Project Smart House

Problem:

Create a program to manage a smart house with the use of object oriented programming in c# language.

Main Functions

Classes:

Lamp:

Class that models a lamp, with the option of changing its brightness.

EcoLamp:

Class that models an eco friendly lamp,with the option of changing its brightness and its maximum brightness halved to save power. It also has a timer function to make sure the lamp automatically turns off after the selected timer comes to an end.

TwoLampDevice:

Class that combines two lamps, which can also be of different types, to turn them on or off or toggle it, increase the brightness or decrease it and change the brightness in a determined lamp of a determined brightness.

LampsRow:

Class that manages an arbitrary number of Lamps and EcoLamps from a single point. Allows to add new Lamp, new EcoLamp and a new AbstractLamp in a determined position and remove Lamp with name, with Guid and remove with name in a determined position. Allows to switch on and switch off with name and Guid and also switch all lamps on or off. Allows to change the brightness of a single lamp with the name or Guid and also change brightness of all lamps. Also allows to find the lamp with the highest or the lowest brightness, also can find all the lamps in a determined range or find all the lamps which are on or off, also can find a lamp with its Guid. Finally can sort lamps by intensity.

Thermostat:

Class which controls temperature with range 15°-30° (default 20°), always On. Verified IncreaseTemperature raises by 0.1° up to 30° (throws at max). Verified DecreaseTemperature lowers by 0.1° down to 15° (throws at min). Verified SetTemperature accepts any value in valid range, throws outside bounds.

Door:

Class which is a secure door controller with 4+ digit PIN, status Unknown. Verified OpenDoor works from Closed to Open, throws when Locked/Open. Verified CloseDoor works from Open to Closed, throws otherwise. Verified LockDoor works from Closed to Locked, throws when Open. Verified UnlockDoor works from Locked to Closed with correct PIN, throws with wrong PIN or when not Locked.

AirConditioner:

Class which is a fan speed controller (Low/Medium/High, default Medium). Verified TurnOn works when off, throws when on. Verified TurnOff works when on, throws when off. Verified SetFanSpeedLow/Medium/High work only when on, throw when off. Verified IncreaseFanSpeed cycles Low to Medium to High, throws at max or when off. Verified DecreaseFanSpeed cycles High to Medium to Low, throws at min or when off.

Implementation Requirements

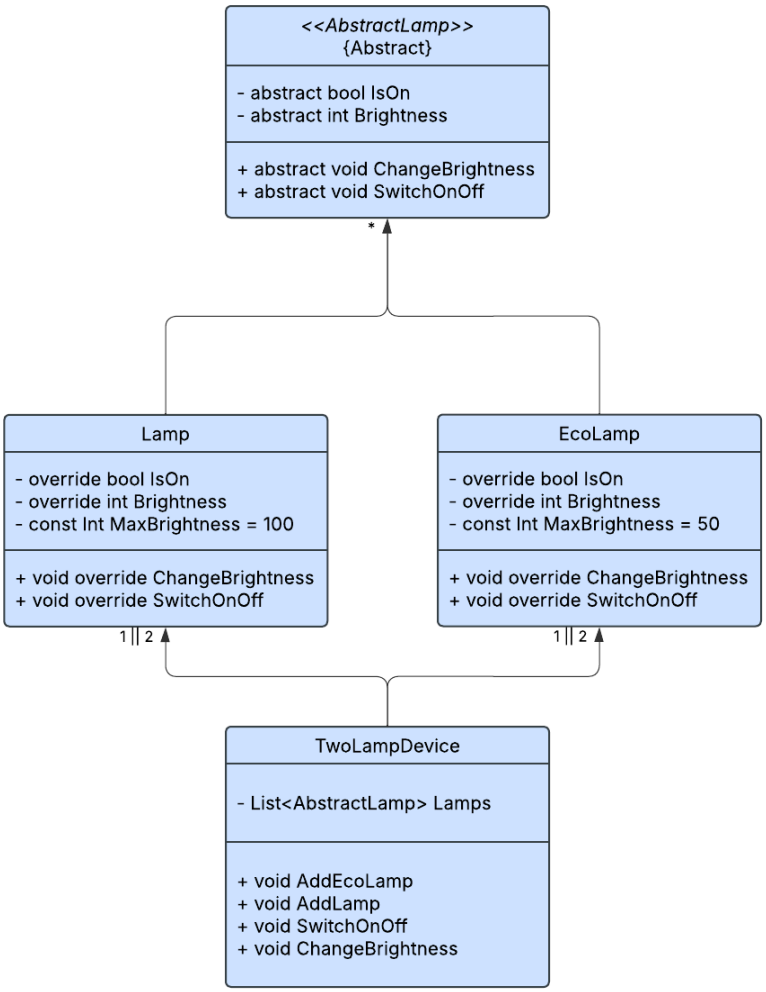
Lamp:

Metodo/Proprietà	Descrizione/Funzionalità

MinBrightness	Returns The minimum value of Brightness(0).
MaxBrightness	Returns The maximum value of Brightness(100).
DefaultBrightness	Returns The default value of Brightness(50).
Brightness	The current Brightness value.
SwitchOn()	Turns on the lamp and sets the brightness to its default value(50). Updates LastUpdatedAtUtc.
SwitchOff()	Turns off the lamp and sets the brightness to its minimum value(0). UpdatesLastUpdatedAtUtc.
SwitchOnOff()	Switches the lamp on if it's off or turns it off if it's on. Respectively sets the brightness to either its default or minimum value. Updates LastUpdatedAtUtc.
ChangeBrightness(int newbrightness)	When the lamp is on and newbrightness is in the range 0 to 100, sets brightness as newbrightness. Updates LastUpdatedAtUtc.
Dimmer()	When lamp is on, brightness decreases by 10. Updates LastUpdatedAtUtc.
Brighten()	When the lamp is on, brightness increases by 10. Updates LastUpdatedAtUtc.
Status	Status of the lamp: On/Off
Name	Name of the lamp
LastUpdatedAtUtc	Date/Hour of the last update to the lamp's state.

UML

Class Diagram



Testing

Lamp:

Performed 12 tests. Verified SwitchOn and SwitchOff which respectively turn on and off the lamp. Verified ChangeBrightness which cannot have negative value, the toggle which permits turning on and off and finally Dimmer and Brighten which increase or decrease the brightness.

EcoLamp:

Performed 12 tests. Verified SwitchOn and SwitchOff which respectively turn on and off the lamp. Verified ChangeBrightness which cannot have negative value, the toggle which permits turning on and off and finally Dimmer and Brighten which increase or decrease the brightness.

TwoLampDevice:

Performed 39 tests.
Verified SwitchOn and SwitchOff which respectively turn on and off a determined lamp. Verified ChangeBrightness which cannot have negative value, the toggle which permits turning on and off and finally Dimmer and Brighten which increase or decrease the brightness.

LampsRow:

Performed 42 tests.
Verified SwitchOn and SwitchOff which respectively turn on and off a determined lamp with its name or Guid. Verified SingleChangeBrightness with name or Guid which cannot have negative value, the toggle which permits turning on and off and finally Dimmer and Brighten which increase or decrease the brightness of a determined lamp with name or Guid.
Verified AddLamp and AddEcoLamp, also tested RemoveLamp with name or Guid or simply with the position. Verified AllLampSwitchOn and Off. Verified finding a lamp by intensity, the status or the Guid.

Thermostat:

Performed 10 tests.

Verified constructor throws ArgumentException for null, empty string, or whitespace-only names. Verified SetTemperature throws ArgumentException when temperature exceeds max or below min, and correctly sets valid temperatures. Verified IncreaseTemperature throws ArgumentException when already at max, and

correctly increases by 0.1° when valid. Verified DecreaseTemperature throws ArgumentException when already at min, and correctly decreases by 0.1° when valid.

Door:

Performed 12 tests.

Verified constructor throws ArgumentException for null, empty string, or whitespace-only names, and for PIN under 4 digits. Verified OpenDoor works when closed but throws when locked. Verified CloseDoor works when open. Verified LockDoor works when closed but throws when open. Verified UnlockDoor throws when open or with wrong PIN, but correctly unlocks when locked with correct PIN (1234).

AirConditioner:

Performed 17 tests.

Verified constructor throws ArgumentException for empty name. Verified TurnOn works when off but throws when already on. Verified TurnOff works when on but throws when off. Verified SetFanSpeedLow/Medium/High work only when on, throw when off. Verified IncreaseFanSpeed cycles Medium to High, throws at max or when off. Verified DecreaseFanSpeed cycles High to Medium to Low, throws at min or when off.