Week 1, class 1

Tasks for today:

- Get deal.II installed on your desktops
- Talk about the structure of this class

Week 1, class 1

Getting deal.II installed on your desktops:

    cd ~
    rm .bashrc
    cp /u/.bashrc .bashrc
    chmod u+rw .bashrc
    echo 'export PATH=/u/fac/bangerth/bin/bin:$PATH' >> .bashrc
    bash
    which cmake

verify that this links to the correct program in ~bangerth/bin/bin, otherwise fix .bashrc before it's too late!

Week 1, class 1

Getting deal.II installed on your desktops:

```
tar xvzf /u/fac/bangerth/dealii-8.2.1.tar.gz
cd /data/scratch
mkdir ${USER}-deal.II
cd ${USER}-deal.II
cmake -DCMAKE_INSTALL_PREFIX=~/bin/deal.II ~/dealii-8.2.1
make -j4
make -j4 install
cd /data/scratch
rm -r ${USER}-deal.II
```

Week 1, class 2

Tasks for today:

- Student presentations about projects

Week 2, class 1

Tasks for today:

- Check out project descriptions
- Play with step-1

Week 2, class 1

Check out project descriptions:

```
cd ~
svn checkout https://wolfgang.math.tamu.edu/svn/...
                       ...shared/math-676/trunk/2015/projects
cd projects/your-last-name
```

Next: Read through your project description.

Week 2, class 1

Play time:

```
cd ~
cp -r ~/bin/deal.II/examples/step-1 .
cd step-1
cmake -DDEAL_II_DIR=~/bin/deal.II .
make
make run
```

```
okular grid-1.eps
okular grid-2.eps
```

Week 2, class 1

Play time:

make strip_comment
gedit step-1.cc

… edit according to your desires...

make run
okular grid-2.eps

Week 2, class 1

Ideas for play time:

- Change the geometry for the first mesh
  ($\rightarrow$ namespace GridGenerator)

- Change where we refine in mesh 2:
  – refine towards the outer rim
  – refine a geometric region (e.g., the upper right quadrant)

- More advanced: Try 3d

Week 2, class 2

If you didn't get your project description yet:

```
cd ~
cd projects
svn update
```

Next: Read through your project description.

Play time – continue with step 1:

```
cd ~
cd step-1
make
make run


okular grid-1.eps
okular grid-2.eps
```

Play time:

make strip_comment
gedit step-1.cc

… edit according to your desires...

make run
okular grid-2.eps

Week 2, class 2

Ideas for play time:

- Change the geometry for the first mesh
  (→ namespace GridGenerator)

- Change where we refine in mesh 2:
  – refine towards the outer rim
  – refine a geometric region (e.g., the upper right quadrant)

- More advanced: Try 3d

Week 2, class 2

Play time – try step 3:

```
cd ~
cp -r ~/bin/deal.II/examples/step-3 .
cd step-3
cmake -DDEAL_II_DIR=~/bin/deal.II .
make
make run
```

Week 2, class 2

Ideas for play time – step-3:

- Change the geometry
  ($\rightarrow$ namespace GridGenerator)

- Use a different right hand side than *f(x)=1*

- Use a coefficient inside Laplace operator/bilinear form

- More advanced: Try 3d

- Output in a different format than gnuplot, e.g., VTK
  (then visualize with Visit or Paraview)

Week 3, class 1

Questions from lectures:

- Why do we need *reinit(cell)*?

- How are vertices numbered?

- Why are DoFs numbered differently than vertices?

- What is the difference between *CompressedSparsityPattern* and *SparsityPattern*?

- Why not triangles?

Week 3, class 1

Play time – step-3, step-4:

- Change the geometry
  (→ namespace GridGenerator)
- Use a different right hand side
- Use different boundary values
- Use a coefficient inside Laplace operator/bilinear form

- More advanced: Try 3d in step-3
- Output in a different format than gnuplot, e.g., VTK
  (then visualize with Visit or Paraview)

Week 3, class 2

Questions from lectures:

- What does *Triangulation<2>::active_cell_iterator* mean?

- How to show a 3D solution without contour plot. Is it a good idea to show 3D plot using pseudocolor and then use selection/box to show part of the solution? Or are there other way to show 3D plot?

Week 3, class 2

Play time – step-4:

- Change the geometry
  ($\rightarrow$ namespace GridGenerator)
- Use a different right hand side
- Use different boundary values
- Use a coefficient inside Laplace operator/bilinear form

- Play with ways to visualize the solution

Week 4, class 1

Questions from lectures:

- How to know which header file I need to *#include*?

- Why does Eclipse show me errors?

- The con of red green refinement is "triangles can degenerate by a factor of 2 when converted to green cells." But, I cannot see why it is con. Is dividing by 2 bad?

- If the "ConstraintMatrix" objects are not stored or used as matrices even though they represent the matrix CV of constraints for hanging nodes, how are they stored and used?

Week 4, class 1

Play time – step-6:

- Different coefficients
- Matrix-valued coefficients
- Different ways of refining
- Try a non-convex domain

Week 4, class 2

Questions from lectures:

- Why does refinement in step-6 go towards the interface?

- Why refine 30% of cells and coarsen 3%?

Let's talk about the journal again:

- Write reflectively: write what you learned and understood

- Do not write a summary

Week 4, class 2

Play time – step-6:

- Different coefficients
- Matrix-valued coefficients
- Different ways of refining
- Try a non-convex domain

Week 5, class 1

Questions from lectures:

- Why do only active cells carry DoFs?

Also:

- No office hours on Thursday (I will record more lectures)

Week 5, class 1

Play time – step-6 plus think about your own project

Week 5, class 2

Questions from lectures:

- What does "regularity" mean and how does it correspond to convergence order?

Week 5, class 2

Play time – step-6 plus think about your own project

Week 6, class 1

Questions from lectures:

- For the release version of executable, since all the exceptions checks are disabled, how do we print error messages to the user when the program aborts? E.g., we need four input data but user only provides three data.

Also:

- No office hours on Thursday (I will record more lectures)

- Talk to me if you want to meet!

Week 6, class 1

Play time – work on your own project

Questions from lectures:

• Why would we use a mixed formulation?

Week 6, class 2

Play time – work on your own project

Week 7, class 1

Questions from lectures:

- What does the syntax update_flags|update_gradients mean?

Week 7, class 1

Play time – work on your own project

Week 7, class 2

Questions from lectures:

-

Week 7, class 2

Play time – work on your own project

Week 8, class 1

Remember:

March 24 (2 weeks from today) is the due date for

- 10-minute progress talk

- Midterm reflective essay

Week 8, class 1

Play time – work on your own project

Week 8, class 2

Remember:

March 24 (less than 2 weeks from today!) is the due date for

- 10-minute progress talk
- Midterm reflective essay

Week 8, class 2

Play time – work on your own project

Week 9, class 1

- No office hours on Thursday (I will record more lectures)

Week 9, class 1

Midterm progress presentations

Week 9, class 2

Remaining midterm presentations

Play time – work on your own project

Week 10, class 1

- No office hours on Thursday (I will record more lectures)

Week 10, class 1

Play time – work on your own project

Week 10, class 2

Play time – work on your own project