LE LANGAGE C++
MASTER 1

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Université Paris Diderot - Paris 7

2013—2014

INFORMATIONS *ADMINISTRATIVES*

- Un Cours

`Jean-Baptiste.Yunes@univ-paris-diderot.fr`

  - Lundi 15h30—17h30
    - Salle 247E de la Halle aux Farines

- Des Travaux Pratiques
  - Lundi 8h30—10h30 (Isabelle Fagnot)
    - Salle 2031
  - Lundi 8h30—10h30 (Antoine Mamcarz)
    - Salle 2032

- Pour les Travaux Pratiques
  - Veiller à ce que vous possédiez un compte sur les machines de l'UFR (ce compte est différent de votre compte ENT)
  - Répartissez-vous également sur les deux groupes

La **notation**

- Un examen (en Janvier, date à préciser ultérieurement)
- Un projet (délivrance du sujet et date de soutenance à préciser ultérieurement)
- Pour être reçu :
  60% examen + 40% projet
- Si inférieur à 10, seconde session :
  60% session2 + 40% projet

Un **partiel**

- non obligatoire
- permet d'obtenir un *bonus* pour la note finale
- ne pas s'y rendre ou le rater ne pénalisera pas...
- on ne peut que gagner!

Instructions utiles :

consultez régulièrement l'entrée DIDEL du cours M LOV,

n'hésitez pas à utiliser les forums pour poser des questions,

marquez la page du cours dans vos signets

`http://www.liafa.univ-paris-diderot.fr/~yunes/cours/cpp/`

réfléchissez déjà à la composition de vos trinômes pour le projet à venir.

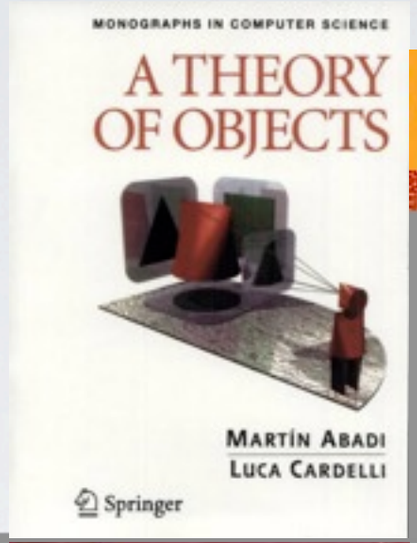
Éléments du cours :

1. Introduction
2. Un C plus plus ?
3. Le paradigme objet
4. Les classes
5. Du modèle aux classes
6. La spécialisation
7. La factorisation
8. L'héritage multiple
9. Les opérateurs
10. Les modèles
11. Les design patterns
12. Les exceptions
13. La Standard Template Library
14. La méta-programmation

Quels sont les **buts** de ce cours ?

- Une connaissance de la problématique de l'analyse objet
- La maîtrise des éléments de base d'UML
- La connaissance de l'implémentation en C++ de fragments UML
- La maîtrise du langage C++ et de ses particularités

BIBLIOGRAPHIE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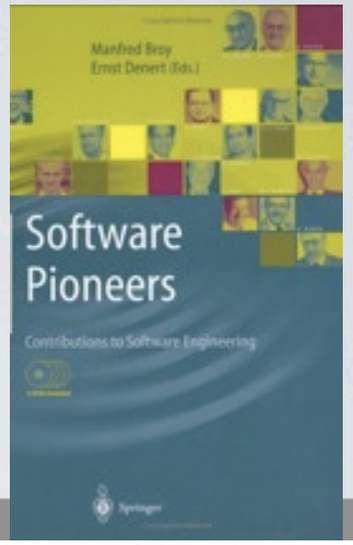
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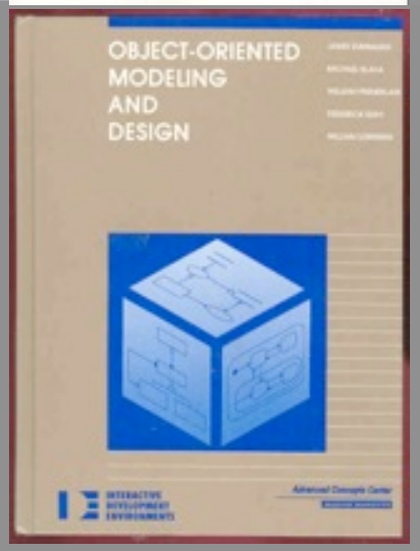
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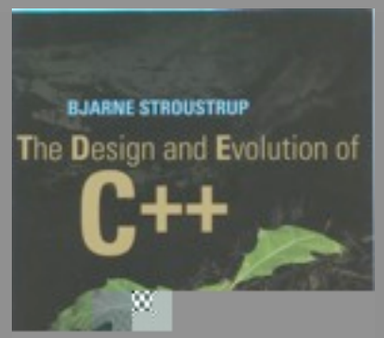
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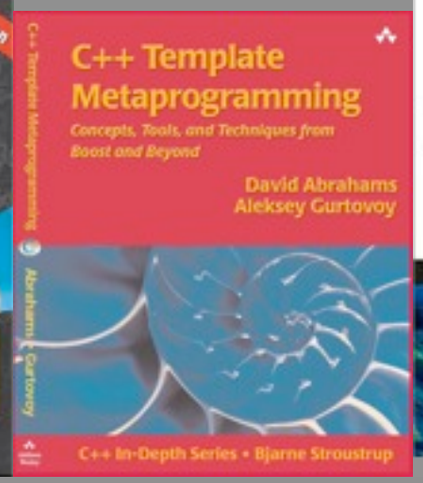
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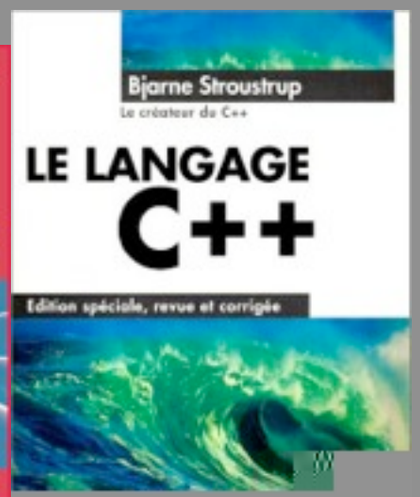
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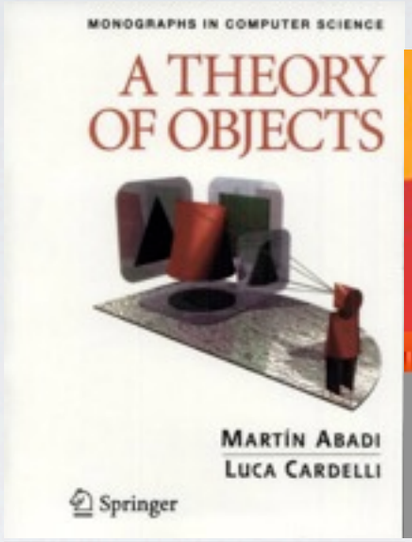
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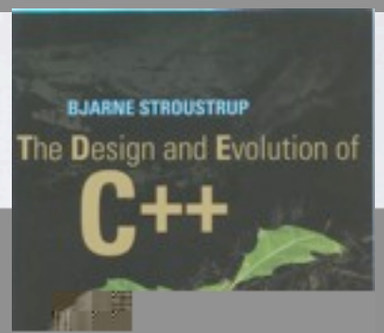
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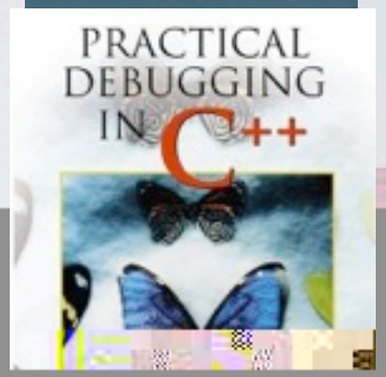
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Rational Rose 2000 pour Windows 95/98/NT4*
Outils de validation et de prototypage
UML d'ObjeXion Software*
Modèles UML et prototypes des deux études de cas du livre
Spécifications UML 1.3**
Sur le site Web d'accompagnement :
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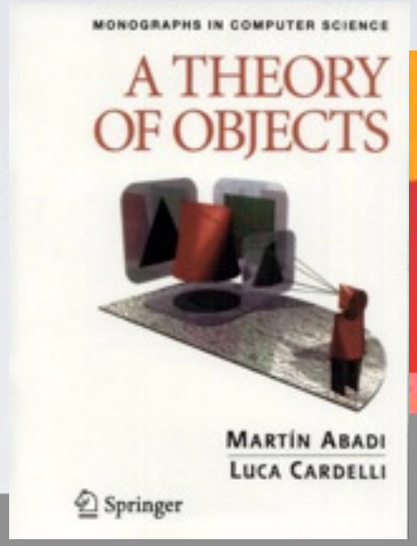
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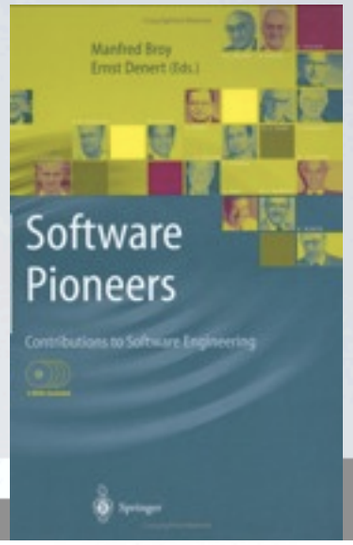
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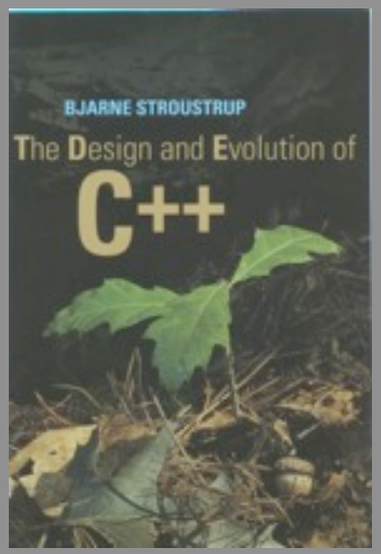
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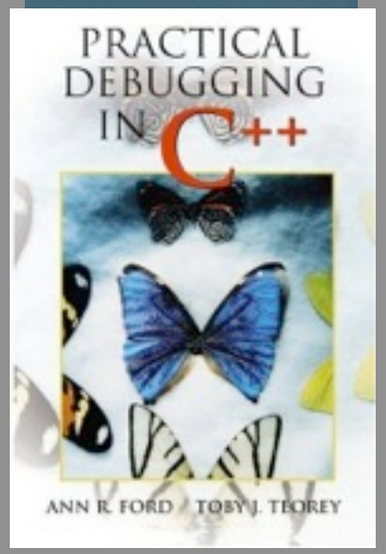
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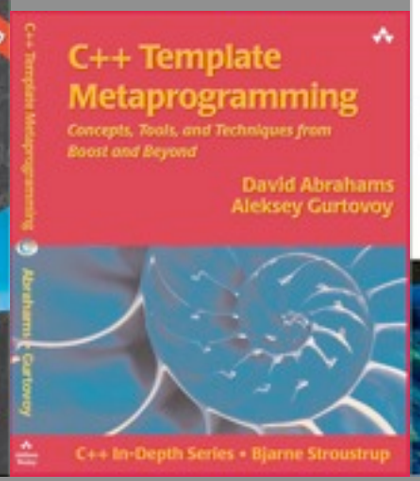
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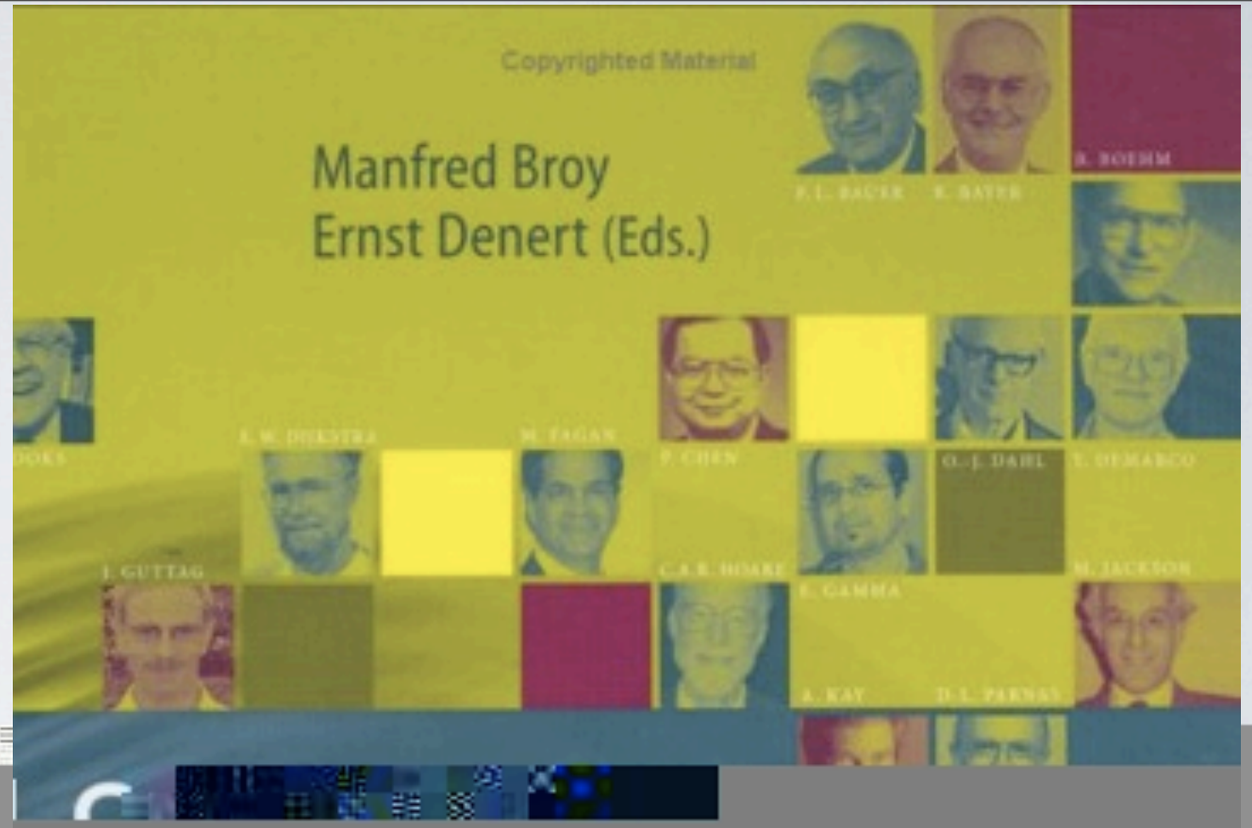
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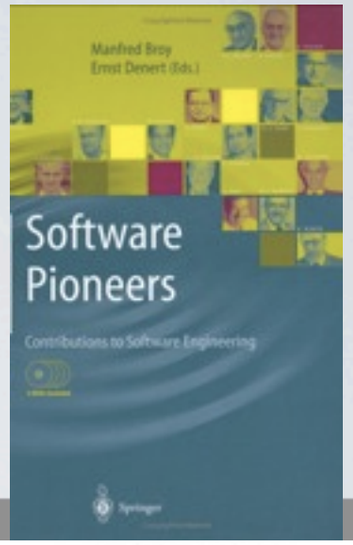
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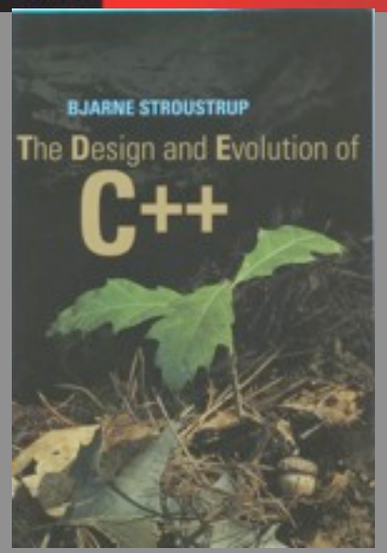
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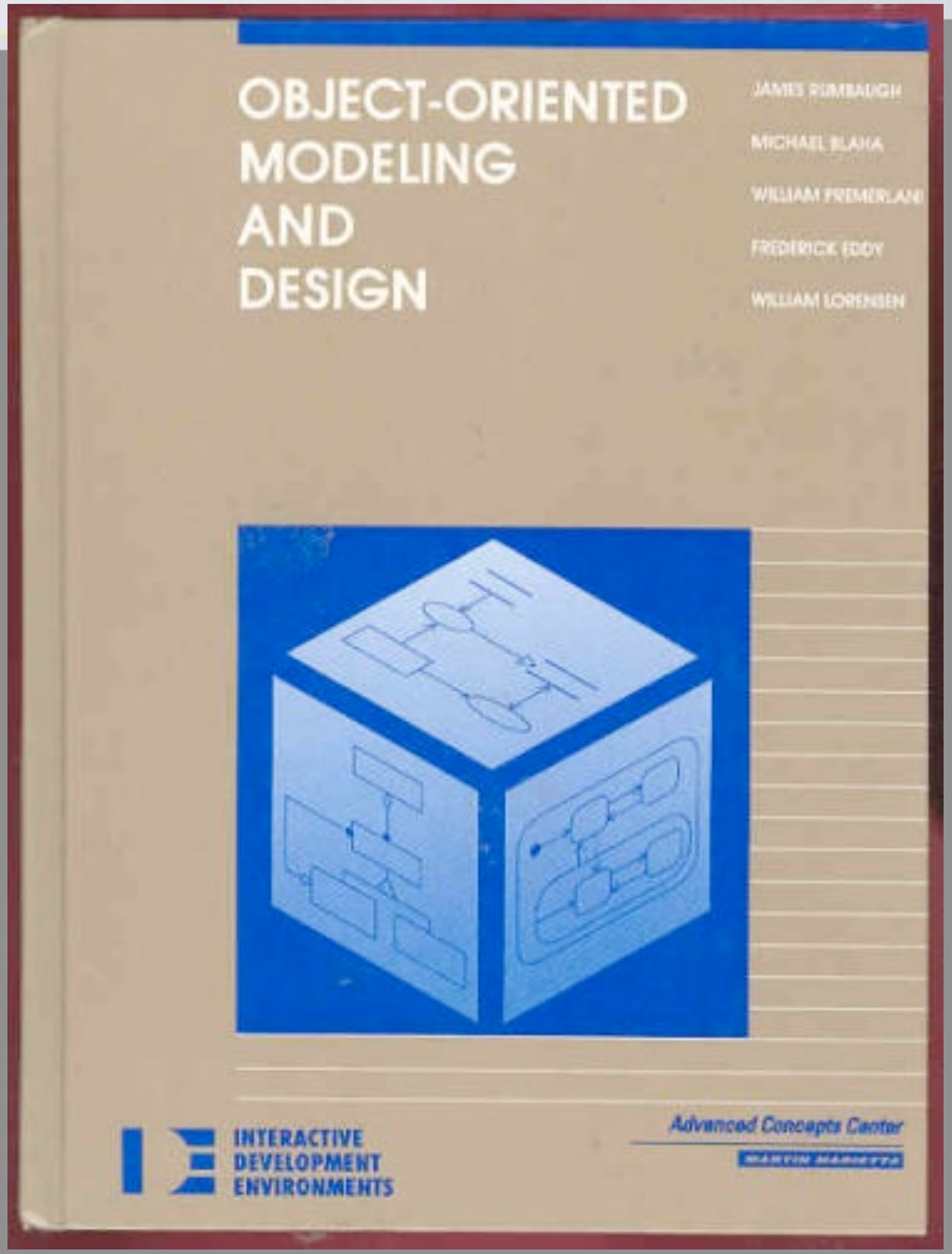
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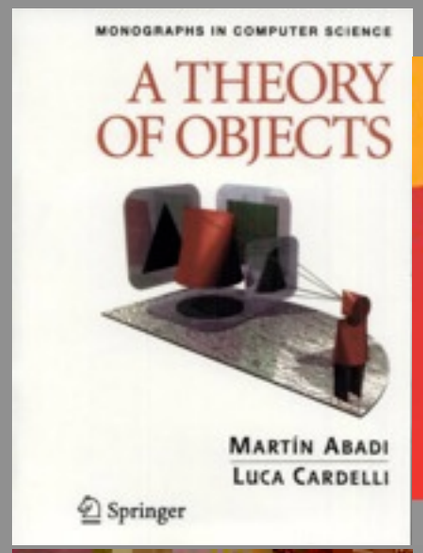
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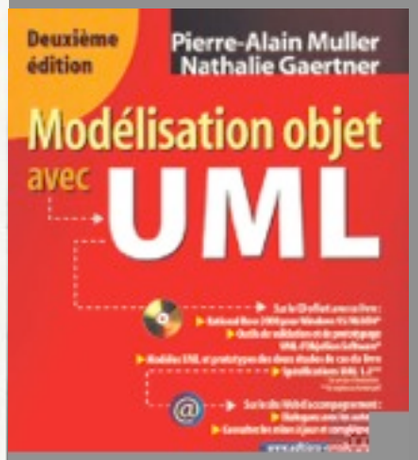
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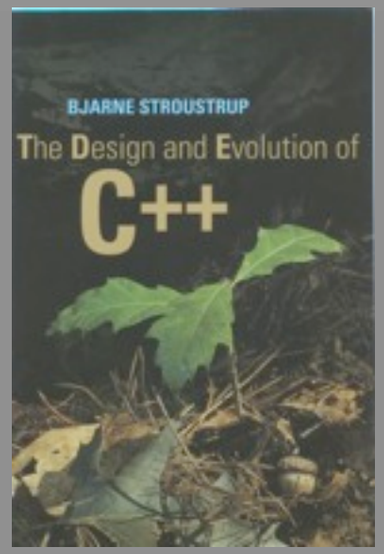
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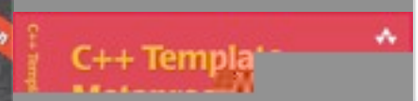
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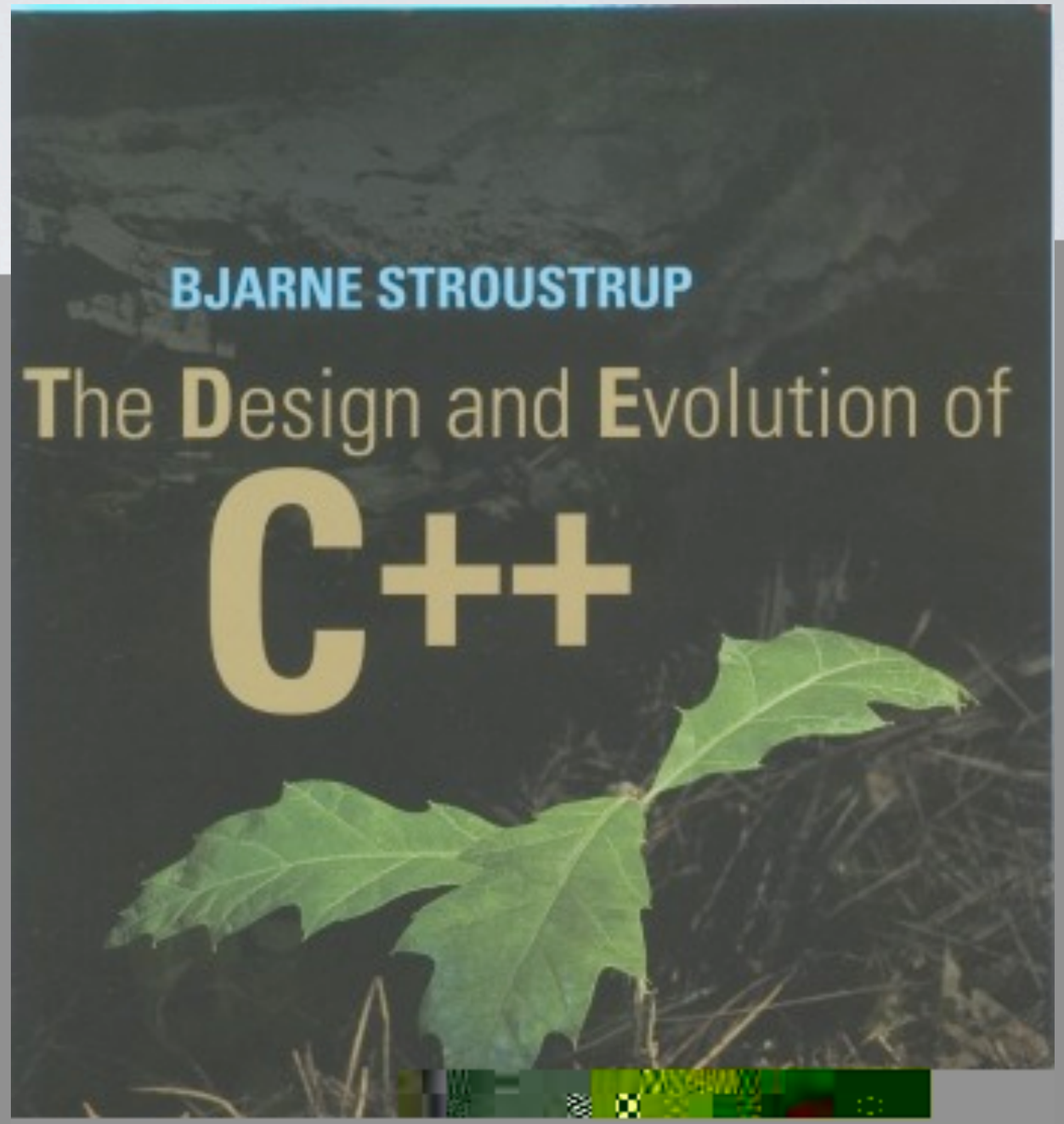
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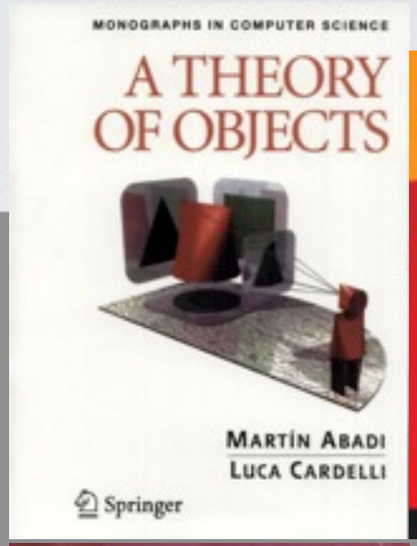
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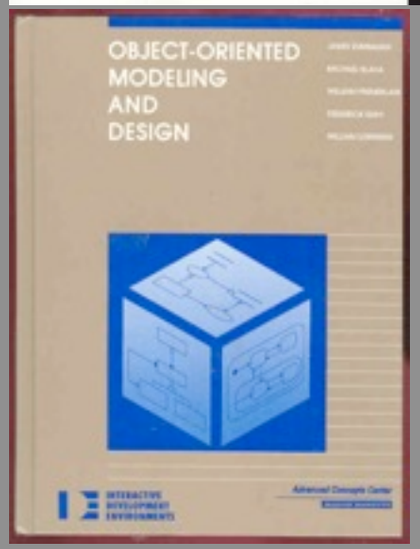
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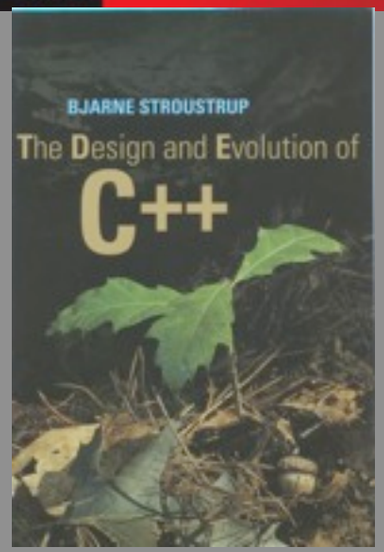
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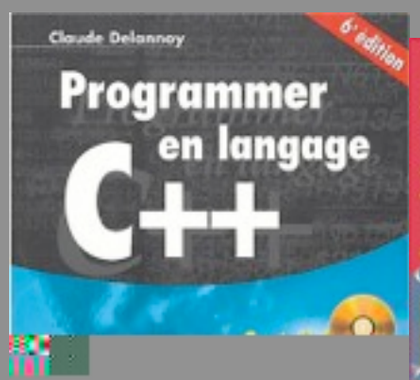
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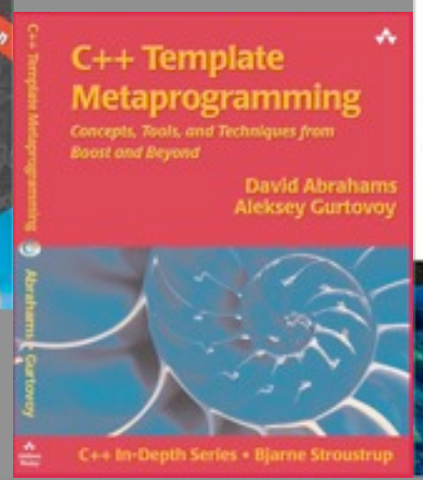
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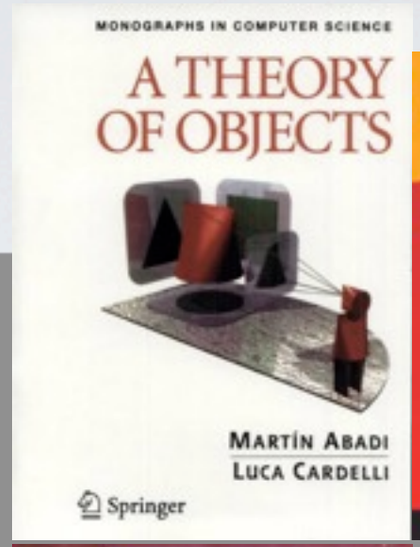
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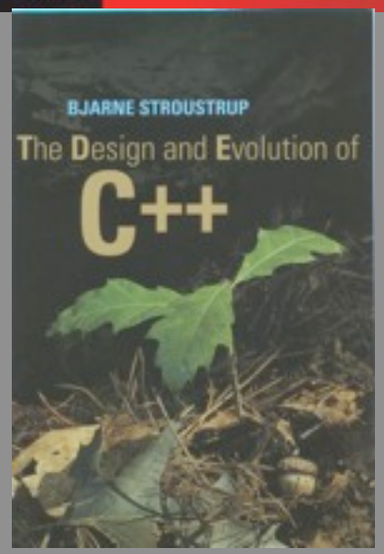
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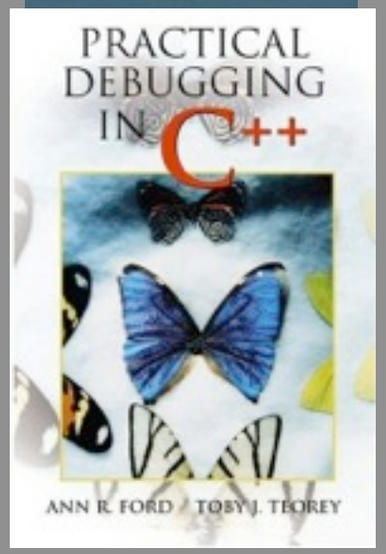
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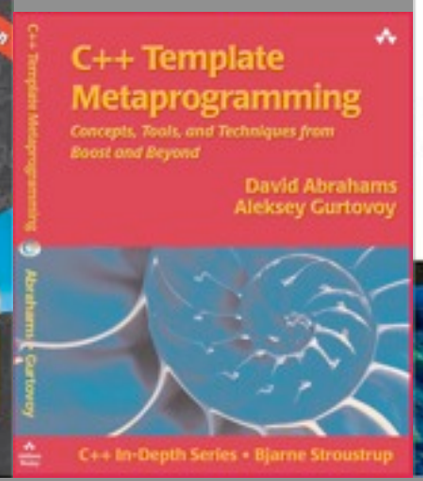
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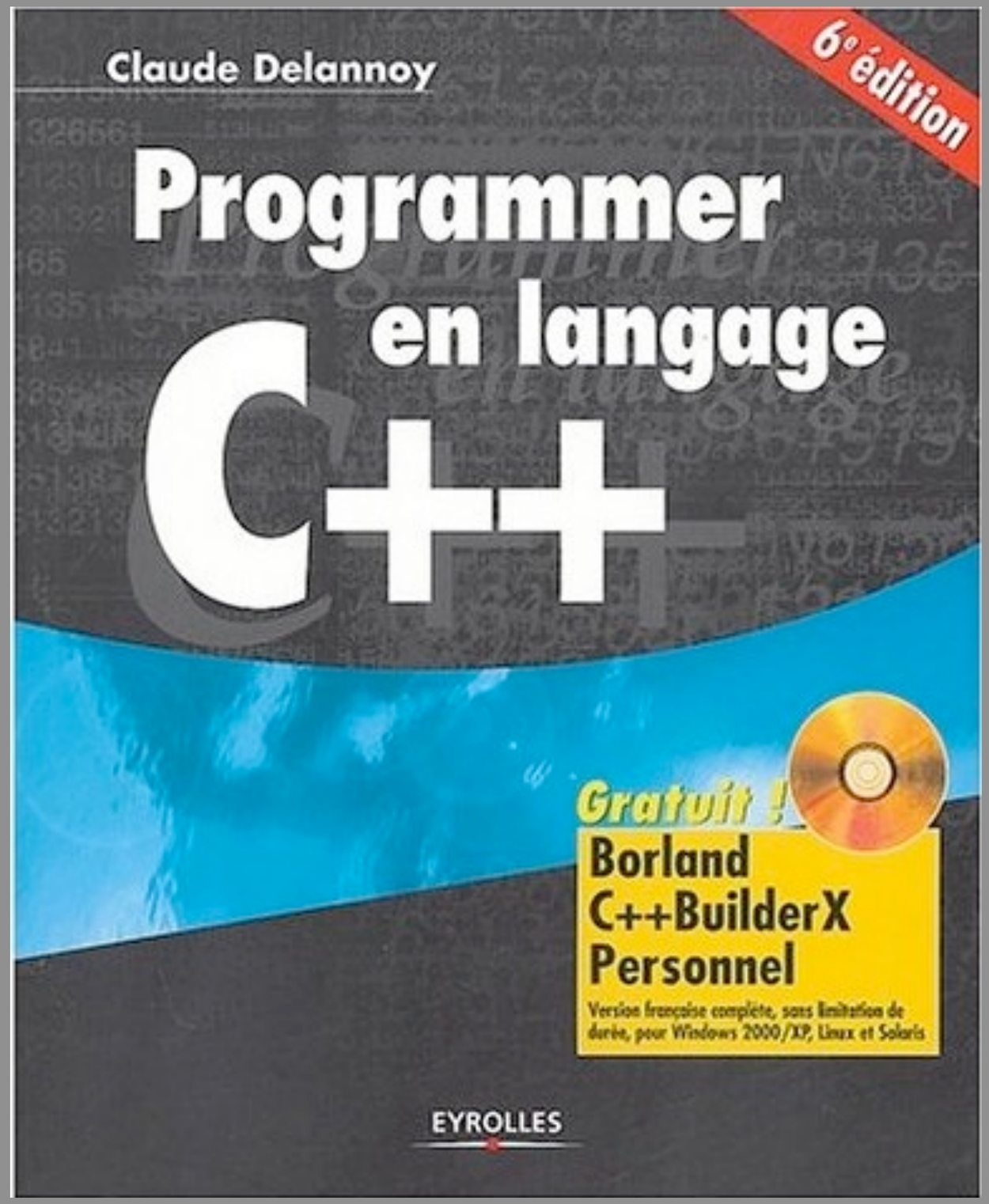
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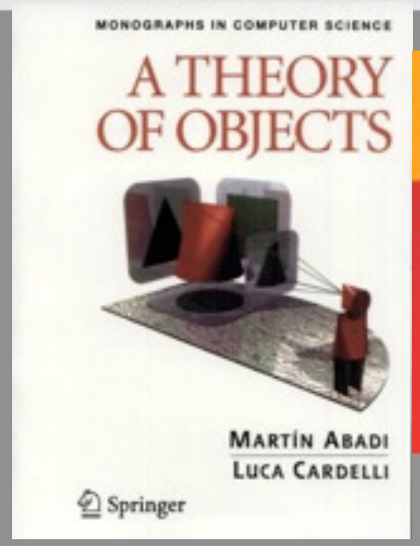
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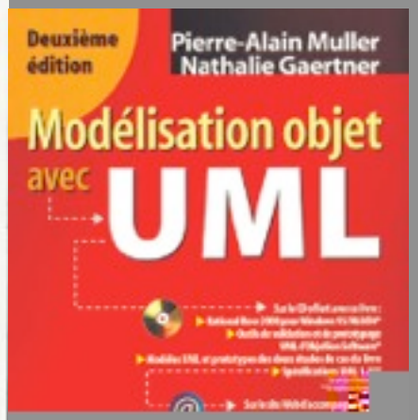
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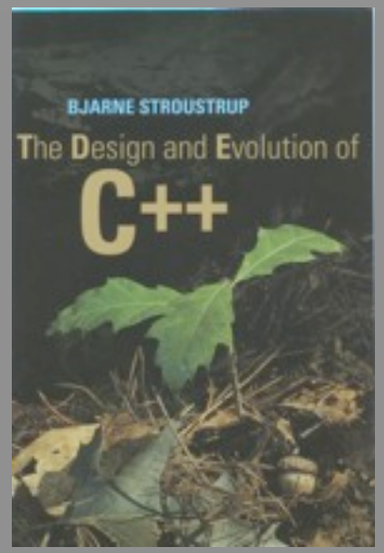
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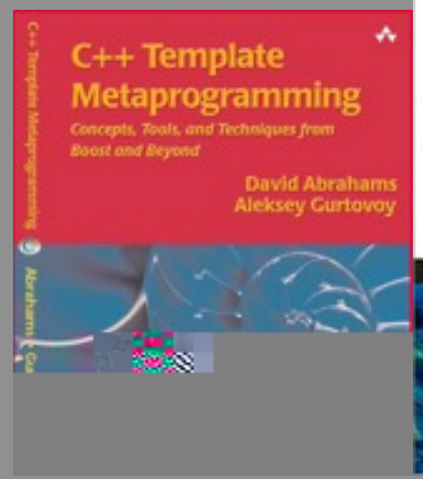
C++ Template Metaprogramming
Concepts, Tools, and Techniques from Boost and Beyond
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Bjarne Stroustrup
Le créateur du C++
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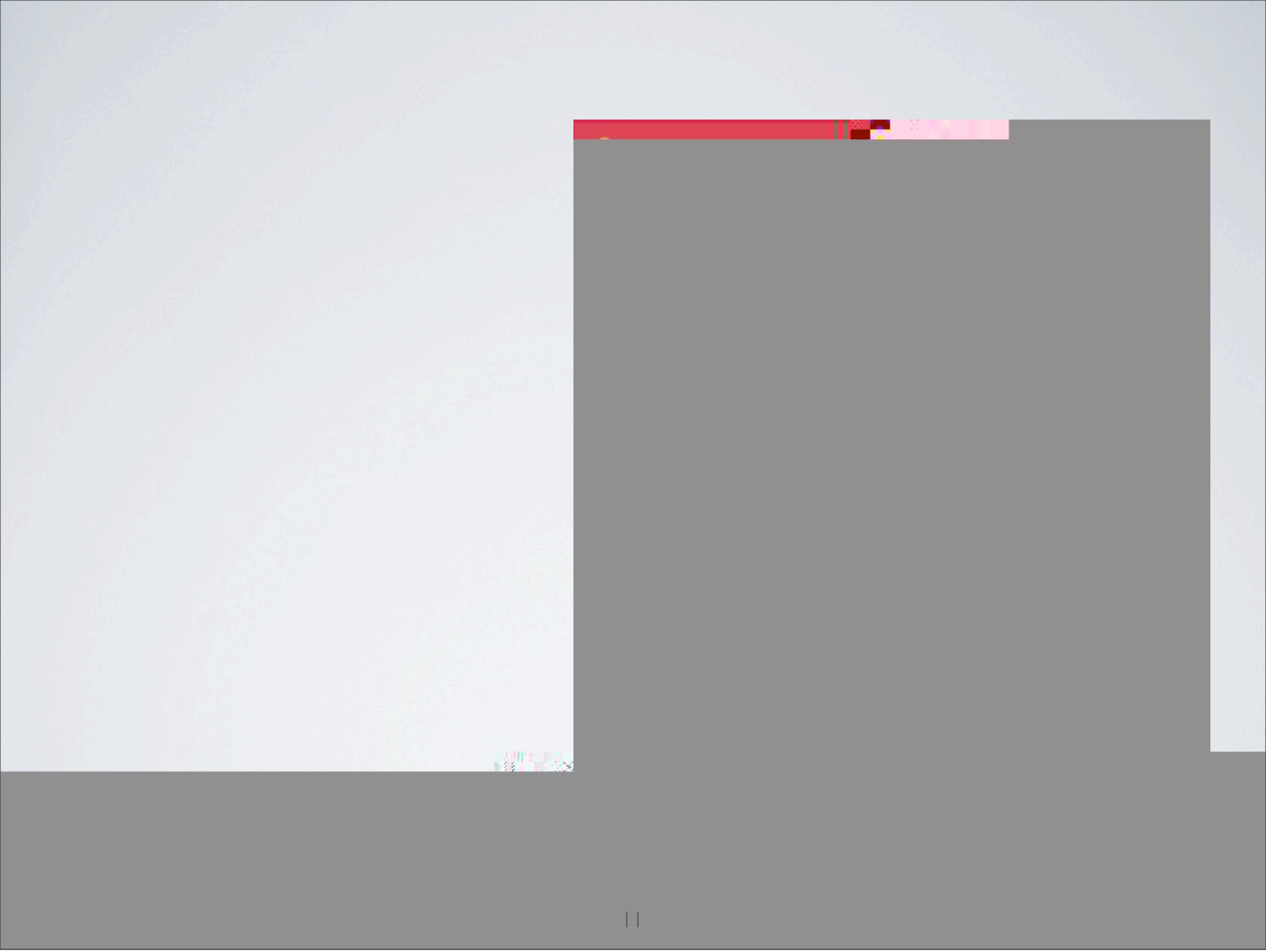

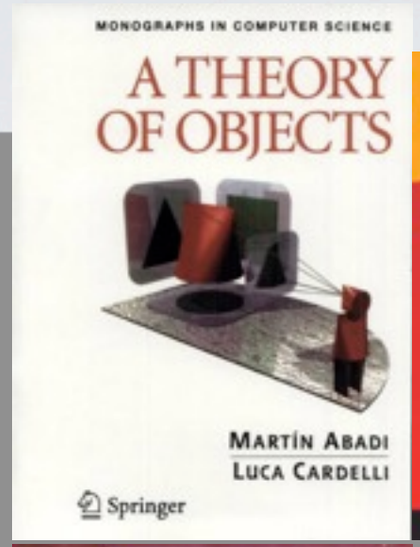
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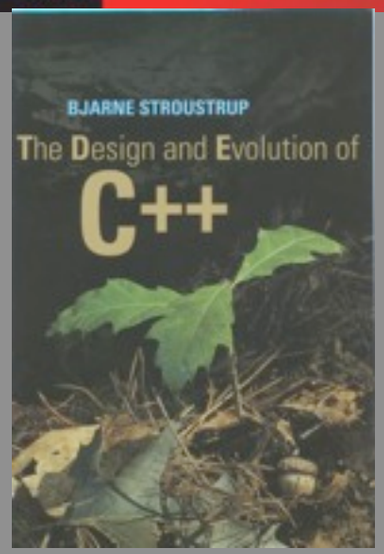
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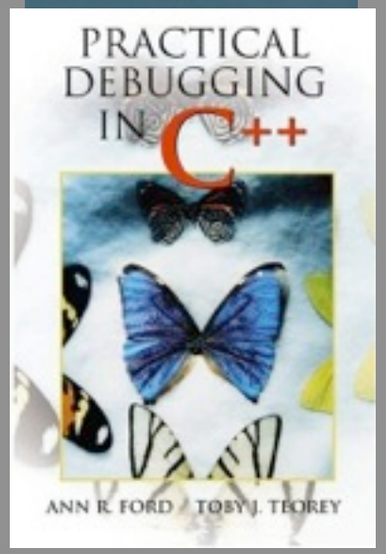
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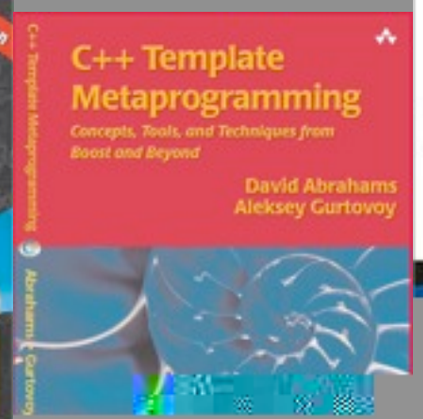
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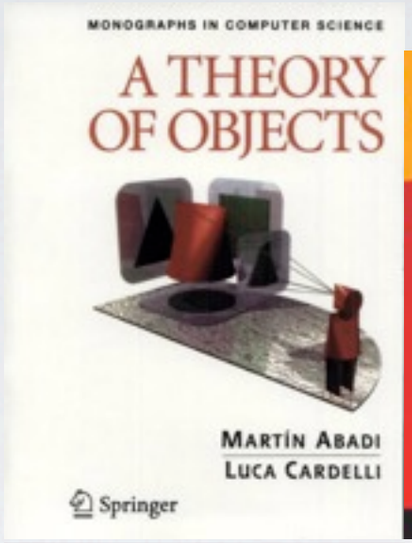
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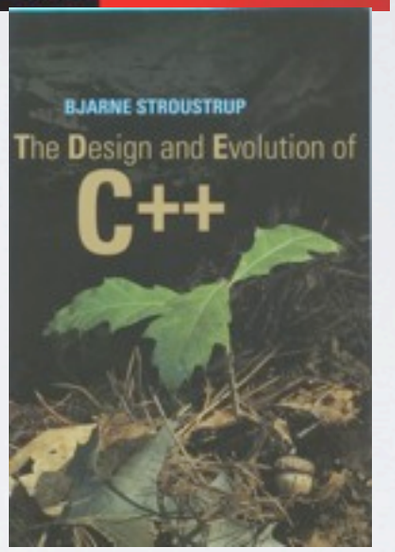
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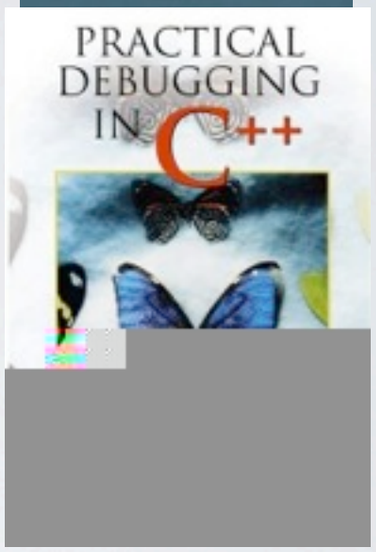
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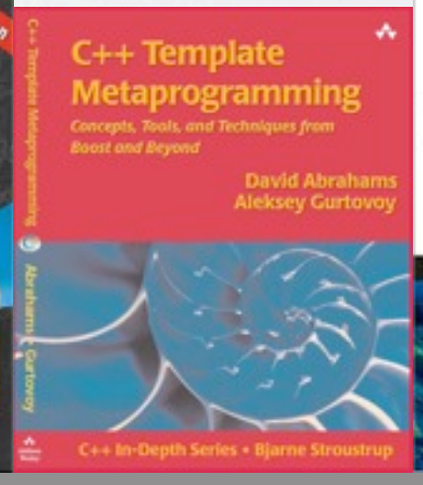
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INTRODUCTION

Deux visions (compatibles) de la question

- Une extension du langage C ?
- Un langage orienté objet à la syntaxe inspirée du C ?

Deux approches pédagogiques

- *bottom-up*
- *top-down*

Le C++ repose sur **un modèle d'objet**

Encapsulation

- droits d'accès

Instanciation de classe

- construction/destruction
- statique vs dynamique

Messages

- invocation de méthodes

Généralisation

- héritage, redéfinition, extension
- types abstraits, factorisation, méthodes virtuelles

On y distingue **trois polymorphismes**

- *ad-hoc* (la surcharge)
- par sous-typage (l'héritage)
- généralisé ou universel (les modèles)

La généricité :

- fonctions/méthodes génériques
- types génériques (aka templates)

Rappels historiques à propos du langage C++ ou une ode à la gloire de *(Bell)* :

- 1979-1982 : C avec classes
- 1983-1985 : C++, cfront, manuel de référence
- 1986-1988 : diffusion importante du langage
- 1989-1998 : cfront 2.0, cfront 3.0, STL (Alexander Stepanov - HP), ISO 14882:1998
- 2003 : ISO 14882:2003
- 2011 : ISO 14882:2011 *aka* C++11

- `isocpp.org` (`/std`)

- Attention le standard est un document de 1400 pages!!!

Langages ayant influencé la conception du C++

C (1972, Kernighan & Ritchie - Bell)

Langages ayant influencé la conception du C++

Simula (1960, Dahl & Nygaard - Oslo)

Langages ayant influencé la conception du C++

Ada 83 (1980, Ichbiah - CII-Honeywell Bull)

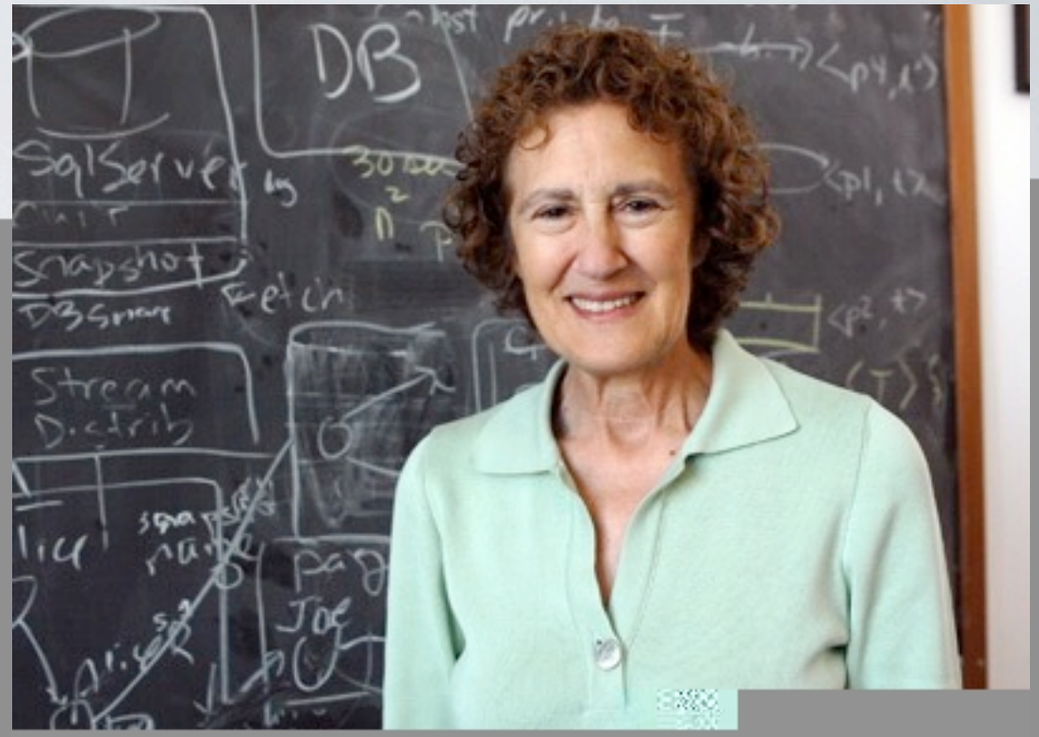
†

Langages ayant influencé la conception du C++

Algol 68 (inspiré d'Algol 60, Backus & Naur)

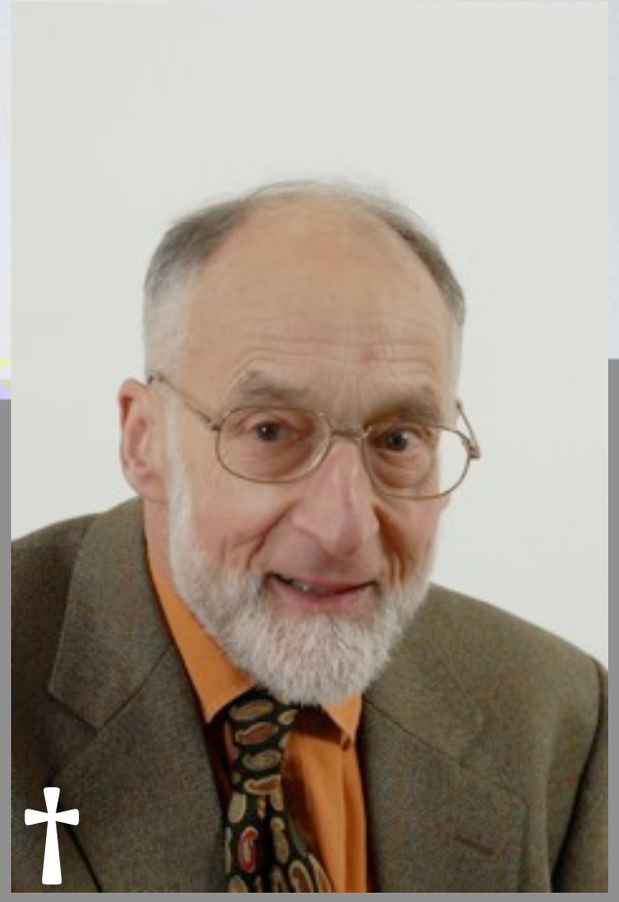
Langages ayant influencé la conception du C++

CLU (1975, Liskov - MIT)



Langages ayant influencé la conception du C++

ML (1980, Milner - Edimbourg)



Quelques caractéristiques :

- compatibilité totale avec le C (sauf de très rares exceptions bien connues, faciles à identifier et à réparer)
- performances comparables à celles du C (une obsession de conception) : on *colle* à la machine

Des **critiques**. « C++ **sucks** » :

At a recent conference, a speaker asked for a show of hands and found that twice as many people claimed to hate C++ as had ever written even a single small C++ program. The only word for such behavior is bigotry. In dealing with the current wave of C++ bashing, we should remember that bigotry is bred by ignorance and fear.

Des **critiques**. « C++ is too **complex** » :

Experience shows that trying to learn OOP or C++ from The Annotated C++ Reference Manual is usually a BIG mistake. It is a nice book, I can recommend it (:-), but not as a tutorial. After all, most people wouldn't try learning a natural language exclusively from a grammar plus a dictionary. Few would succeed.

Des **critiques**. « C++ programmers are **idiots** »

Many of the most experienced individuals and organizations in the industry (and academia) use C++. Ascribing their choice of C++ over alternatives to stupidity, ignorance, or inexperience is arrogant and insulting - and in many cases simply wishful thinking based on a limited field of knowledge. I still think the average C++ programmer is pretty smart, but rarely a fanatic, and usually too busy getting the work done to bother with language laws or the latest academic advances in OO type theory. Fortunately, one doesn't need to be a genius to write good C++.

Des **critiques**. « C++ is **useless**/**unreliable**/ **dangerous** because it lacks feature/property X » :

My firm conclusion is that no single feature is truly necessary. Much more successful software has been written in languages proclaimed BAD, than has been written in languages acclaimed as saviors of suffering programmers; much more.

Des **critiques**. « C++ is **not Object-Oriented** »

C++ supports object-oriented programming (as defined by most people). C++ supports it pretty well for real-world applications. Its type system and general model of the world are coherent and relevant to real applications.

The proof of the pudding is in the eating, so I consider the fact that many large projects have been completed using C++ much more significant than the fact that C++ doesn't conform to the latest fashion of OO theology.

Have a look at the "Design Patterns" book by Gamma et. al. for examples of elegant designs clearly expressed in relatively straightforward C++. I observe that there are a lot of myths about what features C++ has and doesn't have.

Un exemple original :

Un exemple :

Un exemple :

Un exemple :

Un exemple :

Un exemple :

Un exemple :