

CVL

A computer vision library
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Table of Contents

1	Using CVL	1
2	Concepts and overview	3
3	API reference	4
Appendix A	Copying Information	5
	GNU Free Documentation License	5
	GNU GPL	11
	Additional information	20

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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