

CVL

A computer vision library
version 0.2.0, August 31, 2007

Martin Lambers (marlam@marlam.de)

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1 Using CVL

The usage of CVL is best demonstrated with a small example program.

```
#include <stdio.h>

#include <cvl/cvl.h>

int main(void)
{
    cvl_gl_context_t *gl_context;
    cvl_frame_t *input_frame, *output_frame;

    /* Create a GL context on display ":0" and activate it. */
    gl_context = cvl_gl_context_new(":0");
    if (!gl_context)
    {
        fprintf(stderr, "Cannot create GL context.\n");
        return 1;
    }

    /* Initialize CVL. */
    cvl_init();

    /* Read frame, process it, and write it. */
    cvl_read_pnm(stdin, &input_frame);
    output_frame = cvl_frame_new_tpl(input_frame);
    cvl_gauss(output_frame, input_frame, 1, 1, 1.0f, 1.0f);
    cvl_frame_free(input_frame);
    cvl_write_pnm(stdout, output_frame);
    cvl_frame_free(output_frame);

    /* Check for errors in one of the cvl_*() functions. */
    if (cvl_error())
    {
        fprintf(stderr, "CVL error message: %s\n", cvl_error_msg());
        cvl_deinit();
        cvl_gl_context_free(gl_context);
        return 1;
    }

    /* Cleanup. */
    cvl_deinit();
    cvl_gl_context_free(gl_context);

    return 0;
}
```

This example reads a NetPBM image from standard input, applies a 3x3 Gauss filter to it, and writes the result to standard output.

It can be compiled and linked with the following command:

```
gcc -o cvl_example cvl_example.c -lcvl
```

If you want to use Autoconf, use the following `configure.ac` snippet to test for CVL:

```
AC_LIB_HAVE_LINKFLAGS([cvl], [],  
    [#include <cvl/cvl.h>  
    #if CVL_VERSION_MAJOR < 0 || CVL_VERSION_MINOR < 2 || CVL_VERSION_PATCH < 0  
    CVL version too old  
    #endif],  
    [cvl_init();])  
if test "$HAVE_LIBCVL" != "yes"; then  
    AC_MSG_ERROR([could not find CVL >= 0.2.0])  
fi
```

Then link your application with CVL by adding `$(LIBCVL)` to the appropriate line in the application's `Makefile.am`.

The `AC_LIB_HAVE_LINKFLAGS` macro automatically adds an `--with-libcvl-prefix` option to the configure script, handles library dependencies automatically and works fine with cross compilers. It comes as part of GNU gettext.

2 Concepts and overview

CVL aims to be a simple to use, general purpose library that is useful in the context of computer vision. Its features include

- Support for NetPBM (pbm, pgm, ppm, pnm, pam) and PFS files.
- Support for images with up to four channels consisting of integer (`uint8_t`) or floating point (`float`) data.
- Support for the color formats luminance, XYZ, HSL, RGB and for arbitrary data formats.
- Support for various standard filters, image blending and layering, and geometric transformations.
- Support for high dynamic range (HDR) image handling, e.g. tone mapping.

Some of the concepts of CVL can already be seen in the example program from the previous section:

- CVL stores images (or possibly arbitrary data) in frames (`cvl_frame_t`).
- CVL filter functions like `cvl_gauss()` write into existing frames. Frames can be created by reading them, by using other frames as templates, or by giving all parameters explicitly.
- CVL needs an active GL context. This does not need to be created by `cvl_gl_context_new()`. Any GL context can be used, but CVL expects that it can use this context exclusively. If you want to mix CVL and GL calls (for example to render CVL frames), use `cvl_gl_state_save()`, then setup the GL context and use it as you like, and call `cvl_gl_state_restore()` when you're done. Afterwards, continue to use the context for CVL.
- After `cvl_init()` was called, CVL uses an error state to return information about errors. This state can be queried with the `cvl_error()` function. If a CVL function is called while an error state is set, the function will do nothing and return immediately. This way, it is possible to defer error checking until after a group of CVL function calls. The error state can be reset with `cvl_error_reset()`.

3 API reference

The API reference is provided in HTML format in the separate directory `cv1-reference`.

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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Programs

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To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the “copyright” line and a pointer to where the full notice is found.

```
one line to give the program's name and a brief idea of what it does.
Copyright (C) yyyy  name of author
```

```
This program is free software; you can redistribute it and/or modify
it under the terms of the GNU General Public License as published by
the Free Software Foundation; either version 2 of the License, or
(at your option) any later version.
```

```
This program is distributed in the hope that it will be useful,
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MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
GNU General Public License for more details.
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You should have received a copy of the GNU General Public License
along with this program; if not, write to the Free Software
Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.
```

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type 'show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type 'show c' for details.
```

The hypothetical commands ‘show w’ and ‘show c’ should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than ‘show w’ and ‘show c’; they could even be mouse-clicks or menu items—whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a “copyright disclaimer” for the program, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
‘Gnomovision’ (which makes passes at compilers) written by James Hacker.
```

```
signature of Ty Coon, 1 April 1989
Ty Coon, President of Vice
```

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