# $C^1$ surface interpolation, using reduced HCT elements

This tool computes a smooth surface (of class $C^1$) interpolation of a function using a set of control points in space. Matlab/Octave is used to compute the triangulation of the control points and to create the mesh used for interpolation.

## Usage

### Setting the input parameters:

- control points are set in `data/hctr.pts`
- $f : \mathbb{R}^2 \to \mathbb{R}$ , $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ are implemented in `src/Func.xpp`. To use those implemented functions, simply modify the header of `main.cpp`.

```
...
float TestFunction(Point p){
    // SET FUNCTION HERE
    return f(p);
}
float dxTestFunction(Point p){
    // SET dx FUNCTION HERE
    return dxf(p);
}

float dyTestFunction(Point p){
    // SET dy FUNCTION HERE
    return dyf(p);
}
...
```

- The resolution of the interpolation mesh is specified directly in the main Matlab script `maim.m`. By default, `res_x = 50` and `res_y = 50`.

# Running the program

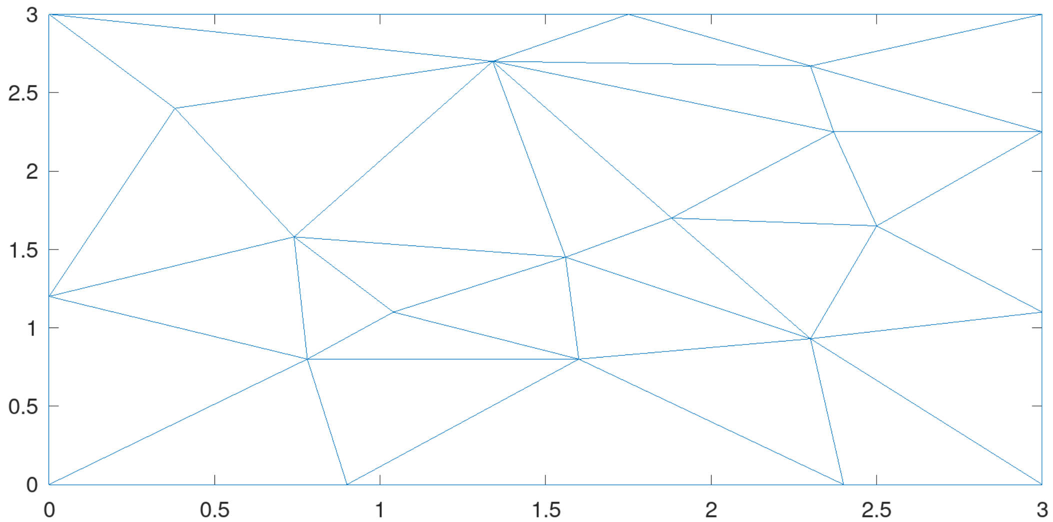
To obtain all results, simply run the main Matlab/Octave script `main.m`.

If you wish to run the C++ code on it's own, run

```
./launch.sh <nb_triangles> <res_x> <res_y>
```

## Results

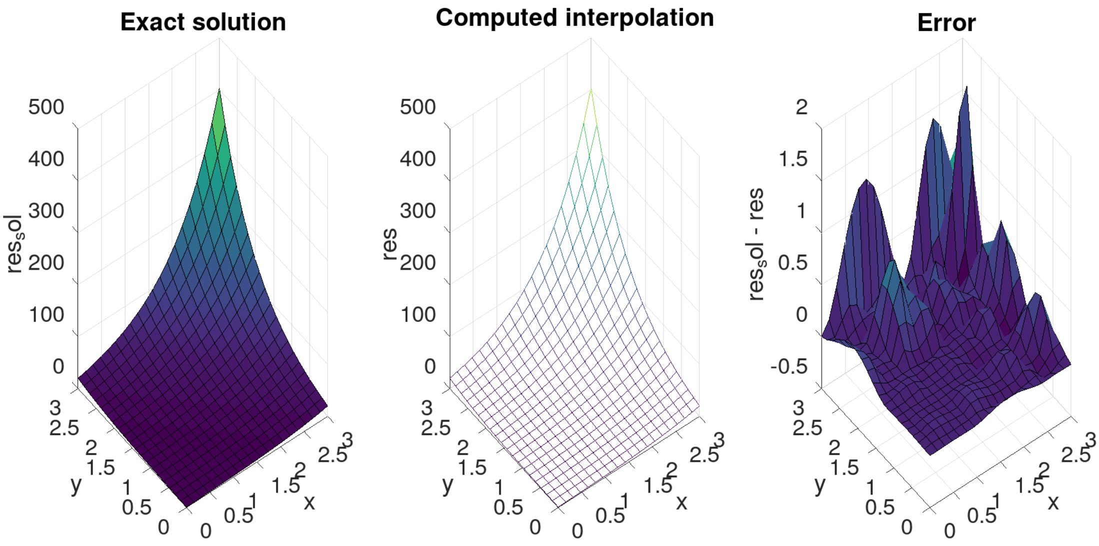
# Triangulation




# Interpolated surface

- **Example 1**:

$f : (x, y) \mapsto e^{x+y}$, `res_x = res_y = 20`




- **Example 2**:

$f:(x,y)\mapsto y^3-2xy^2-5x^2y+10xy+1,$ `res_x = 50, res_y = 100`