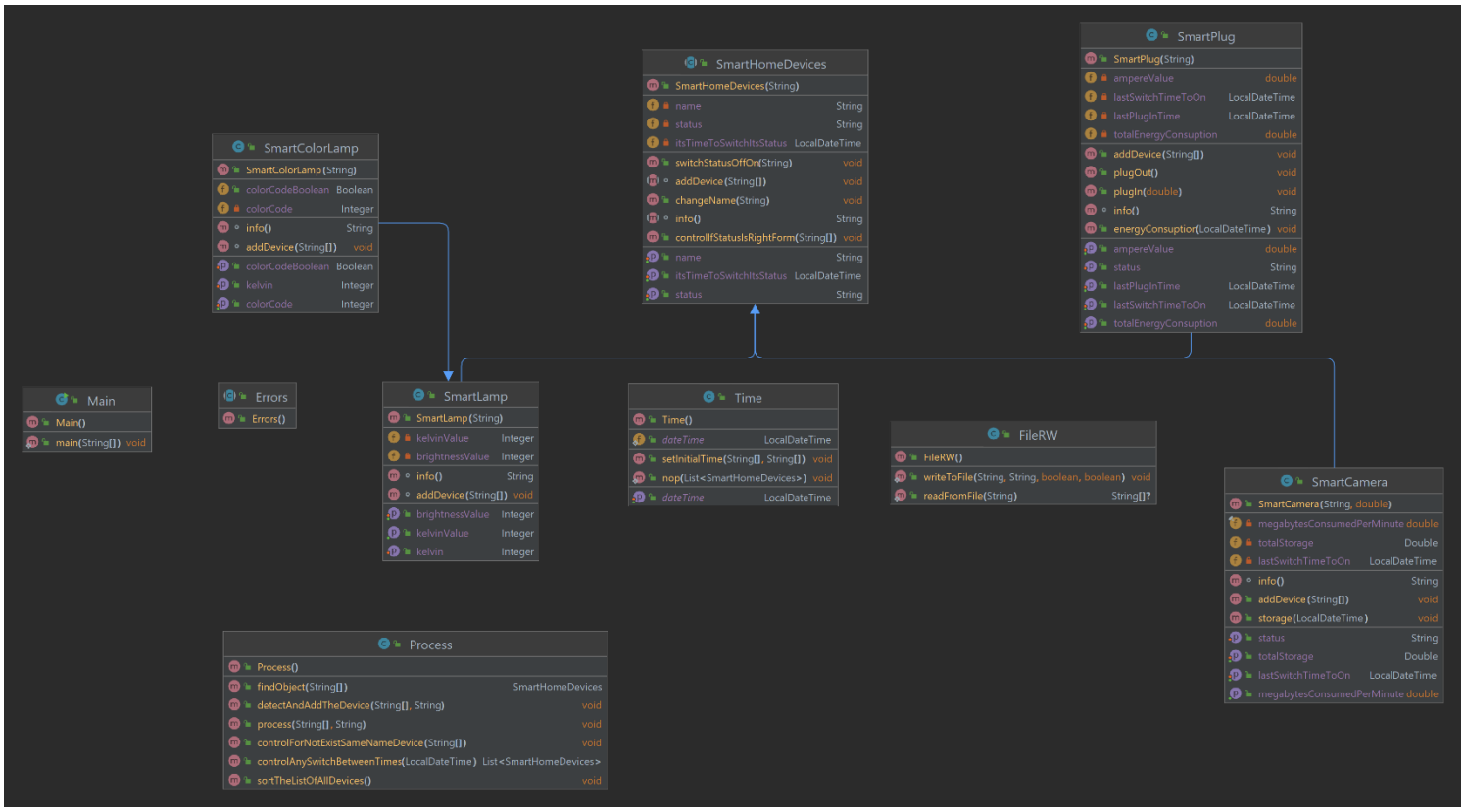
Abstraction: Abstraction separates “what” from “how”. It provides plomirphism, that is, multiformality. The basic logic of the interface is related to the abstract.

Inheritence: Inheritance provides the "is a" relationship, which is a strong relationship between objects and classes. Since every object in real life is actually derived from another object, inheritance plays a major role in defining OOP as the adaptation of real life to software.

Polymorphism: Multiformality is the name given to the fact that the same action is performed in different ways on each type of object. In other words, it is a concept related to methods. Enables “program in the general” rather than “program in the specific”, it increases the modularity and flexibility of the program.

UML (Unified Modeling Language): It is a diagram in which all the classes in the program are packaged together with their methods and attributes in the form of boxes and their relationships between other classes, if any, are shown with arrows and the entire program is displayed. It is a very useful map for people who will study the code.

UML Diagram and Explanation of the UML Diagram



The UML diagram in the image shows that there are a total of 10 classes. the methods, properties and fields of each class are provided with their signatures (signature: access modifier, return type, types of parameters). Three classes have been derived from the "SmartHomeDevice" class. The SmartColorLamp class is derived from the SmartLamp class. As can be understood from the names of the children's classes, each one represents a smart device. Children have their own attributes and methods that are not in the super class, but at the same time they override many methods from the super class. The super class (SmartHomeDevice class) contains attributes and methods that are common to all children (as abstract or normal).

Apart from these, there are five independent classes, one of which is the process class and contains many methods in it. The reason is that this class takes on the role of a processor to keep the main class clean. The process method of this class does the basic operation of the program. The FileRW class is a class created for reading and writing files. The Time class is a class that helps the program in time management. The nop command in the Time class is executed not only in the "Nop" command, but also in other time-related commands. Apart from these, there is an Error class, there are 10 internal classes in the Error class. The reason is that a new class must be opened for each custom error.

Resource

Java Documentation- Java SE Documentation