

Programação Orientada a Objetos: Operações Bancárias em C++

Projeto Final - Programação III

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Abstract—Este projeto visa demonstrar os principais conceitos de orientação a objeto usando a linguagem C++; são eles: Classe, Encapsulamento, Agregação e Composição, Templates, Sobrecarga de operador, Herança e Polimorfismo. Por meio de operações bancárias tais como abertura de contas, transferências, demonstrativos bancários (extratos), entre outros.

Index Terms—C++, Programação, Orientação a Objetos, Operações Bancárias.

I. INTRODUÇÃO

Este relatório tem como objetivo detalhar o funcionamento do algoritmos desenvolvido para simular operações do sistema bancário, feito como trabalho final para a disciplina de programação 3.

II. DESENVOLVIMENTO

A. Classe Conta

```
1 #ifndef CONTA_H
2 #define CONTA_H
3 #include <iostream>
4 #include <string>
5 #include "pessoa.h"
6
7 class Conta {
8     private:
9         static int contasCriadas;
10        std::string senha = "";
11    protected:
12        int numero;
13        Pessoa *correntista;
14        float saldo{};
15    public:
16        Conta();
17        Conta(int numero, Pessoa &correntista, float saldo, std::string senha);
18        virtual ~Conta();
19
20        bool validacao(std::string chave) const;
21        int getNumero();
22        void setNumero(int num);
23        Pessoa getCorrentista();
24        void setCorrentista(Pessoa &correntista);
25        float getSaldo();
26        void setSaldo(float saldo);
27        int getNumeroTotalDeContas();
28        bool movimentar(float valor, int operacao);
29        void depositar(float valor);
30
31        virtual void info() const;
32        virtual bool sacar(float valor);
33 };
34 #endif
```

Fig. 1. Arquivo de cabeçalho conta.h

A classe Conta define um tipo de dado abstrato para a criação da estrutura de classes de contas bancárias, é a estrutura central do projeto e classe base para as classes derivadas ContaComum, ContaEspecial e ContaPoupanca, ou seja, estas três, herdam as funcionalidades de Conta. Nela encontramos atributos e métodos comuns a todas as contas (e o que esperamos que elas tenham no mundo real). Exemplos de atributos presentes: senha, número da conta, saldo; exemplos de métodos: depositar, sacar, entre outras.

Conceitos fundamentais de OO a partir da Classe Conta:

- 1) **Encapsulamento**: Em linguagens orientadas a objeto, é a capacidade de ocultação de detalhes de implementação por parte de entidades de manipulação de dados, por meio dos especificadores de acesso, em C++ são três: **public**, **private** e **protected**. Cada atributo oferece um nível de ocultação para membros de classes.
- 2) **Agregação**: Conta possui uma referência para a classe Pessoa, trata-se de uma associação na forma de agregação, pois o objeto do tipo Pessoa não deixa de existir quando o objeto do tipo Conta, associado a ele, é destruído. Com isso um objeto Conta, por meio dos métodos presentes na classe Pessoa, pode ter acesso ao nome e CPF do correntista.

```
1 #ifndef PESSOA_H
2 #define PESSOA_H
3 #include <iostream>
4 #include <string>
5
6 class Pessoa {
7     private:
8         std::string nome;
9         std::string CPF;
10    public:
11        Pessoa();
12        Pessoa(std::string _nome, std::string _CPF);
13        ~Pessoa();
14        void setNome(std::string _nome);
15        void setCPF(std::string _CPF);
16        std::string getNome();
17        std::string getCPF();
18 };
19 #endif
```

Fig. 2. Arquivo de cabeçalho pessoa.h

- 3) **Herança:** Herança é um dos pontos chave de programação orientada a objetos. Ela fornece meios de promover a extensibilidade do código, a reutilização e uma maior coerência lógica no modelo de implementação.

```

1 #ifndef CONTAPOUPANCA_H
2 #define CONTAPOUPANCA_H
3 #include "conta.h"
4 #include "taxa.h"
5
6 class ContaPoupanca : public Conta, public Taxa {
7 private:
8     //Não há atributos em ContaPoupanca além dos definidos nas classes Conta e Taxa
9 public:
10     ContaPoupanca(int numero, Pessoa &correntista, float saldo);
11     ~ContaPoupanca();
12     virtual void info() const override;
13     virtual void incremento_juros() override;
14     virtual void descontarTaxaManutencao() override{};
15 };
16
17 #endif

```

Fig. 3. Arquivo de cabeçalho contaPoupanca.h

4) Polimorfismo:

O polimorfismo em C++ se apresenta sob diversas formas diferentes, desde as mais simples, como funções com mesmo nome e lista de parâmetros diferentes, até as mais complexas como funções virtuais, cujas formas de execução são dependentes da classe a qual o objeto pertence e são identificadas em tempo de execução.

No método sacar, por exemplo, o polimorfismo é necessário, pois a classe ContaEspecial permite que o correntista saque um valor além do saldo, trata-se de um limite especial que esse tipo de conta oferece. Mesmo com o saldo zerado, é possível realizar um saque até determinado valor. Isso já não acontece, por exemplo, em ContaPoupanca, onde não é possível sacar valores além do saldo em conta, cada classe apresenta um comportamento distinto para a funcionalidade sacar.

B. Classe Movimento

A classe Movimento registra todas as atividades de uma determinada conta. Sempre que uma nova transação é realizada, um objeto Movimento é criado e associado a conta correspondente.

```

1 #ifndef MOVIMENTO_H
2 #define MOVIMENTO_H
3 #include "conta.h"
4
5 class Movimento {
6 private:
7     Conta conta;
8     std::string historico;
9     float valor;
10    float saldoAnterior;
11    int operacao;
12

```

Fig. 4. Arquivo de cabeçalho movimento.h

A relação entre as classes Movimento e Conta é na forma de uma agregação. Os atributos “historico”, “valor” e “operacao” armazenam, a descrição da transação, valor da transação, se é saque ou depósito; respectivamente.

C. Classe Transacao

Transacao controla operações de movimentações bancárias. Mesmo sendo totalmente possível um objeto ContaComum, por exemplo, realizar um saque ou depósito, no código do projeto isso é feito apenas por meio de um objeto do tipo Transacao. Pois assim é possível criar um objeto Movimento e registrar as atividades bancárias realizadas.

III. PREPARE YOUR PAPER BEFORE STYLING

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections III-A–III-E below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not number text heads— \LaTeX will do that for you.

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Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

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Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \quad (1)$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

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- The word “data” is plural, not singular.
- The subscript for the permeability of vacuum μ_0 , and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
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- In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.

- Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
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- There is no period after the “et” in the Latin abbreviation “et al.”.
- The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

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figure

Fig. 5. Example of a figure caption.

TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy ^a		

^aSample of a Table footnote.

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ACKNOWLEDGMENT

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For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

REFERENCES

- [1] G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” *Phil. Trans. Roy. Soc. London*, vol. A247, pp. 529–551, April 1955.
- [2] J. Clerk Maxwell, *A Treatise on Electricity and Magnetism*, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
- [3] I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in *Magnetism*, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
- [4] K. Elissa, “Title of paper if known,” unpublished.
- [5] R. Nicole, “Title of paper with only first word capitalized,” *J. Name Stand. Abbrev.*, in press.

- [6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” *IEEE Transl. J. Magn. Japan*, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
- [7] M. Young, *The Technical Writer’s Handbook*. Mill Valley, CA: University Science, 1989.

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