Interactive Image Processing demonstrations for the web

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Motivation

Context

UPC Image and Video Processing Group

ImagePlus
Software development platform
Motivation

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- 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

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- 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

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• 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
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.](image)

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

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• Possible scheme
• Looking for the right technology
• Final scheme of the application
• Web Interface
• Wt basics vs HTML basics
• One application, one demo
It really is a way, but it is not optimal, saving files in disc, and being dependent of ImagePlus tools.
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-Server Scheme
Final scheme of the application

ImagePlus

Web Framework & Web Utilities

Wt

HTML
Web Interface


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**  
- `<div>` → WContainerWidget  
- `<span>` → WText

**Qt**  
- QDesignerContainer Extension
- 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

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- 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

```cpp
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

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

References:
Demonstration

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

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- 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