Optional tasks

Team 12

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M2: **Optimisation and Inference for Computer Vision**
Masters in Computer Vision

Universitat Autònoma
de Barcelona

Summary

Optional tasks

Deliver I

- Test with other images (+1 point)
- Solve the problem with an interpolation method (+1 point)

Deliver III

- Test with other images (Up to +2 points (+0.33 each))
- Implement mixing gradients (+1 point)
- Implement multigrid (+10 points)

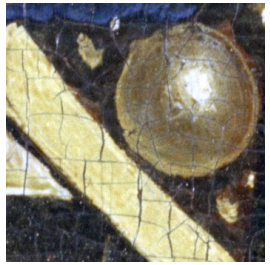
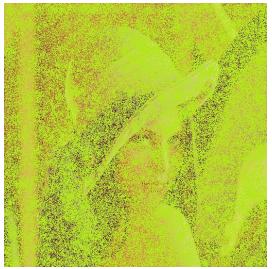
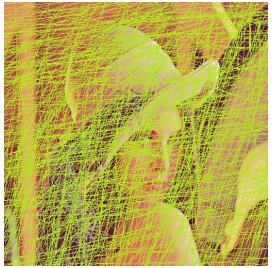
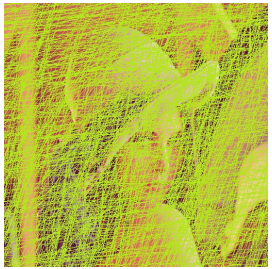
Deliver IV

- Test with the optional dataset (+0.25 each point)
- Test with our own images (+0.25 each point)

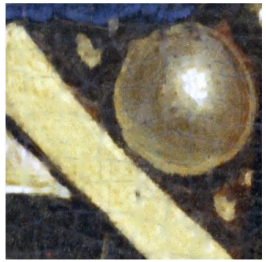
Optional tasks

Deliver I: Test with other images

BEFORE

Art Gallery Image	40% Information	25% Information	Scratched Image	Extra Scratched Image
				

AFTER





Optional tasks

Deliver I: Solve the problem with an interpolation method

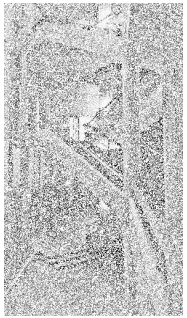
We have solved the problem using an interpolation (another NON variational method). In this slide we describe this approach and compare the results with the previous technique.

DESCRIPTION

Our algorithm fills the pixels located on the image mask by linearly interpolating the intensity value of the neighbor pixels in the image to be restored.

RESULTS

Image to be restored



Laplacian solution

Interpolating solution

CONCLUSIONS

Laplacian method outperforms the interpolation in terms of visual results.

Optional tasks
Deliver III: Test with other images

White wall

Banksy’s drawing

Banksy’s Graffiti

Optional tasks

Deliver III: Test with other images

Mountains

Hot-air balloon

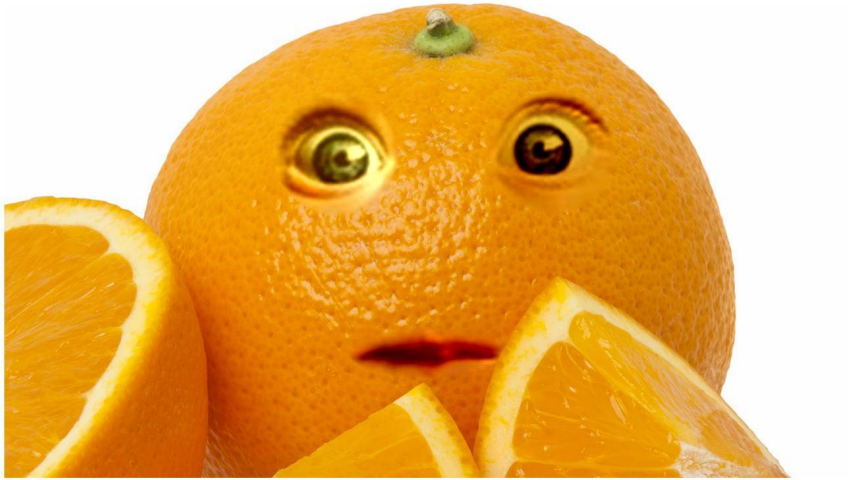
Different color intensities depending on the position

Optional tasks

Deliver III: Test with other images

Orange

Excited orange



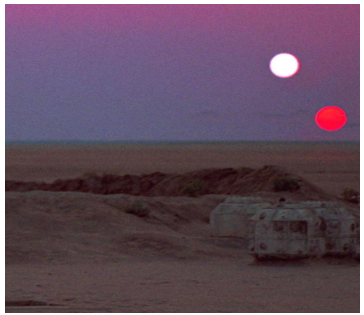
Excited baby

Optional tasks

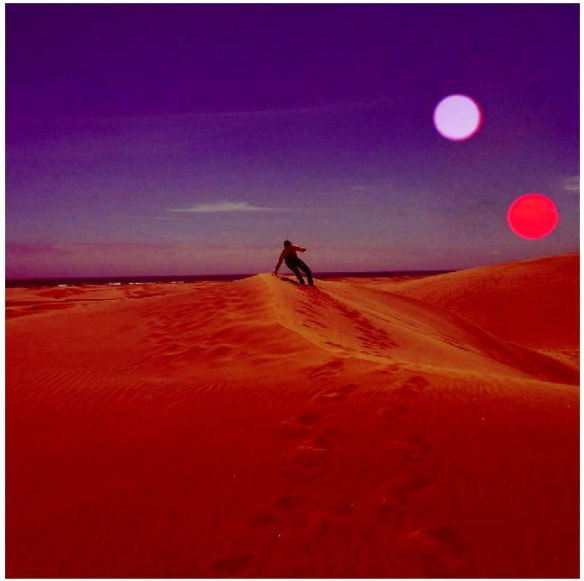
Deliver III: Test with other images

Desert hiking

Tatooine



Tatooine desert hiking



Optional tasks

Deliver III: Test with other images

Sergio Sancho

Barney Stinson

Someone

Optional tasks
Deliver III: Test with other images

Barcelona from air

UFO

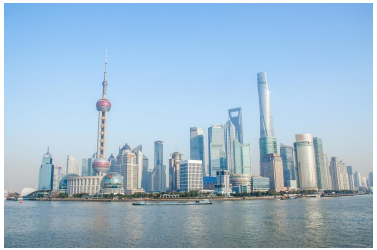
Independence Day 3. Now in Barcelona

Optional tasks

Deliver III: Test with other images

Mars landscape

Shanghai skyline



Random Martian city

Optional tasks

Deliver III: Implement mixing gradients

White wall

Banksy’s Graffiti

Banksy’s drawing

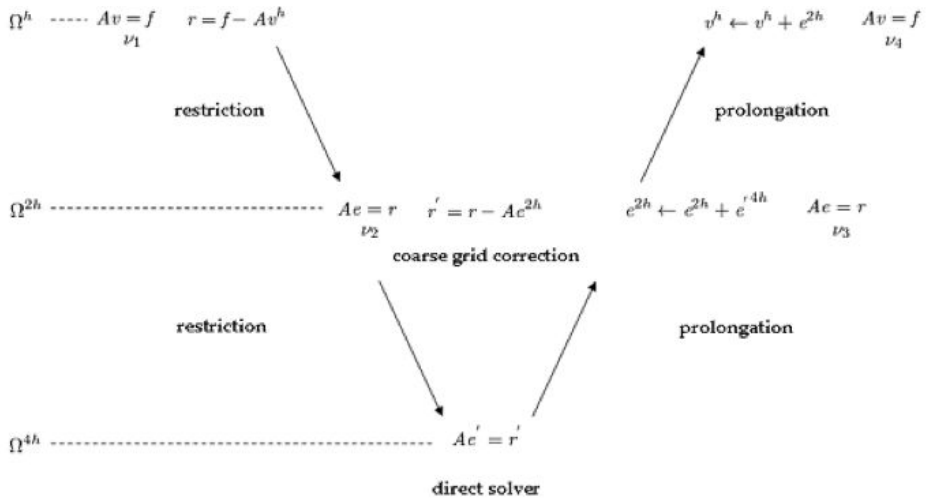
Optional tasks

Deliver III: Implement multigrid

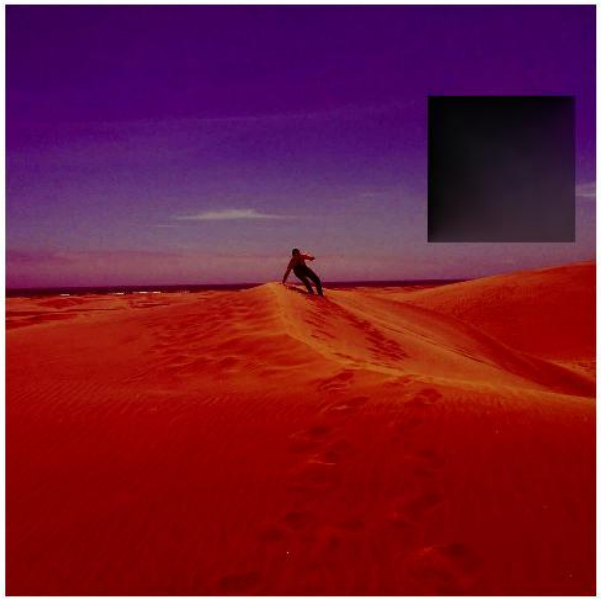
```
function [ u_next ] = multigrid(u,b)
        % Smooth
        for i = 1:5
                u = 0.8 * jacobi(u,b) + 0.2 * u;
        end
        % Solve the error equation on a coarser grid
        n = size(u, 1) - 1;
        if n>2
                r = residual(u, b);
                % Interpolation fine to coarser
                rc = r(1:2:end, 1:2:end);
                zmat = zeros( round((n+1)/2) );
                ec = multigrid(zmat, rc);
                % Interpolation coarser to fine
                e = zeros(n+1);
                e(1:2:end,1:2:end) = ec;
                e(2:2:end-1,:) = 0.5 * (e(3:2:end,:) + e(1:2:end-2,:));
                e(:,2:2:end-1) = 0.5 * (e(:,3:2:end) + e(:,1:2:end-2));
                u = u + e;
        end

        % Post smoothing
        for i = 1:5
                u = 0.8 * jacobi(u, b) + 0.2 * u;
        end

        u_next = u;
end
```



Optional tasks
Deliver III: Implement multigrid



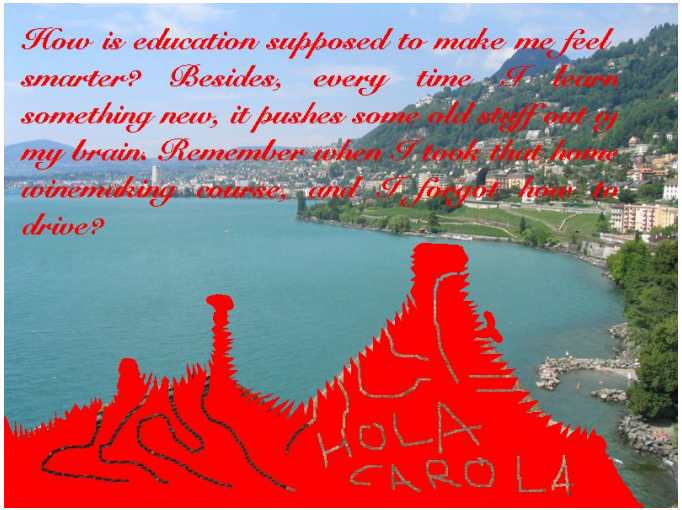
As depicted in the previous figure, our proposed multigrid algorithm is not working with Poisson editing technique.

Multigrid methods in numerical analysis are algorithms for solving differential equations using a hierarchy of discretizations. We are basing our multigrid method in the Jacobi algorithm in order to solve the differential equation system in the coarse image. The Jacobi method is a really simple one, and in our case, is giving us really poor results.

The first step to try to get better results would be analize the result that the Jacobi method is giving us in the coarse image, check if we can improve it and after, see how well are we doing the interpolation process to recover correctly the solution image.

Optional tasks
Deliver IV

Problem: Recovering images



Optional tasks
Deliver IV: Test with optional database

This is the result of applying the pipeline of the last deliver.
The images that the algorithm uses for the workflow are the top 5 in terms of GIST similarity from the optional dataset.

Optional tasks

Deliver IV: Test with optional database

Optional tasks

Deliver IV: Test with optional database

Optional tasks

Deliver IV: Test with our own images

This is the result of applying the pipeline of the last deliver to our own dataset. All images are downloaded from internet with free license. We present our 10 top results, divided by good and bad results.

Bad results

Good results

Optional tasks

Deliver IV: Test with our own images

Bad results

Good results

Optional tasks

Deliver IV: Test with our own images

Bad results

Good results

Optional tasks

Deliver IV: Test with our own images

Bad results

Good results

Optional tasks

Deliver IV: Test with our own images

Bad results

Good results