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

```cpp
#ifndef CONTA_H
#define CONTA_H
#include <iostream>
#include <string>
#include "pessoa.h"

class Conta {
   private:
    static int contasCriadas;
    std::string senha = "";
   protected:
    int numero;
    Pessoa *correntista;
    float saldo{};
   public:
    Conta();
    Conta(int numero, Pessoa &correntista, float saldo, std::string senha);
    virtual ~Conta();

    bool validacao(std::string chave) const;
    int getNumero();
    void setNumero(int num);
    Pessoa getCorrentista();
    void setCorrentista(Pessoa &correntista);
    float getSaldo();
    void setSaldo(float saldo);
    int getNumeroTotalDeContas();
    bool movimentar(float valor, int operacao);
    void depositar(float valor);

    virtual void info() const;
    virtual bool sacar(float valor);
};
#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 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.

```cpp
#ifndef PESSOA_H
#define PESSOA_H
#include <iostream>
#include <string>

class Pessoa {
   private:
    std::string nome;
    std::string CPF;
   public:
    Pessoa();
    Pessoa(std::string _nome, std::string _CPF);
    ~Pessoa();
    void setNome(std::string _nome);
    void setCPF(std::string _CPF);
    std::string getNome();
    std::string getCPF();
};
#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.

```
#ifndef CONTAPOUPANCA_H
#define CONTAPOUPANCA_H
#include "conta.h"
#include "taxa.h"

class ContaPoupanca : public Conta, public Taxa {
   private:
   //Não há atributos em ContaPoupanca além dos definidos nas classes Conta e Taxa
   public:
    ContaPoupanca(int numero, Pessoa &correntista, float saldo);
    ~ContaPoupanca();
    virtual void info() const override;
    virtual void incremento_juros() override;
    virtual void descontarTaxaManutencao() override{};
};

#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.

```
#ifndef MOVIMENTO_H
#define MOVIMENTO_H
#include "conta.h"

class Movimento {
   private:
    Conta conta;
    std::string historico;
    float valor;
    float saldoAnterior;
    int operacao;

```

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.

A. Abbreviations and Acronyms

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.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: “Wb/m^2” or “webers per square meter”, not “webers/m^2”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.
- Use a zero before decimal points: “0.25”, not “.25”. Use “cm^3”, not “cc”.)

C. Equations

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:

$$a + b = \gamma \tag{1}$$

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 . . .”

D. LaTeX-Specific Advice

Please use "soft" (e.g., `\eqref{Eq}`) cross references instead of "hard" references (e.g., `(1)`). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don't use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

Please note that the `{subequations}` environment in LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that, you might write an article in which the equation numbers skip from (17) to (20), causing the copy editors to wonder if you've discovered a new method of counting.

BibTeX does not work by magic. It doesn't get the bibliographic data from thin air but from .bib files. If you use BibTeX to produce a bibliography you must send the .bib files.

LaTeX can't read your mind. If you assign the same label to a subsubsection and a table, you might find that Table I has been cross referenced as Table IV-B3.

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Do not use `\nonumber` inside the `{array}` environment. It will not stop equation numbers inside `{array}` (there won't be any anyway) and it might stop a wanted equation number in the surrounding equation.

E. Some Common Mistakes

- 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".
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an "inset", not an "insert". The word alternatively is preferred to the word "alternately" (unless you really mean something that alternates).
- Do not use the word "essentially" to mean "approximately" or "effectively".
- 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".
- Do not confuse "imply" and "infer".
- The prefix "non" is not a word; it should be joined to the word it modifies, usually without a hyphen.
- 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".

An excellent style manual for science writers is [7].

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

G. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

H. Figures and Tables

a) Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation "Fig. 5", even at the beginning of a sentence.

figure

Fig. 5. Example of a figure caption.

TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	*Subhead*	*Subhead*
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[a]Sample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization {A[m(1)]}", not just "A/m". Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)", not "Temperature/K".

ACKNOWLEDGMENT

The preferred spelling of the word "acknowledgment" in America is without an "e" after the "g". Avoid the stilted expression "one of us (R. B. G.) thanks ...". Instead, try "R. B. G. thanks...". Put sponsor acknowledgments in the unnumbered footnote on the first page.

REFERENCES

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first ..."

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished" [4]. Papers that have been accepted for publication should be cited as "in press" [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

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

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