BASIC/ADVANCED MULTIMEDIA IMAGING

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Visual Studio 2008 Version

A Basic Introduction to OpenCV

By Tobi Vaudrey

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Useful Links

MOST IMORTANT – Learning OpenCV Book!

Get your hands on a "Learning OpenCV" book. This book has a lot of info and hints/tips on programming with OpenCV. It explains some theory as well. http://oreilly.com/catalog/9780596516130/

Visual Studio and other Microsoft Products Free Download

Link: http://msdn.cs.auckland.ac.nz/

Recommended downloads:

- Visual Studio 2008
- MSDN (if you have a lot of space as it is available online)

IMPORTANT NOTE: Use the same version of Visual Studio when editing your programs! If you switch between Visual Studio 2005 and 2008, then you may get bugs and your code will not work. It can take a while to figure it out. You have been warned.

OpenCV (Open Computer Vision Library)

Link to download for Windows: http://sourceforge.net/projects/opencvlibrary/

Link to Official Website: http://www.intel.com/technology/computing/opency/index.htm

Link for "cheat sheet" and introduction to OpenCV: http://www.cs.iit.edu/~agam/cs512/lect-notes/opency-intro/opency-intro.html

Wiki for documentation on OpenCV: <u>http://opencvlibrary.sourceforge.net/</u>

OpenCV Reference Manual: http://www.cs.unc.edu/Research/stc/FAQs/OpenCV/OpenCVReferenceManual.pdf

OpenCV User Group: http://groups.yahoo.com/group/OpenCV/

Other Possibly Useful Links

IPP (Intel Performance Primatives):

http://www.intel.com/cd/software/products/asmo-na/eng/302910.htm

Only recommended for the people who are very keen. This is a library that will be used by OpenCV if it is installed. It is a library that optimises your processor for running Computer Vision mathematics. I.e. it will speed up your programs when you run them.

Getting OpenCV Working on your PC

First you need to get a copy of Visual Studio 2008. Secondly, you need to install OpenCV. (See page 1 for links.)

Now you are ready, but there are some minor things that need to be set up.

IMPORTANT NOTE:

where "C:\Program Files\OpenCV" is used in this setup, make sure that this is the location where OpenCV is installed.

For Computer Science Students:

On all Science Lab machines, OpenCV is installed **under the default path, i.e.** "C:\Program Files\OpenCV"

For Mechanical Engineering Students:

OpenCV is installed under the **MECHENG409 folder**, i.e. "S:\Mech\Courses\MechEng409\OpenCV"

Create New Project

- Within Developer Studio create new application:
- Select from menu "File"->"New..."->"Projects" tab.
- Choose "Visual C++" > "Win32" > "Console Application".

New Project			? ×
Project types:	Templates:	.NET Framework 3.5	▼ 000 0-0- 0-0- 0-0-
Reporting Test WCF Workflow Visual C# Visual C++ ATL CLR General MFC Smart Device Test Win32 Other Project Types Test Project Types	Visual Studio installed tem	plates 🔚 Win32 Project	
A project for creating a Win32 console a	pplication		
Name: <pre></pre>			
Location: H: (visual Studio 200	18 Projects	• •	prowse
Solution: Create new Solution		I Create directory for solution	
Solution Name: <enter_name></enter_name>			
		ОК	Cancel

- Type the project name and choose location
- Click OK..
- In the Application Wizard, click Next.

Win32 Application Wizard - Test		
Welcome	to the Win32 Application Wizard	
Overview Application 5ettings	These are the current project settings: • Console application Click Finish from any window to accept the current settings. After you create the project, see the project's readme.txt file for information about the project features and files that are generated. Previous Next > Finish Cancel	

- I recommend unchecking "Precompiled headers"
- Then click Finish.

Win32 Application Wizard - Te	st		? ×
C:_	tion Settings		
Overview Application Settings	Application type: C Windows application Console application C DLL C Static library Additional options: Empty project Export symbols Precompiled header	Add common header files for:	
	< Previous	Next > Finish Car	icel

- After the above steps done Developer Studio will create the project folder (by default it has the same name as the project), <project name>.vcproj file,
 Solution <project name>.sln and, Three Source files: <project name>.cpp,
 stdafx.cpp and stdafx.h. StdAfx files are precompiled header files, which I find cause more pain than they're worth.
- For example, consider that we have created a new "**Hello**" Project. Open the Hello.cpp file, and include the OpenCV-related #include directives:

```
#include <cv.h>
#include <cxcore.h>
#include <highgui.h>
```

- Note that these should be included *after* **stdafx.h** (if using pre-compiled headers) or you may get build errors.
- Now type some OpenCV code, and Build the Solution by pressing the F7 Key. There should be linker errors. E.g.

IplImage * src = cvLoadImage("picture.bmp",1);

- To resolve these, add dependency projects into workspace (following steps)
- Choose from menu: "Project" -> "Properties". (Or right click on your project in the left hand tree)
- Choose "Configuration Properties" -> "Linker" tab -> "Input" category -> "Additional Dependencies:"
- Add the paths for all necessary import libraries (cxcore.lib cv.lib highgui.lib cvaux.lib)

Test Property Pages		?	×
Configuration: Active(Debug)	Platform: Active(Win32)	Configuration Manager	
Configuration Properties General Debugging C/C++ General Optimization Preprocessor Code Generation Language Precompiled Headers Output Files Browse Information Advanced Command Line Linker General Input Manifest File Debugging System Optimization Embedded IDL Advanced Command Line	Additional Dependencies Ignore All Default Libraries Ignore Specific Library Module Definition File Add Module to Assembly Embed Managed Resource File Force Symbol References Delay Loaded DLLs Assembly Link Resource	cxcore.lib cv.lib highgui.lib cvaux.lib cvcam.lib	
		OK Cancel <u>Apply</u>	

OPTION 1: Customize Project Options

NOTE: If you do NOT do this, you will NEED to do OPTION 2.

PROS:

- Can copy the project and run from anywhere as long as the paths are the same.
- Perfect for the Lab PC's

CONS:

- Needs to be set up on every new project you create.
- Choose from menu: "Project" -> "Properties". (Or right click on your project in the left hand tree)
- Choose "Linker" tab -> "General" category -> "Additional Library Directories", Add the paths:

"C:\Program Files\OpenCV\lib"

Test Property Pages		? ×
Configuration: Active(Debug)	Platform: Active(Win32)	Configuration Manager
Configuration Properties General Debugging C/C++ General Optimization Preprocessor Code Generation Language Precompiled Headers Output Files Browse Information Advanced Command Line Linker General Input Manifest File Debugging System Optimization Embedded IDL Advanced Command Line	Output File Show Progress Version Enable Incremental Linking Suppress Startup Banner Ignore Import Library Register Output Per-user Redirection Additional Library Directories Link Library Dependencies Use Library Dependences Use UNICODE Response Files	\$(OutDir)\\$(ProjectName).exe Not Set Yes (/INCREMENTAL) Yes (/NOLOGO) No No No C: \Program Files \OpenCV\ib" Yes No Yes No Yes
		OK Cancel Apply

• Now, choose "C\C++" -> "General" -> "Additional Include Directories"

```
"C:\Program Files\OpenCV\cv\include"
"C:\Program Files\OpenCV\cxcore\include"
"C:\Program Files\OpenCV\otherlibs\highgui"
"C:\Program Files\OpenCV\cvaux\include"
```

Test Property Pages		<u>? ×</u>
Configuration: Active(Debug)	Platform: Active(Win32)	Configuration Manager
Configuration Properties	Additional Include Directories	"C:\Program Files\OpenCV\cxcore\include";"C:\P
General	Resolve #using References	
Debugging	Debug Information Format	Program Database for Edit & Continue (/ZI)
C/C++	Suppress Startup Banner	Yes (/nologo)
General	Warning Level	Level 3 (/W3)
Optimization	Detect 64-bit Portability Issues	No
Preprocessor	Treat Warnings As Errors	No
Code Generation	Use UNICODE Response Files	Yes
Language		
Precompiled Headers		
Output Files		
Browse Information		
Advanced		
Command Line		
Linker		
General		
Input		
Manifest File		
Debugging		
System		
Optimization		
Embedded IDL	Additional Include Directories	
Advanced	Specifies one or more directories to add t	o the include path: use semi-colon delimited list if more than one.
	(/I[path])	
		OK Canad Arabi

- Click OK to save your settings.
- That's it, you should be able to compile and run your code O

OPTION 2: Customize Global Options

NOTE: If you do NOT do this, you will NEED to do OPTION 1.

PROS:

- Every project that is set up will work straight away.
- Perfect for home PC's

CONS:

- Will not work very well on Lab PC's.
- Open the Visual C++ Application. In the menu bar, select **Tools->Options**
- In the listing, choose **Projects and Solutions -> VC++ Directories**.
- First, select Library files from the "Show Directories for" List Box.
- Click the **Insert New** icon, and locate the folder where you have installed opency.
- Consider that it is installed in "C:/Program Files/OpenCV".
- In the Library files list, locate and add:

"C:\Program Files\OpenCV\lib"

Options		<u>?</u> ×
Options Environment Projects and Solutions General Build and Run VB Defaults VC++ Directories VC++ Project Settings Source Control Text Editor Database Tools Debugging Device Tools HTML Designer Office Tools Test Tools Text Tomplating Windows Forms Designer Workflow Designer	Platform: Win32 C:\Program Files\OpenCV\lib \$(VCInstallDir)lib \$(VCInstallDir)atImfc\lib\\386 \$(WindowsSdkDir)\lib \$(VSInstallDir)atImfc\lib\\386 \$(WindowsSdkDir)\lib \$(VSInstallDir)lib \$(VSInstallDir) \$(VSInstallDir)lib Library Directories Path to use when searching for librar Corresponds to environment variable	? × Show directories for: Library files · · · · · · · · · · · · · · · · · · ·
		OK Cancel

• Now choose Include files in the list box, and locate and add the following directories:

```
"C:\Program Files\OpenCV\cv\include"
```

- "C:\Program Files\OpenCV\cxcore\include"
- "C:\Program Files\OpenCV\otherlibs\highgui"
- "C:\Program Files\OpenCV\cvaux\include"

Options		<u>? ×</u>
Options Environment Projects and Solutions General Build and Run VB Defaults VC++ Directories VC++ Project Settings Source Control Text Editor Database Tools	Platform: Win32 C:\Program Files\OpenCV\otherlibs\c C:\Program Files\OpenCV\cvaux\indu C:\Program Files\OpenCV\cverlibs\h C:\Program Files\OpenCV\ccore\indu C:\Program Files\OpenCV\ccvindude \$(VCInstallDir)include	? × Show directories for: Include files ✓ 🖄 × ♦ ♦ vcam\include ude ighgui ude"
Database Tools Debugging Device Tools HTML Designer Office Tools Test Tools Text Templating Windows Forms Designer Workflow Designer	\$(VCInstallDir)include \$(VCInstallDir)atImfc\include \$(WindowsSdKDir)\include \$(FrameworkSDKDir)include 4 Include Directories Path to use when searching for inclu Corresponds to environment variable	de files while building a VC++ project.

• Next, choose source files in the list box, and locate and add the following directories:

	"C:\Program Fi "C:\Program Fi "C:\Program Fi "C:\Program Fi	les\OpenCV\cv\ les\OpenCV\cxc les\OpenCV\cva les\OpenCV\cva	src" ore\src" ux\src" erlibs\highgui"	
C	Options			<u>? ×</u>
	Environment Projects and Solutions General Build and Run VB Defaults	Platform: Win32	Show director	ies for: ✓ 🖄 🗙 ♦ ♠
	VC++ Directories	C:\Program Files\Op	enCV\otherlibs\cvcam\src\windo enCV\otherlibs\highqui	WS 🔺

VC++ Directories VC++ Project Settings Source Control Text Editor Database Tools Debugging Device Tools	C:\Program Files\OpenCV\otherlibs\cvcam\src\windows C:\Program Files\OpenCV\otherlibs\highgui C:\Program Files\OpenCV\cvux\src C:\Program Files\OpenCV\cvcore\src C:\Program Files\OpenCV\cv\src \$(VCInstallDir)atlmfc\src\nfc \$(VCInstallDir)atlmfc\src\nfcm \$(VCInstallDir)atlmfc\src\atl \$(VCInstallDir)atlmfc\src\atl \$(VCInstallDir)atlmfc\src
HTML Designer Office Tools Test Tools Text Templating Windows Forms Designer Workflow Designer	Source Directories Path to use when searching for source files to use for Intellisense.
	OK Cancel

- Now click **OK** in the Options dialog.
- You have successfully configured the global settings.
- That's it, you should be able to compile and run your code 😊

Final notes

If you have any issues, double check the steps above.

Also look at the other resources available on the net.

Common Problems

Missing DLL's

You may get the following error message if the PATH has not been set for OpenCV.

MedFilte	MedFilterOpticalFlowDemo.exe - Unable To Locate Component		
8	This application has failed to start because cxcore100.dll was not found. Re-installing the application may fix this problem.		

To fix this there are some different options:

- 1. If you do not have admin rights to the computer, or you are using a "hotseat" computer, i.e. you can use multiple computers but log into your profile. Then the best solution is to copy and paste the required *.DLL files from ..\OpenCV\bin to your ..\<MSVisProj>\ folder (i.e., where your project files are).
- 2. If you have admin rights on the computer, then you can also update your PATH directory: to change your PATH settings, right-click 'My Computer', click 'Properties' and look at the 'Advanced' tab. There you will see a button marked 'Environment Variables' click it. In the window that then appears, look for the PATH option in the lower list of the two presented. Add "...\OpenCV\bin\" as the last entry in PATH, usually separated using a semicolon (;).
- 3. If 2 does not work, then simply copy all the *.DLL files from ..\OpenCV\bin to C:\WINDOWS\system32. Or follow the option 1 above.