Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie

WYDZIAŁ INFORMATYKI, ELEKTRONIKI I TELEKOMUNIKACJI

KATEDRA INFORMATYKI

PRACA DYPLOMOWA MAGISTERSKA

Angielski tytuł pracy

A tutaj jej polski tytuł

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Opiekun pracy: ***dr hab. inż. Zbigniew Iksiński, prof. AGH***

Kraków, 2016

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…………………………………..

Składam szczególne podziękowania mojemu Promotorowi, dr hab. inż. ?????, profesorowi nadzwyczajnemu AGH za życzliwość, cenne uwagi merytoryczne, wszechstronną pomoc oraz poświęcony czas.

Contents

Chapter 1

Preface

1.1 Motivation

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1.2 Content of this work

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The chapter 2 provides the requirements for the project, and as well formulates the sample problem of shallow water simulation. The chapter 3 outlines the tools and methods necessary for approaching the problems. In the chapter 4 I thoroughly document the software I developed to accomplish the research goals. I discuss the obtained results in the chapter 5 and sum up the thesis in chapter 6.

1.3 State of the art

1.3.1 Technology 1

A lot of bibliography citations here...

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1.3.2 Technology 2

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1.4 Main thesis of this work

The main thesis of this work may be expressed as follows:

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Chapter 2

Problem formulation

Describe what each section contains...

2.1 Issues to be addressed in this work

2.1.1 (e.g.) Algorithmic challenges

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2.1.2 (e.g.) Parallelization challenges

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2.2 Functional requirements

1. Core functionalities
   (a) ...
   (b) ...
   (c) ...
2. Adaptation strategies
   (a) ...
   (b) ...
3. Visualization and profiling
   (a) ...
   (b) ...
   (c) ...
   (d) ...

2.3 Non-functional requirements

1. Performance and complexity

(a) ...

(b) ...

(c) ...

2. Development requirements

   (a) ...

   (b) ...

Chapter 3

Solution methodology

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3.1 Method 1

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3.2 Method 2

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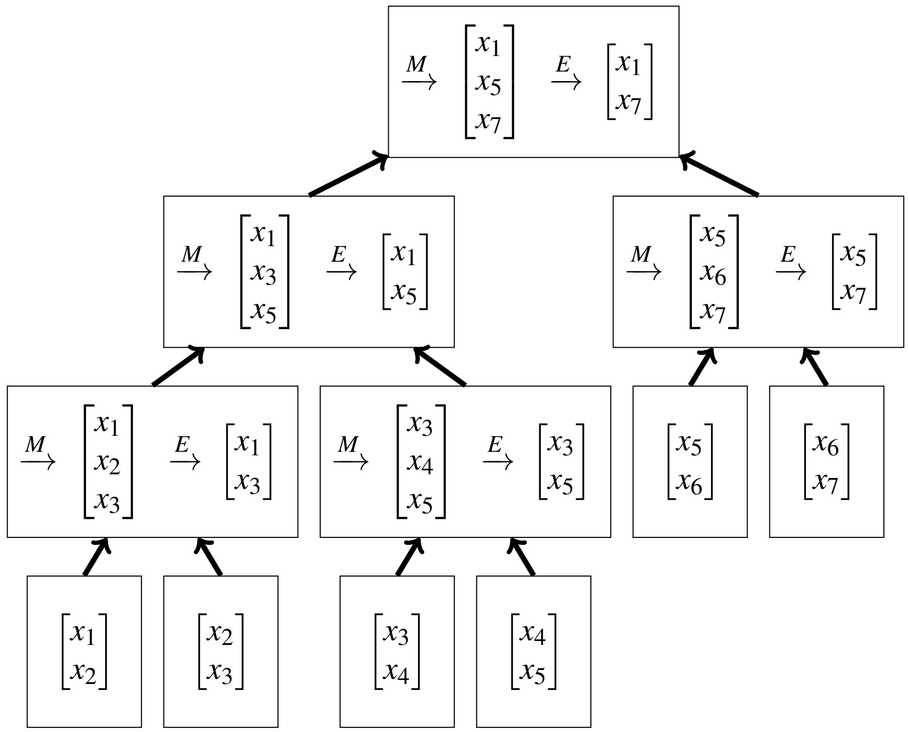
3.3 Method 3

Some nice matrices...

$$A = \begin{bmatrix} 1 & & & & & & \\ 1 & -2 & 1 & & & & \\ & 1 & -2 & 1 & & & \\ & & 1 & -2 & 1 & & \\ & & & 1 & -2 & 1 & \\ & & & & 1 & -2 & 1 \\ & & & & & & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 0 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 0 \end{bmatrix} \tag{3.1}$$

Some nice diagrams...

Figure 3.1: Elimination tree for multifrontal solver



Some nice algorithms...

Algorithm 1 One iteration of the double-grid algorithm

Compute the solution $\mathscr{U}^C$ on the coarse mesh
Split each element of the coarse mesh, thus obtaining the fine mesh
Compute the solution $\mathscr{U}^F$ on the fine mesh
for each coarse mesh element ε_i **do**
    $\triangleright$ ρ_i is the relative error
    $\rho_i \leftarrow \left| \frac{\mathscr{U}_i^F - \mathscr{U}_i^C}{\mathscr{U}_i^F} \right|$
end for
$\rho_{max} \leftarrow max_i(\rho_i)$
for each element ε_i **do**
    if $\rho_i > \tau \cdot \rho_{max}$ **then**
        adapt the ε_i element (split into two halves)
    end if
end for

Some nice figures...

Figure 3.2: Steps 1-5 of the double-grid h-adaptation strategy, quadratic B-splines

(a) Step 1. A solution is delivered on coarse (4 elements) and fine grid (8 elements). Red line marks the coarse-grid solution, green line — the fine-grid solution and black line — the exact (analytic) solution.

(b) Step 2. Since the maximal error multiplied by τ (here set to 20%) were lower than the error on any element, the algorithm halved all four elements after step 1.

Figure 3.2

(c) Step 3. The extreme left and right elements did not get refined after the step 2.

(d) Step 4

Chapter 4

Project documentation

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4.1 Some clever stuff

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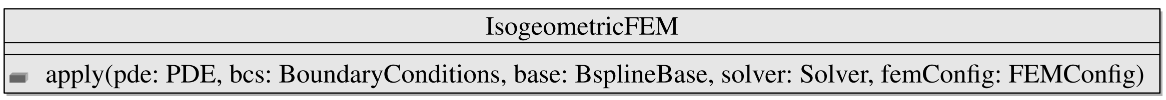
4.2 API components overview

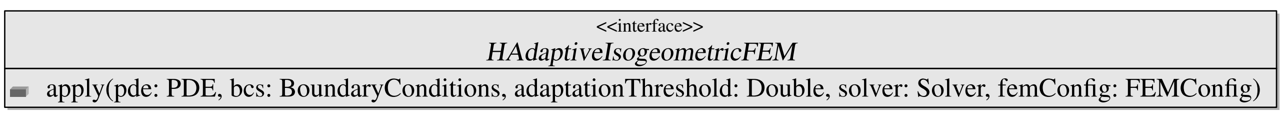
Nice UML no. 1...

Figure 4.1: IsogeometricFEM class



Nice UML no. 2...

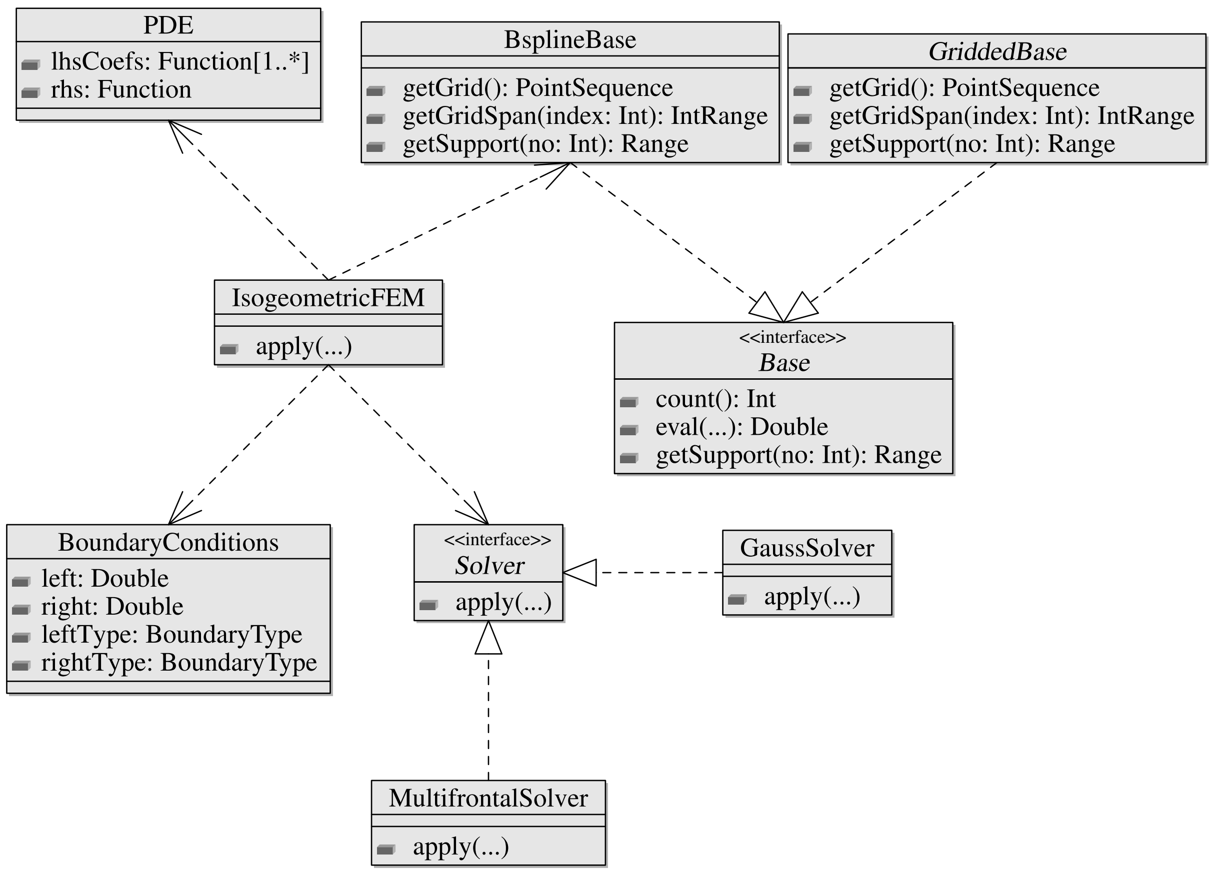
Figure 4.2: HAdaptiveIsogeometricFEM interface



4.3 Detailed API specification and class diagrams

And another large UML...

Figure 4.3: The overall class diagram



Chapter 5

Evaluation of the results

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5.1 e.g. Convergence analysis

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tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

5.2 e.g. Complexity analysis

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5.3 e.g. Flood simulation results

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Chapter 6

Conclusions and future works

6.1 Achieved goals and observations

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6.2 Areas for development

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List of Figures

List of Algorithms

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