

# Interactive Image Processing demonstrations for the web



Terrassa Engineering School(E.E.T.)  
Spring 2011

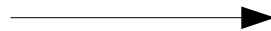
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Albert Gil Moreno

# Motivation

## Context

UPC Image and Video  
Processing Group



**ImagePlus**

Software development platform

# Motivation

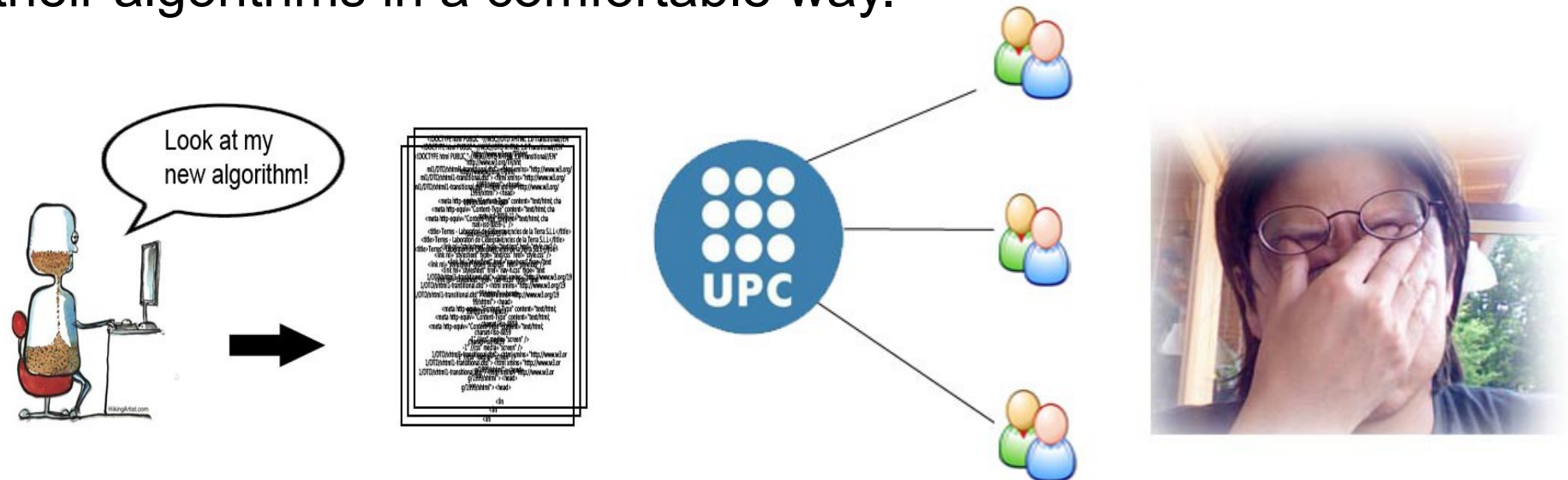
## Index

- Showing the algorithms
  - External Users
  - Internal users

# Showing algorithms

## External users

UPC image and video processing group need a way to show their algorithms in a comfortable way.



# Internal Users

- Detecting possible bugs in the application
- Watching the results in a graphical way

# Requirements

## Index

- Global access
- Minimum web technology
- No plug-ins in the client
- Easy for programmers
- Interactive demos
- Documentation

HOW COULD I FIND A TECHNOLOGY TO  
FULFILL **ALL THIS?**

# Global access

**Internet** is the best way to transmit information to everyone.  
*The more people, the better*



# Minimum web technology

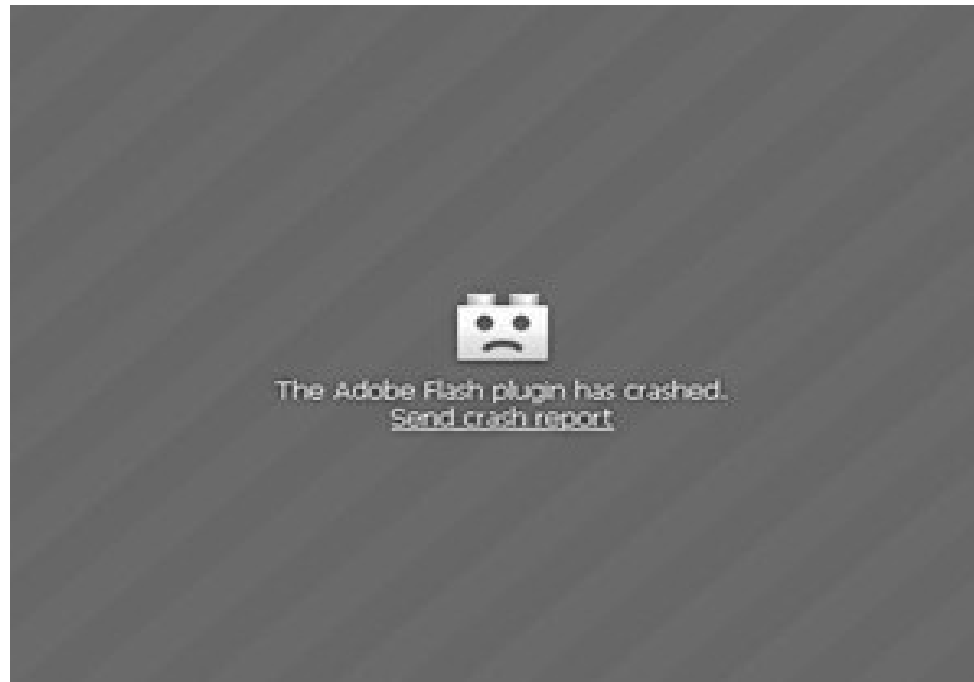
The more technology, the more to learn for developers

## **Available Technology:**

- HTML
- DHTML
- XHTML
- JavaScript
- PHP
- AJAX
- CSS
- ASP.NET
- Ruby on rails
- Java
- C++
- Python
- [...]



# No plug-ins in the client

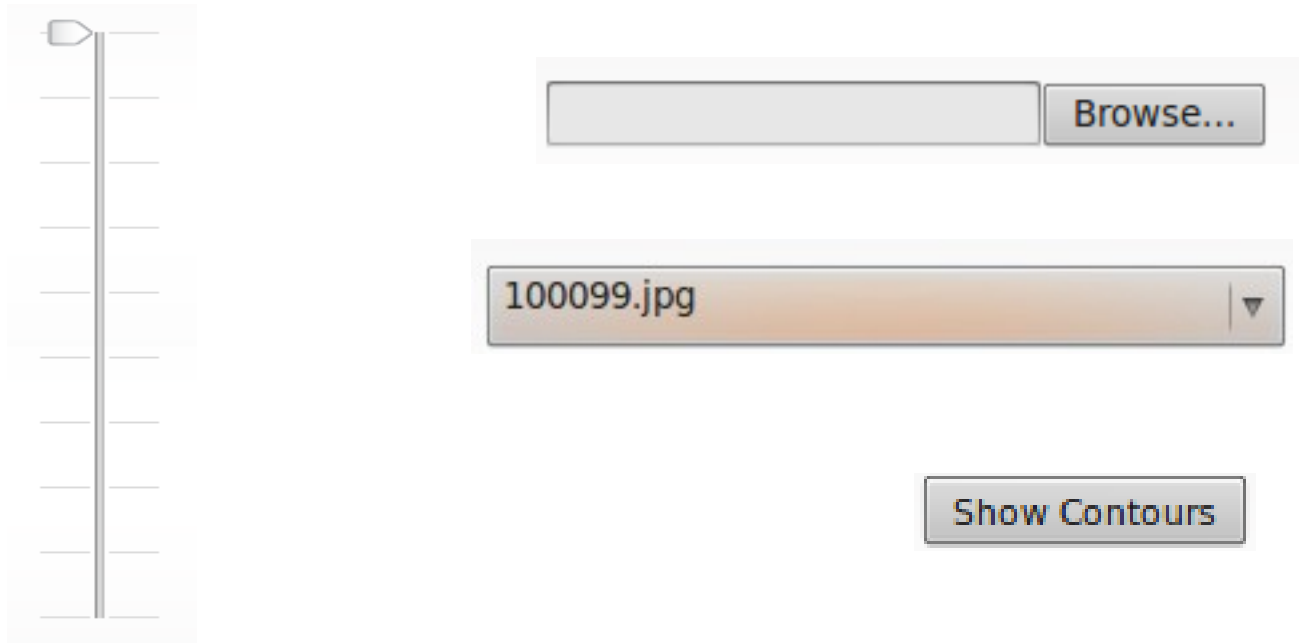


# Easy for programmers

- Simple way to create a web demonstration
- A whole web interface with a few lines of code

# Interactive demos

Interactivity is very important to give a good feeling to the user.



# Documentation

- Afterwards, developers have to code web demonstrations...
- Getting started
- Commenting all the code

# State of the art

## Index

- How to demonstrate image processing
  - Exposing the source code
  - Explaining with pictures
  - Making videos
  - 30 days trial
  - Image Processing in the web
  - Image Processing in the client side

# How to demonstrate image processing

## Exposing the source code






**Image and Video Processing Group**

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**Free Software**

-  [Semi-Fragile Watermarking/](#)
-  [OTIMEC](#)  
(Thresholding program with graphic user interface for the execution of several (42) image binarization (thresholding) algorithms)
-  [IMAGE QUALITY METRICS](#)  
(for the calculation of several (26) image quality measures)
-  [SEGMENTATION](#)  
(two programs for the segmentation of color images (I. Multithresholding; II. Constraint Satisfaction NN))

**Course Projects**

-  [Eigen Face Detection/](#)
-  [Eye and MouthDetection/](#)
-  [Face Detection/](#)
-  [Intelligent Scissor/](#)
-  [Lossless Image Coding/](#)
-  [Spline Contour/](#)
-  [Vector Median Filtering/](#)
-  [Vector Quantization Algorithms](#)
-  [Watermarking/](#)

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**THESIS**

- ["Usage of Shapiro and PONS polynomials In Digital Image Watermarking"](#), M.S.. Thesis, by Emre Topak, 2003
- ["İmge Eşikleme Yöntemlerinin Başarım Değerlendirmesi ve Tahratsız Muayenede Kullanımı"](#), PhD. Thesis (İTÜ), by Mehmet Sezgin, 2002
- ["Image Quality Statistics and Their Use in Steganalysis and Compression"](#), PhD. Thesis, by İsmail Avcıbaşı, 2001
- ["Watermarking Capacity Improvement By Low Density Parity Check Codes"](#), M.S. Thesis, by Ahmet Baştuğ, 2002
- ["In Over Duh: Management Of Self-Similarity"](#) M.S. Thesis, by Hakan Yılmaz, 2002

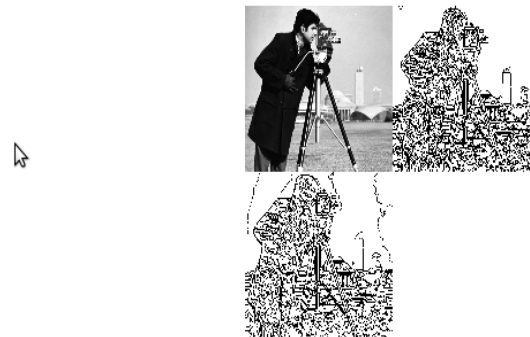
# How to demonstrate image processing

Explaining them step by step with pictures

## 2. Segmentation Using Gibbs-Markov Random Fields (GMRF)

In the segmentation method which forms part of the basis of this work, a GMRF is used for the region boundaries (contours) and a stationary Gaussian model for the grey level information or texture inside the regions. The steps involved in the segmentation process are,

- [preprocessing](#),
- [region growing](#),
- [and contour relaxation](#).

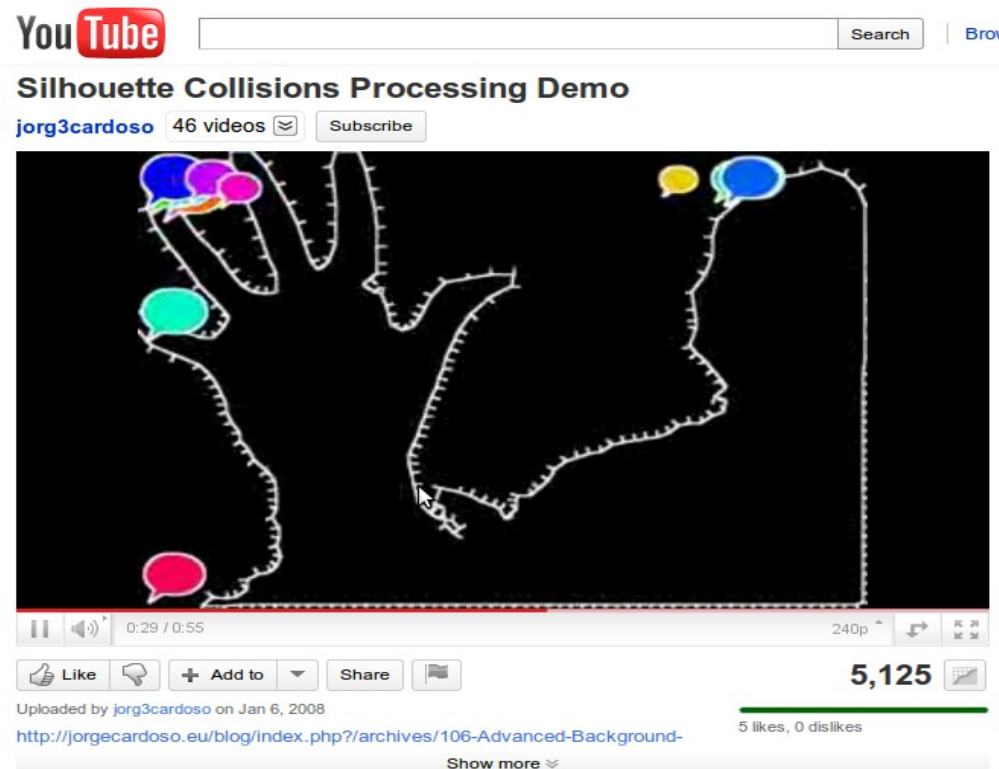


**Figure 1: (Upper left) The original 'cameraman' image, (upper right) contours map before contour relaxation, and (lower left) contour map after application of the contour relaxation algorithm.**

A comparison of the two partitionings before and after relaxation (given in Figure 1) shows that the image partitioning after the contour relaxation is generally more accurate. An exception to this is the sky region which is broken into many smaller regions which are perceived as [false contours](#).

# How to demonstrate image processing

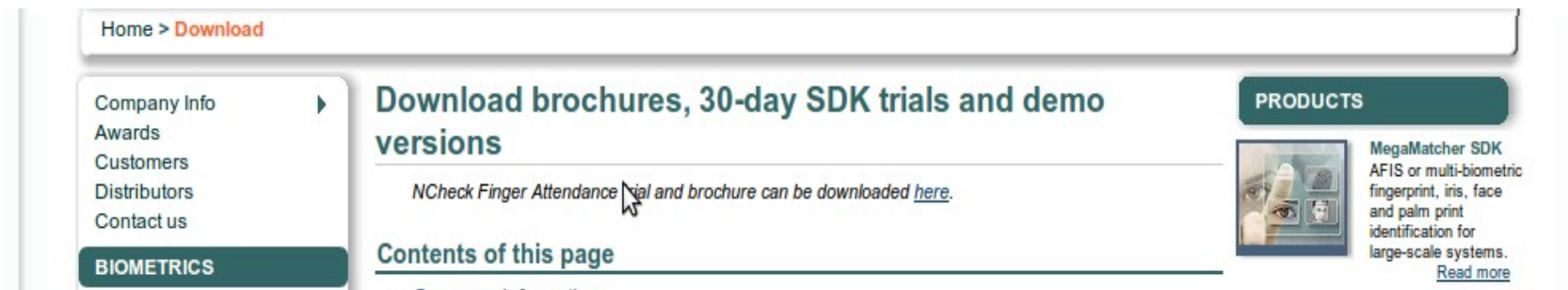
## Making videos





# How to demonstrate image processing

30 days trial



# How to demonstrate image processing

## Image Processing algorithms in the web



More examples:

<http://www.pixl.com/>

<http://www.aviary.com/>

# Image Processing in the client side: Javascript frameworks

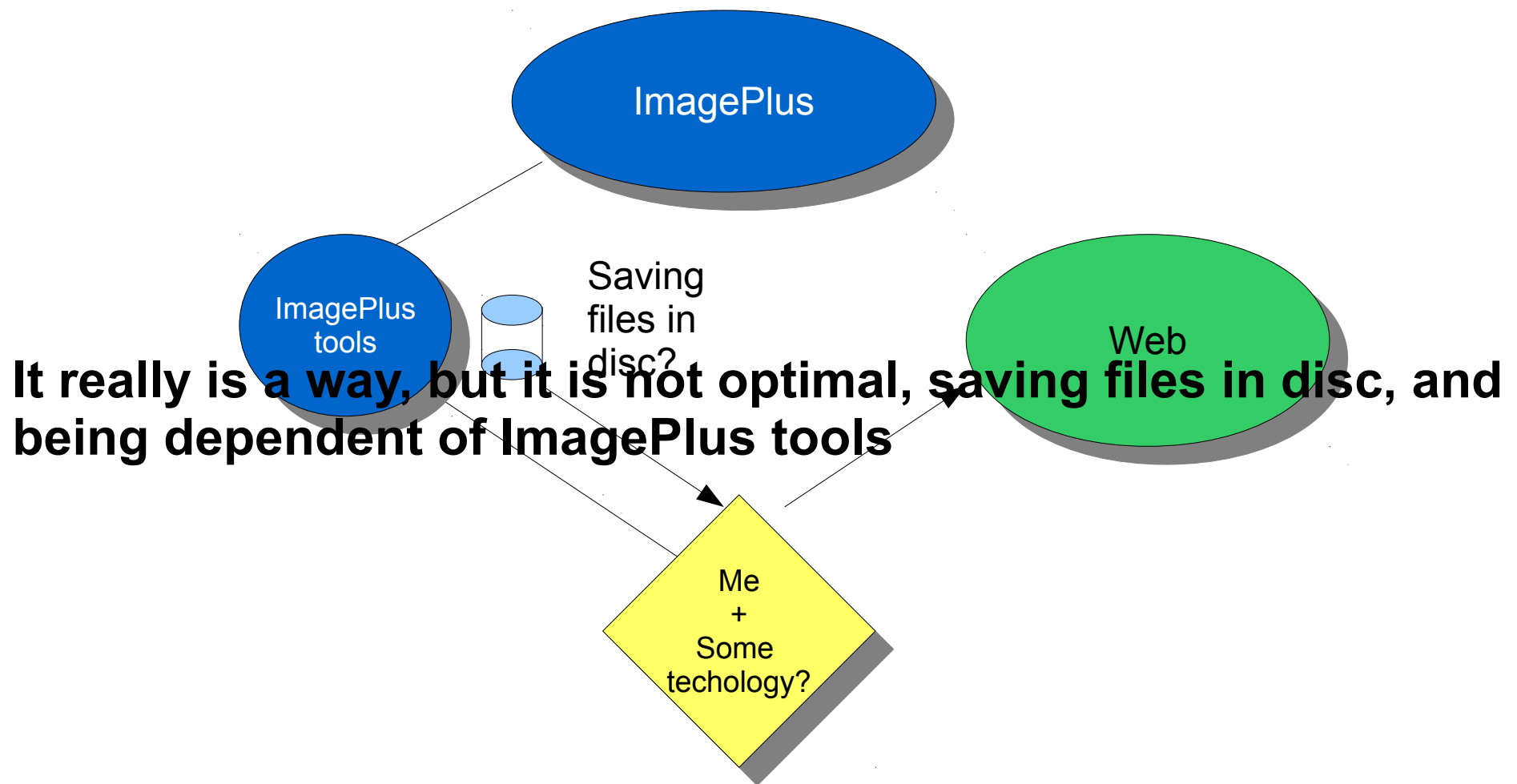
- Just powerful computers
  - No limited computers
  - No tablets
  - No mobile phones

# Design

## Index

- Possible scheme
- Looking for the right technology
- Final scheme of the application
- Web Interface
- Wt basics vs HTML basics
- One application, one demo

# Possible scheme





# Looking for the right technology

## **Wt, the winner one!**

- Render webs
- Interactivity
- Support HTML 5
- Allows PUSH
- Open Source
- and more...

And the most important, Wt is created to join all web technology in **just C++!**

# Wt main approach: Breaking the Client-Server scheme

## **Programmer Side**

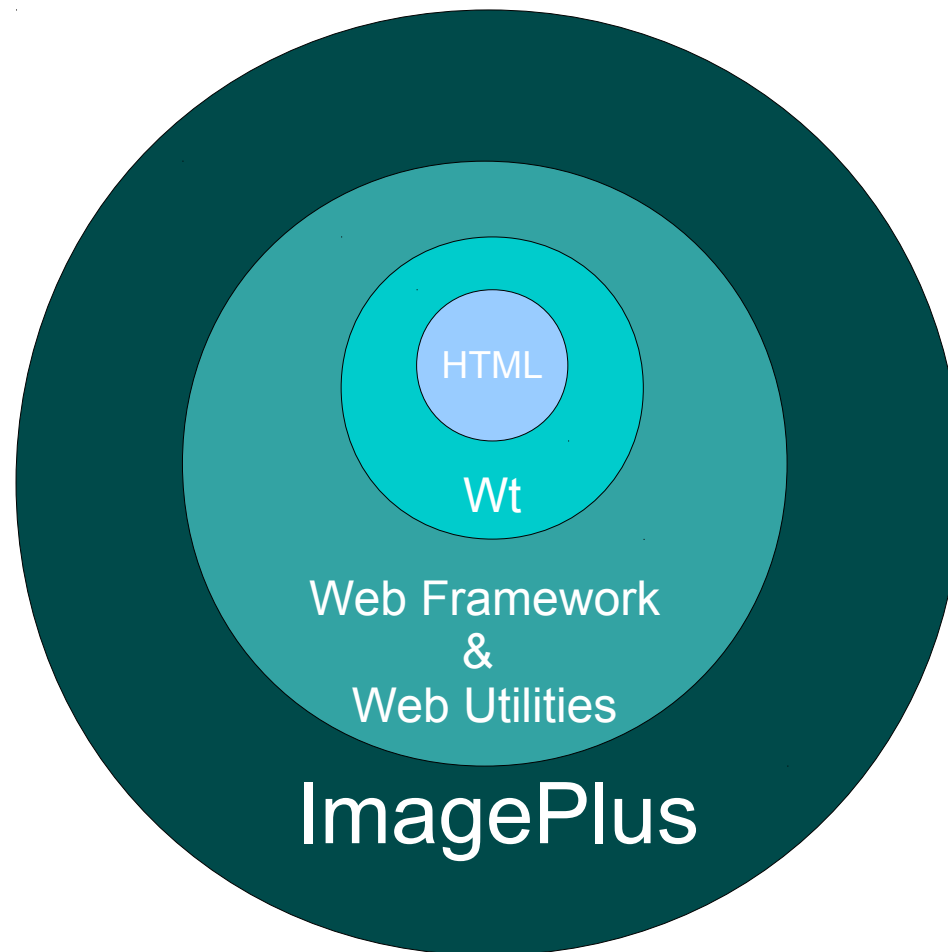
- Like Desktop
- No client-server

## **Web Side**



- Client-Sercker Scheme



# Final scheme of the application






# Web Interface



Binary Partition Tree Creation

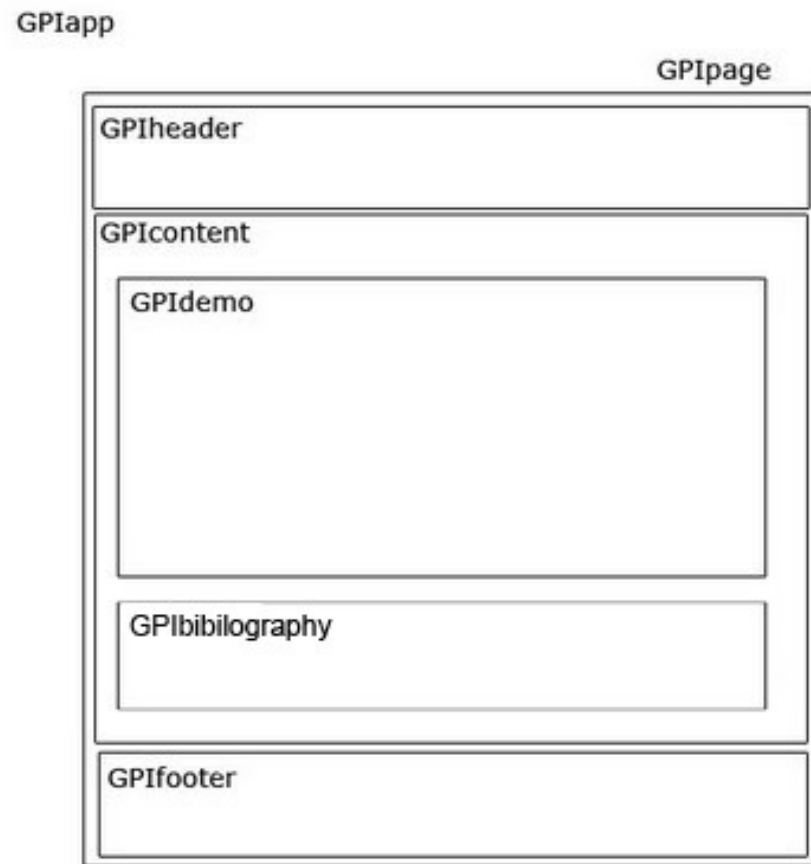
Algorithm Demonstrator

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut neque vitae enim venenatis gravida. Phasellus sollicitudin tortor eget est feugiat laoreet. Aenean eget est risus, vitae suscipit quam. Donec imperdiet blandit mauris, eget gravida nunc rhoncus et. Nulla vitae lacus turpis, sed vulputate quam. Quisque vitae interdum lacus. Etiam a massa non dui pharetra euismod. Duis in lorem ut enim interdum euismod. Integer elementum, mi vel iaculis pulvinar, lacus tellus sodales felis, a aliquet turpis lectus eu lacus. Duis mollis vulputate quam et rhoncus. Duis in elit arcu. Donec ornare auctor diam, id semper lorem dictum nec. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Nunc feugiat purus a erat suscipit fermentum. Duis lacinia, metus vitae volutpat iaculis, felis orci pretium risus, non sagittis ligula justo vel diam. Donec lobortis egestas risus sed fermentum.



This is just a trial footer. UPC Image and Video Processing Group. Copyright | XHTML | CSS | More things

# Interface classes: Architecture



# Wt basics vs HTML basics

HTML	Wt	Qt
<div>	WContainerWidget	QDesignerContainer Extension
<span>	WText	QTextEdit

# Interface classes: Hierarchy

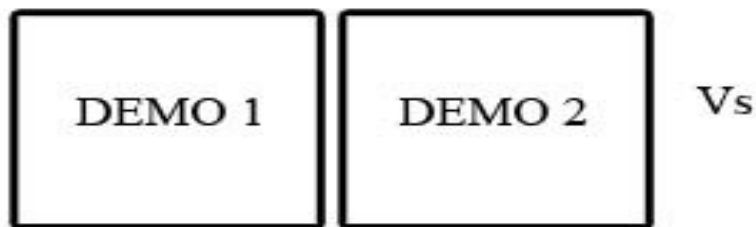


# One application, one demo

## One demo

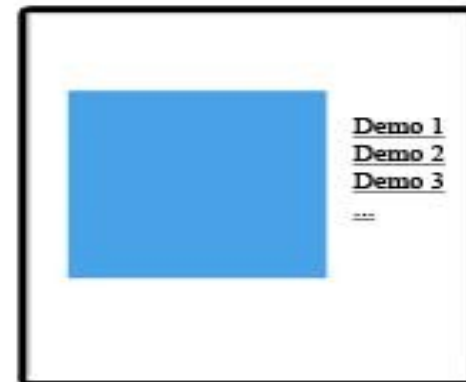
- Tries per user
- ImagePlus structure

📁 Imageplus  
    📁 Tools  
    📁 Web demos



## Multiple demos

- More comfortable for external users.



Easy to make with some hiperlinks!

# Desktop vs Web

Nowadays, with high connections, Internet is becoming more and more important.

- Applications on-line (cloud computing) **[Wt]**
  - The server does everything
    - Mobile devices
- Desktop applications. **[Qt]**

# Results

## Index

- Framework
  - Classes
  - Utilities
    - WebImage
    - WebBibliography
- Demo



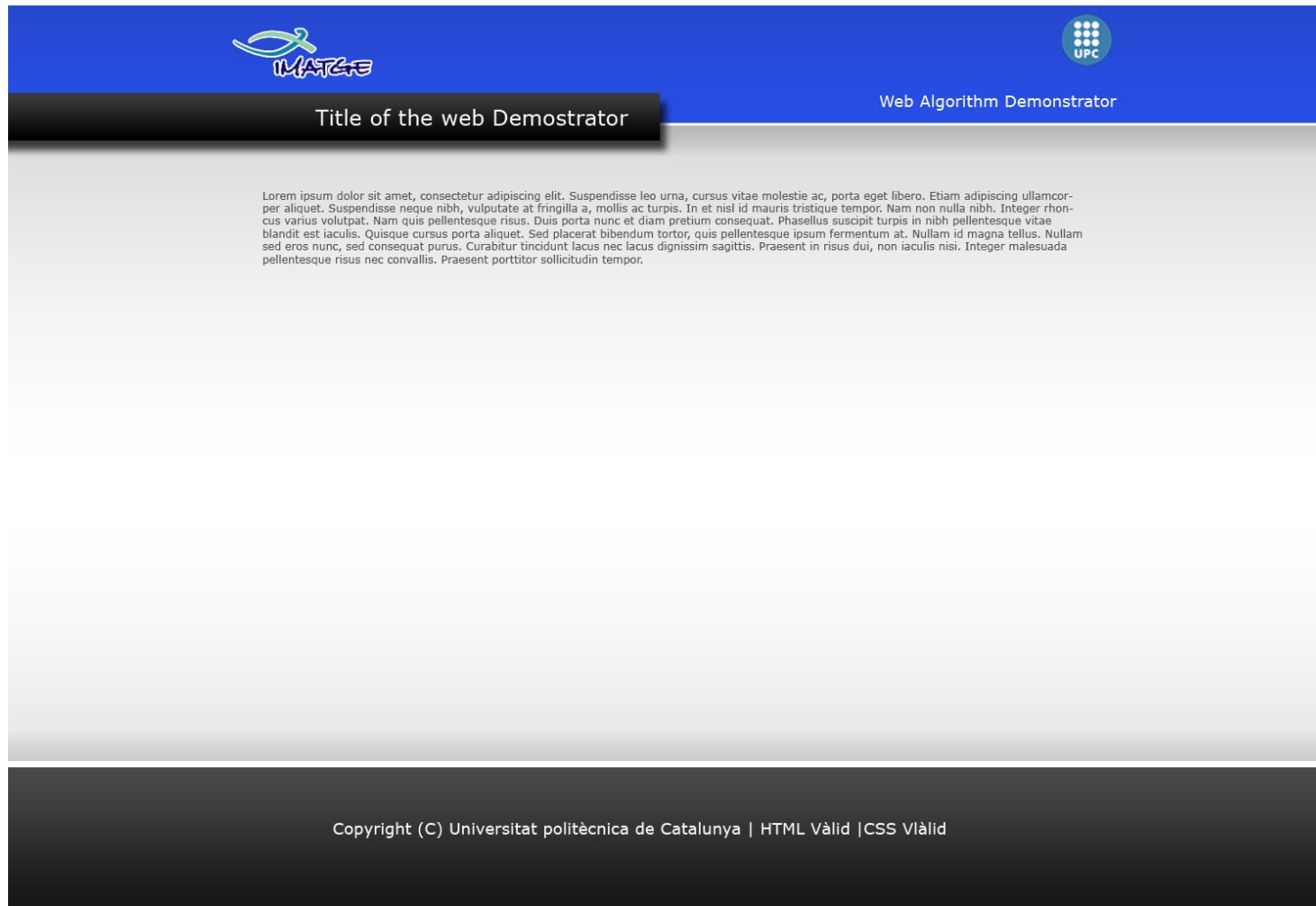
# Framework

- The main result of my project
- Inheriting from “GPIapp” you get a void interface.
- Title and description are also mandatory in each demo

```
class newapp : public GPIapp
{
};

//Constructor
newapp::newapp(const WEnvironment& env)
: GPIapp(env, "Title", "Description")
{
}
```

## Result of writting that little piece of code



# Utilities: WebImage

```
WebImage ima (&getDemo ()) ;  
ima.paintImage ( ImageRGB ) ;
```

# Utilities: WebBibliography

- New class to add a formatted bibliography

```
addBibliography("author","title","publication","url");
```

## References:

- [1] Salembier, P. , Garrido, L. - Univ. Politecnica de Catalunya, Barcelona, [Binary partition tree as an efficient representation for image processing, segmentation, and information retrieval](#), **Image Processing, IEEE**
- [2] Salembier, P. , Garrido, L. - Univ. Politecnica de Catalunya, Barcelona, [Binary partition tree as an efficient representation for image processing, segmentation, and information retrieval](#), **Image Processing, IEEE**
- [3] Salembier, P. , Garrido, L. - Univ. Politecnica de Catalunya, Barcelona, [Binary partition tree as an efficient representation for image processing, segmentation, and information retrieval](#), **Image Processing, IEEE**

# Demonstration



**This is just a little example of what could be done with Wt and the Web Framework created in this project.**

# Conclusions

## Index

- Requirements fulfilled
- Useful for the UPC image and video processing group
- Future project about video demonstrations

# Requirements fulfilled

Going back to the requirements we can see that all requirements are fulfilled.

- Global access
- One application, one demo
- No plug-ins in the client
- Easy for programmers
- Interactive demos
- Minimum web technology

Better results  
than expected!  
Everything is  
in C++!

# Useful for the UPC image and video processing group

There is something to show now!

Click here to go to the demonstration:

[Binary partition tree web demonstration](#)



# Video demonstrations

Wt works HTML 5 video tag

- Future project:

**GSTREAMER + WT + IMAGEPLUS**

# Questions?

All work done in a  
Debian – Linux based environment  
NX No-Machine  
Eclipse IDE  
Iceweasel & Google Chrome browsers