HLS SOBEL (BORDES)

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Enlace a GitHub

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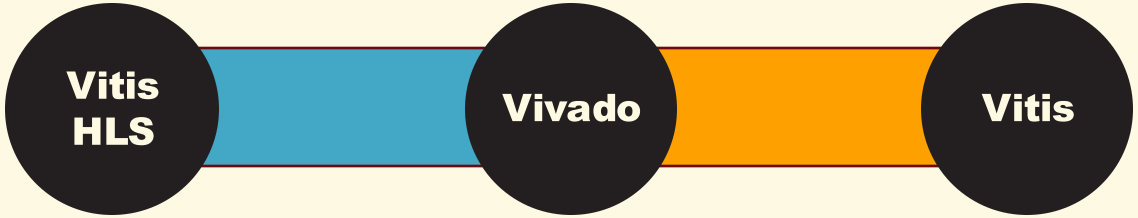
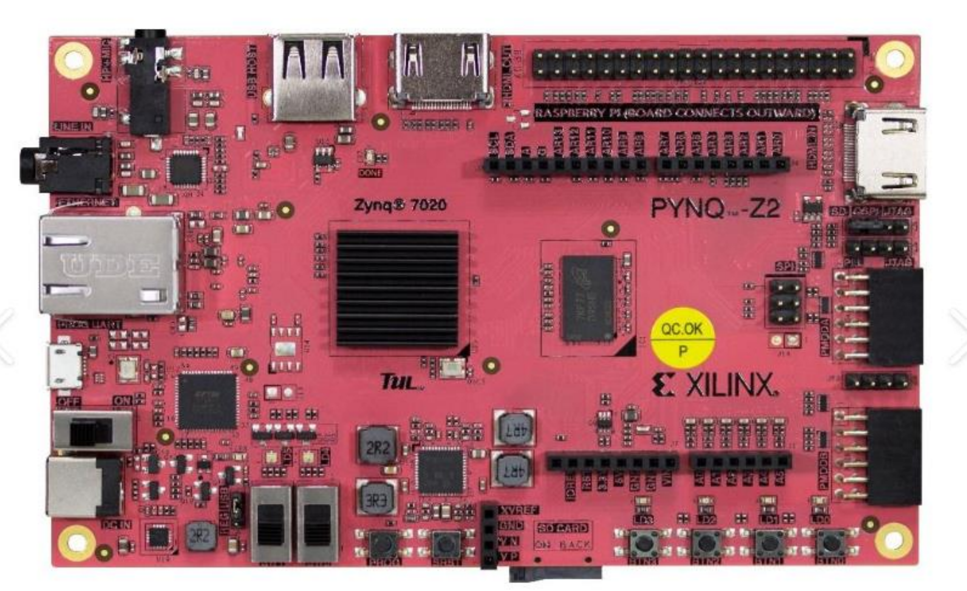
Detección de bordes (Sobel)
FPGA Pynq-Z2



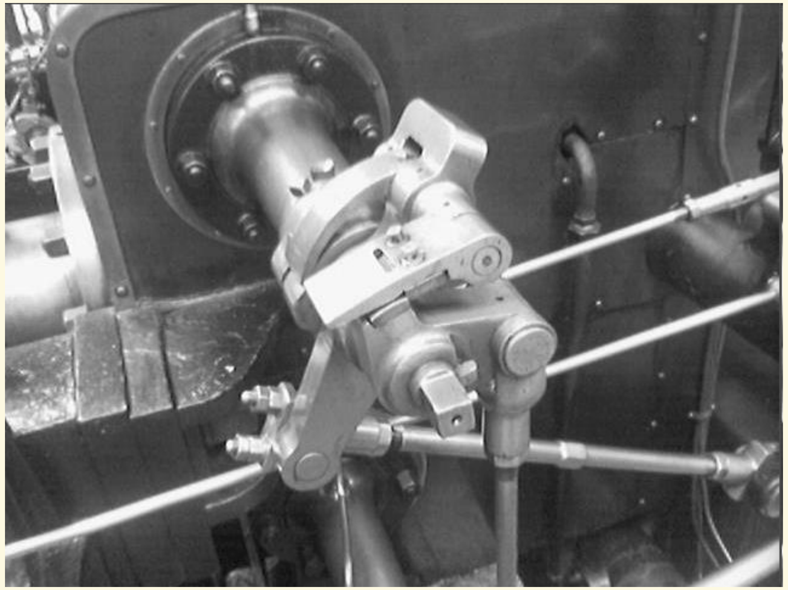
Vitis HLS

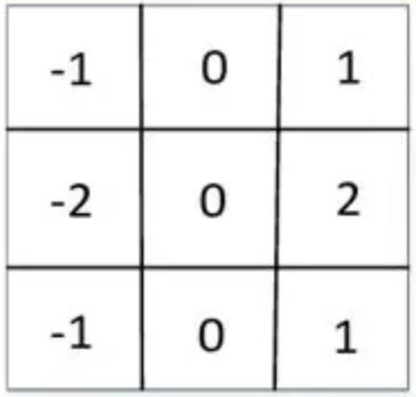
Vivado

Vitis



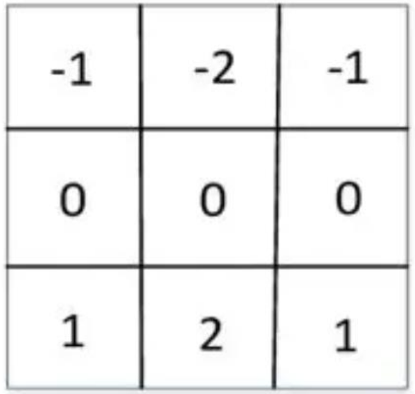
4 Filtro Sobel





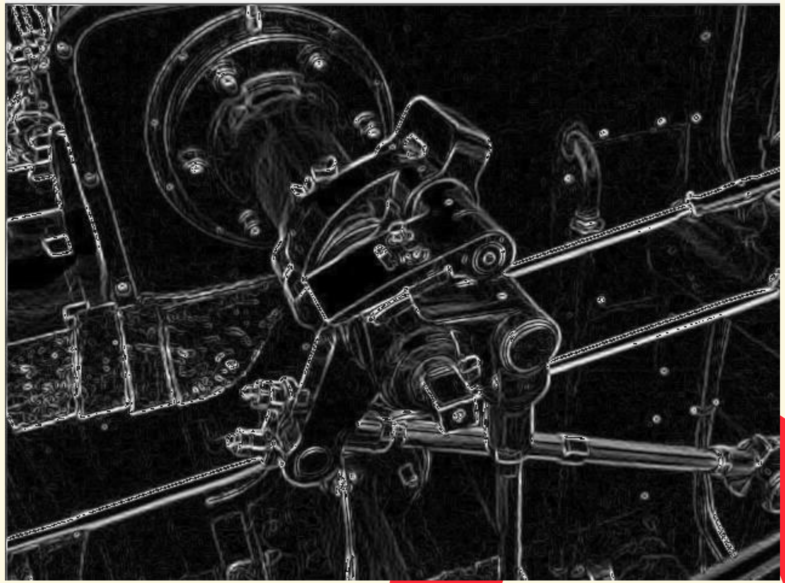
-1	0	1
-2	0	2
-1	0	1

(a) Sobel filter in direction x

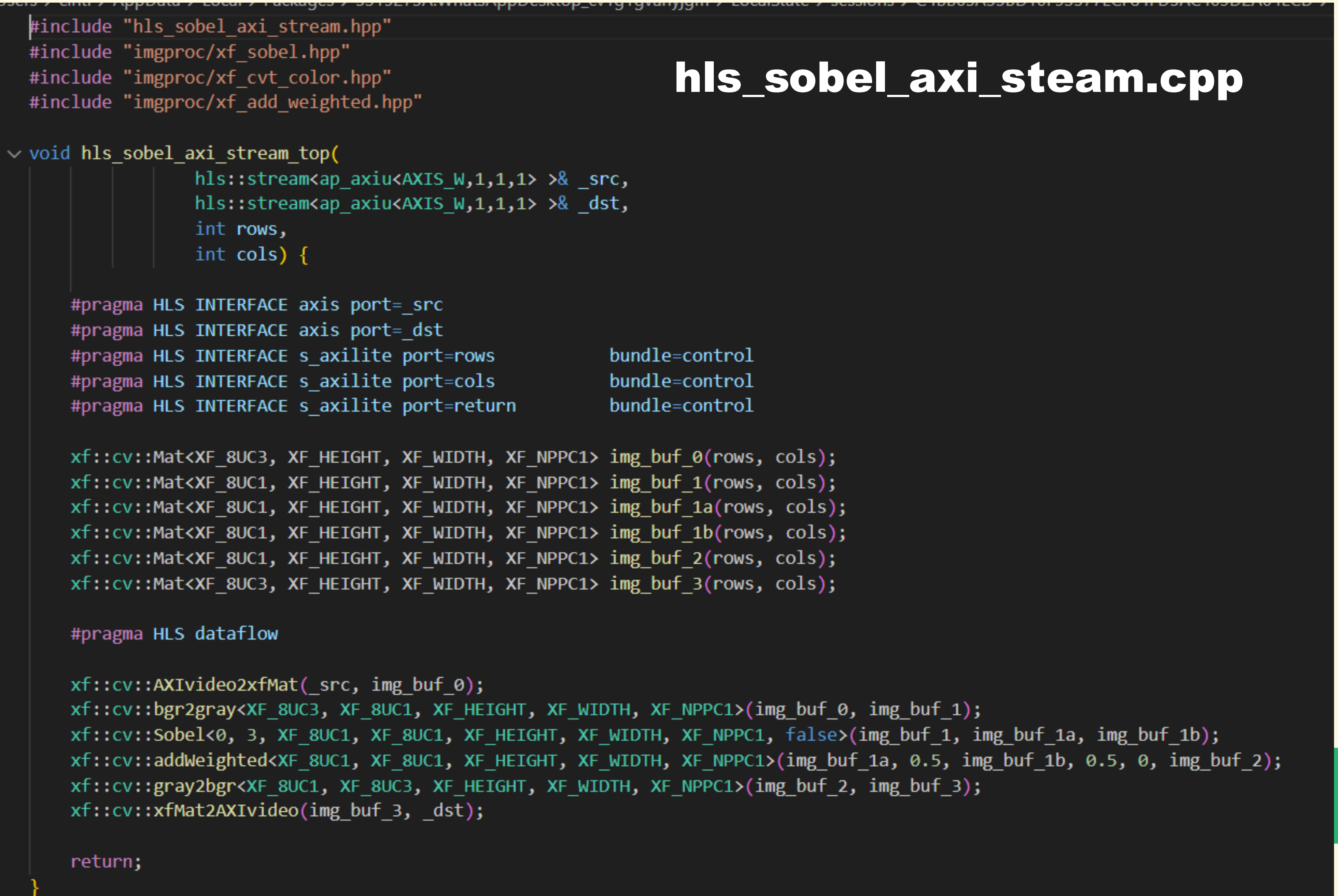


-1	-2	-1
0	0	0
1	2	1

(b) Sobel filter in direction y

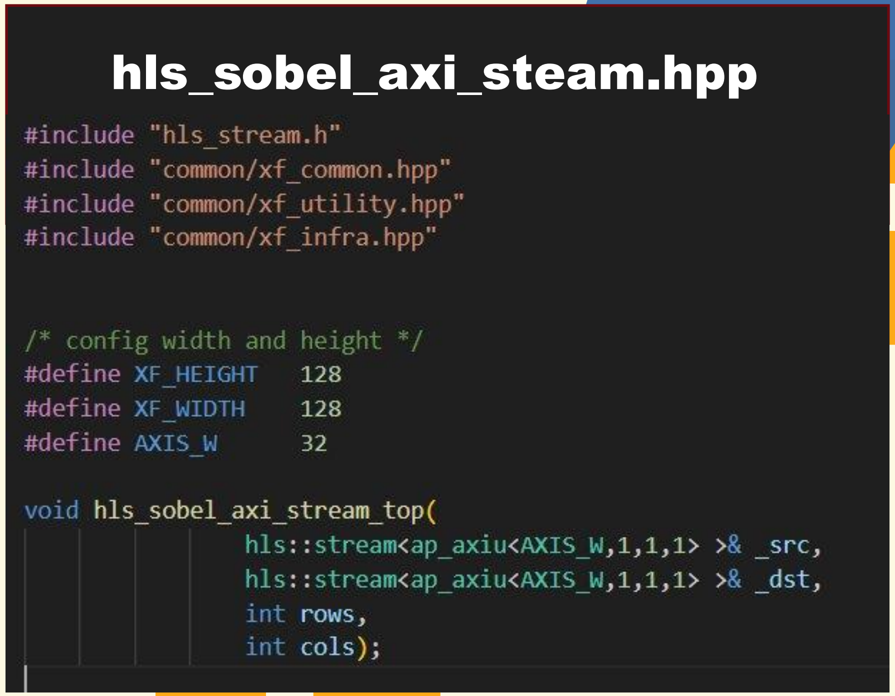


5 Implementación en Vitis HLS



hls_sobel_axi_steam.cpp

```cpp
#include "hls_sobel_axi_stream.hpp"
#include "imgproc/xf_sobel.hpp"
#include "imgproc/xf_cvt_color.hpp"
#include "imgproc/xf_add_weighted.hpp"

void hls_sobel_axi_stream_top(
                hls::stream<ap_axiu<AXIS_W,1,1,1> >& _src,
                hls::stream<ap_axiu<AXIS_W,1,1,1> >& _dst,
                int rows,
                int cols) {

    #pragma HLS INTERFACE axis port=_src
    #pragma HLS INTERFACE axis port=_dst
    #pragma HLS INTERFACE s_axilite port=rows           bundle=control
    #pragma HLS INTERFACE s_axilite port=cols           bundle=control
    #pragma HLS INTERFACE s_axilite port=return         bundle=control

    xf::cv::Mat<XF_8UC3, XF_HEIGHT, XF_WIDTH, XF_NPPC1> img_buf_0(rows, cols);
    xf::cv::Mat<XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1> img_buf_1(rows, cols);
    xf::cv::Mat<XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1> img_buf_1a(rows, cols);
    xf::cv::Mat<XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1> img_buf_1b(rows, cols);
    xf::cv::Mat<XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1> img_buf_2(rows, cols);
    xf::cv::Mat<XF_8UC3, XF_HEIGHT, XF_WIDTH, XF_NPPC1> img_buf_3(rows, cols);

    #pragma HLS dataflow

    xf::cv::AXIvideo2xfMat(_src, img_buf_0);
    xf::cv::bgr2gray<XF_8UC3, XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1>(img_buf_0, img_buf_1);
    xf::cv::Sobel<0, 3, XF_8UC1, XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1, false>(img_buf_1, img_buf_1a, img_buf_1b);
    xf::cv::addWeighted<XF_8UC1, XF_8UC1, XF_HEIGHT, XF_WIDTH, XF_NPPC1>(img_buf_1a, 0.5, img_buf_1b, 0.5, 0, img_buf_2);
    xf::cv::gray2bgr<XF_8UC1, XF_8UC3, XF_HEIGHT, XF_WIDTH, XF_NPPC1>(img_buf_2, img_buf_3);
    xf::cv::xfMat2AXIvideo(img_buf_3, _dst);

    return;
}
```

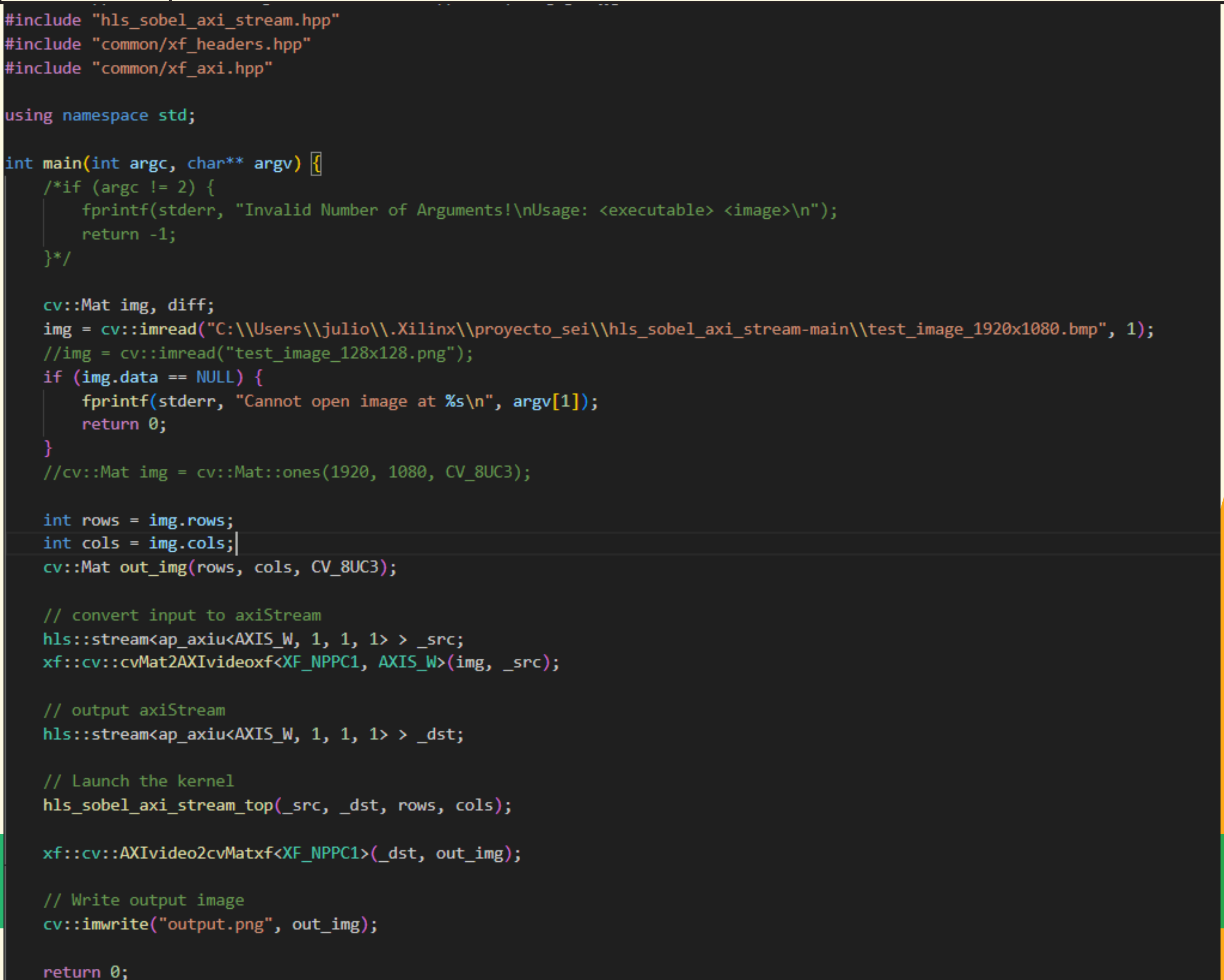


hls_sobel_axi_steam.hpp

```cpp
#include "hls_stream.h"
#include "common/xf_common.hpp"
#include "common/xf_utility.hpp"
#include "common/xf_infra.hpp"


/* config width and height */
#define XF_HEIGHT   128
#define XF_WIDTH    128
#define AXIS_W      32

void hls_sobel_axi_stream_top(
                hls::stream<ap_axiu<AXIS_W,1,1,1> >& _src,
                hls::stream<ap_axiu<AXIS_W,1,1,1> >& _dst,
                int rows,
                int cols);
```

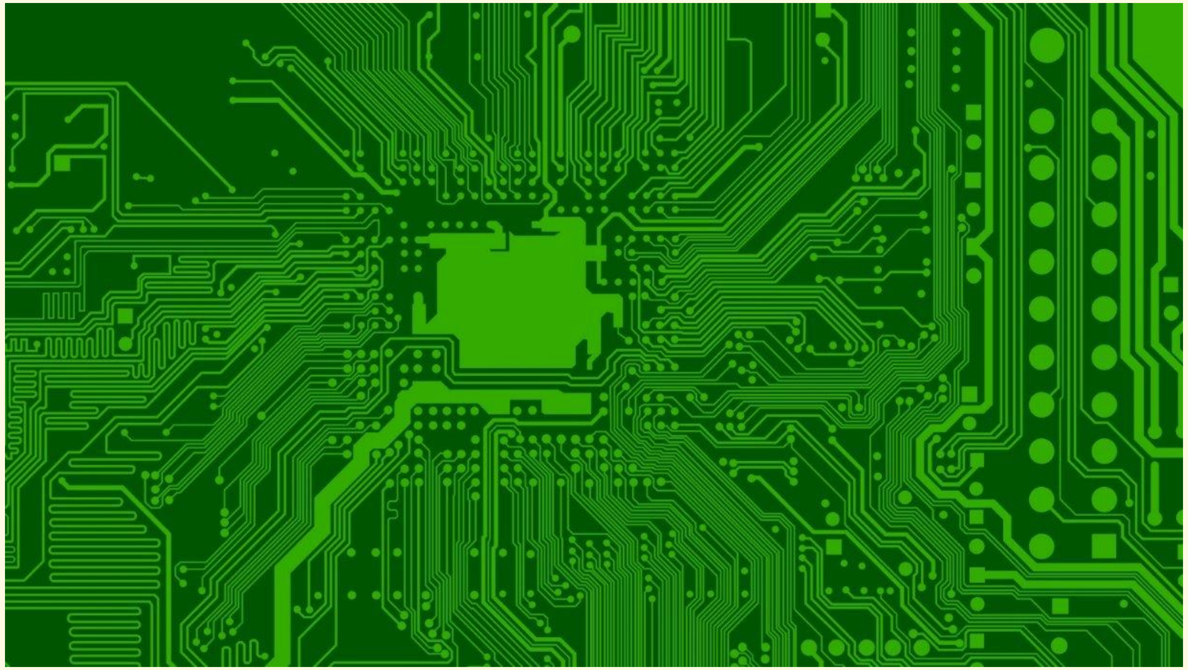
hls_sobel_axi_steam_tb.cpp

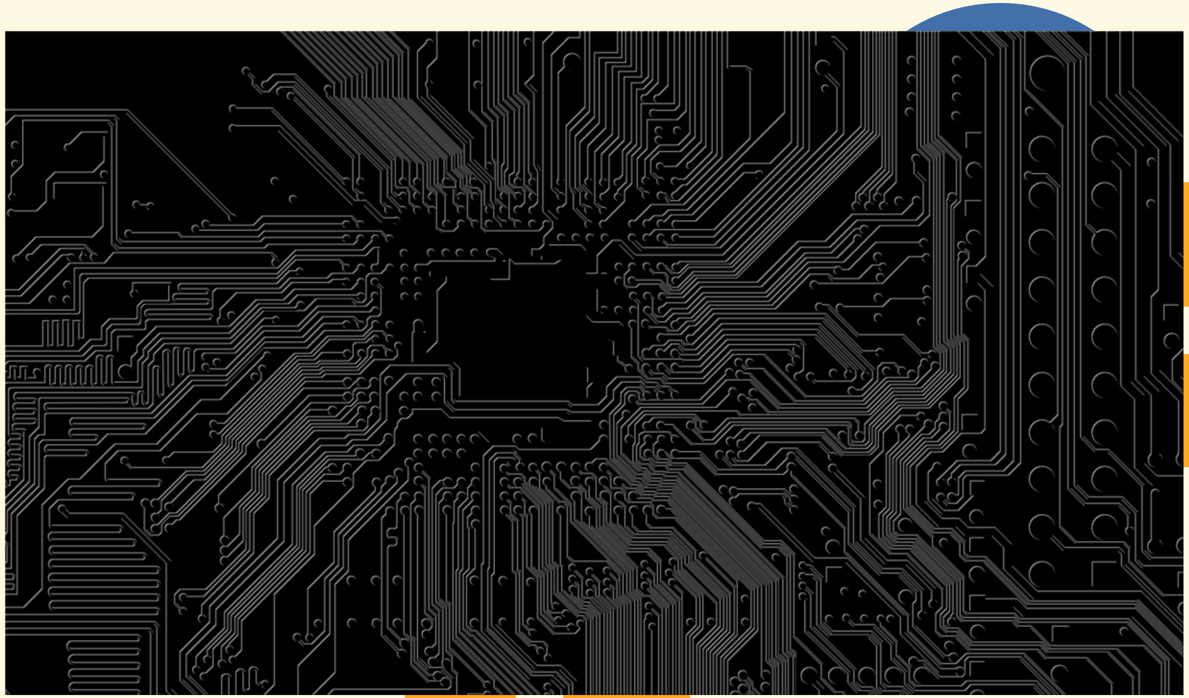
6 Implementación en Vitis HLS



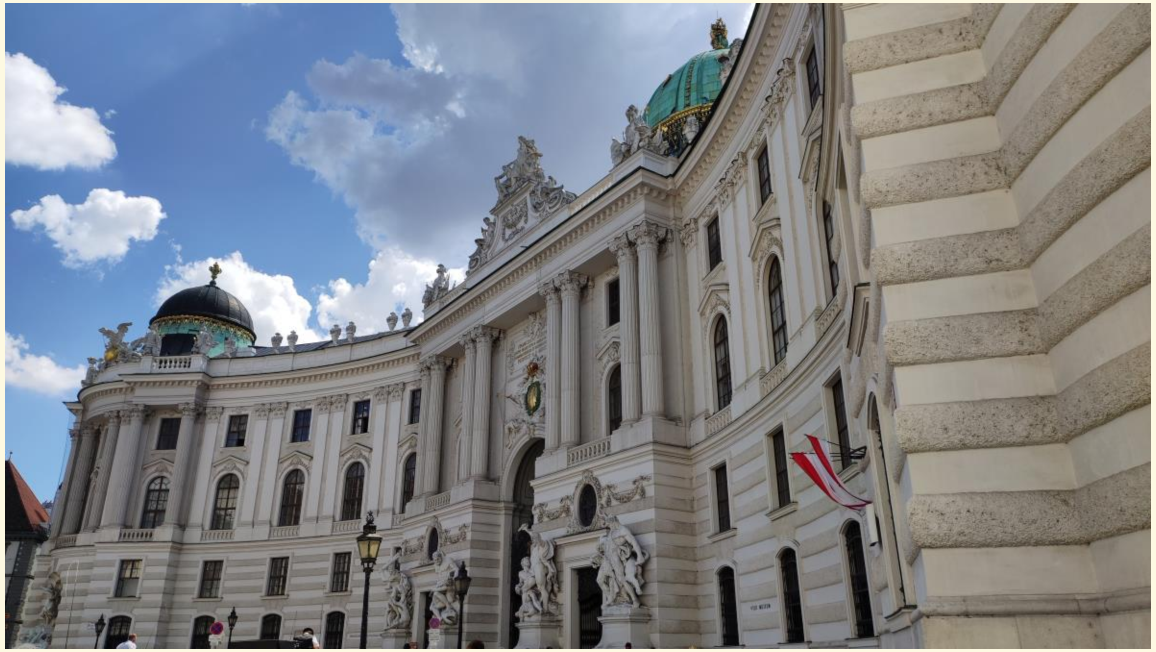
```cpp
#include "hls_sobel_axi_stream.hpp"
#include "common/xf_headers.hpp"
#include "common/xf_axi.hpp"

using namespace std;

int main(int argc, char** argv) {
    /*if (argc != 2) {
        fprintf(stderr, "Invalid Number of Arguments!\nUsage: <executable> <image>\n");
        return -1;
    }*/

    cv::Mat img, diff;
    img = cv::imread("C:\\Users\\julio\\.Xilinx\\proyecto_sei\\hls_sobel_axi_stream-main\\test_image_1920x1080.bmp", 1);
    //img = cv::imread("test_image_128x128.png");
    if (img.data == NULL) {
        fprintf(stderr, "Cannot open image at %s\n", argv[1]);
        return 0;
    }
    //cv::Mat img = cv::Mat::ones(1920, 1080, CV_8UC3);

    int rows = img.rows;
    int cols = img.cols;
    cv::Mat out_img(rows, cols, CV_8UC3);

    // convert input to axiStream
    hls::stream<ap_axiu<AXIS_W, 1, 1, 1> > _src;
    xf::cv::cvMat2AXIvideoxf<XF_NPPC1, AXIS_W>(img, _src);

    // output axiStream
    hls::stream<ap_axiu<AXIS_W, 1, 1, 1> > _dst;

    // Launch the kernel
    hls_sobel_axi_stream_top(_src, _dst, rows, cols);

    xf::cv::AXIvideo2cvMatxf<XF_NPPC1>(_dst, out_img);

    // Write output image
    cv::imwrite("output.png", out_img);

    return 0;
```

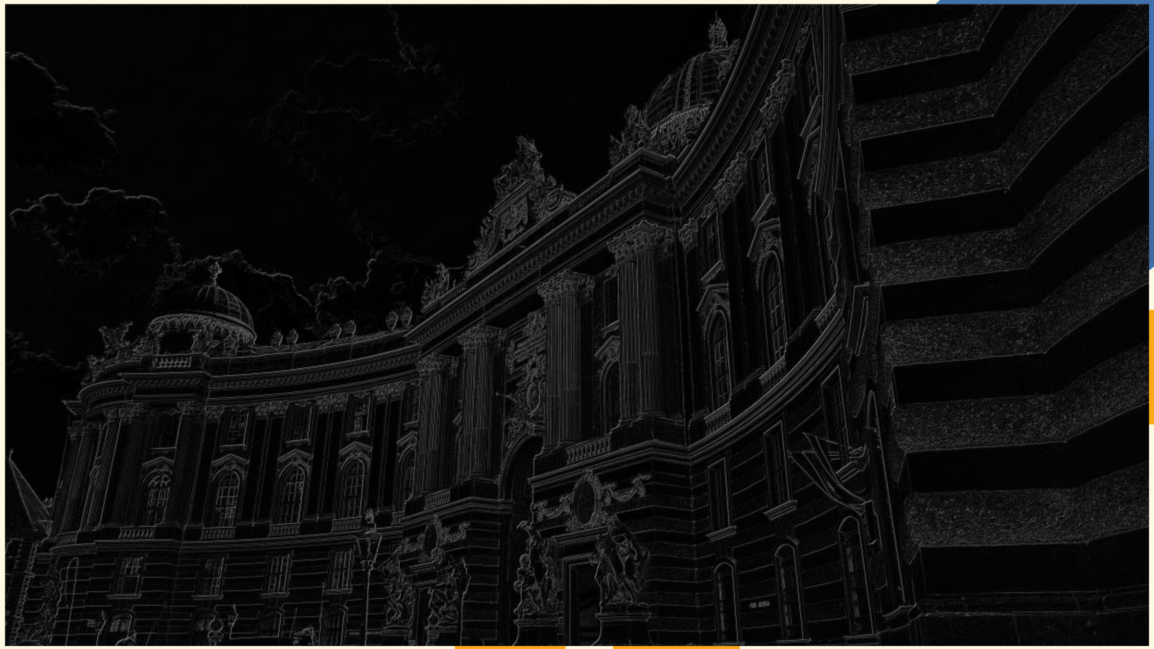
7 Implementación en Vitis HLS



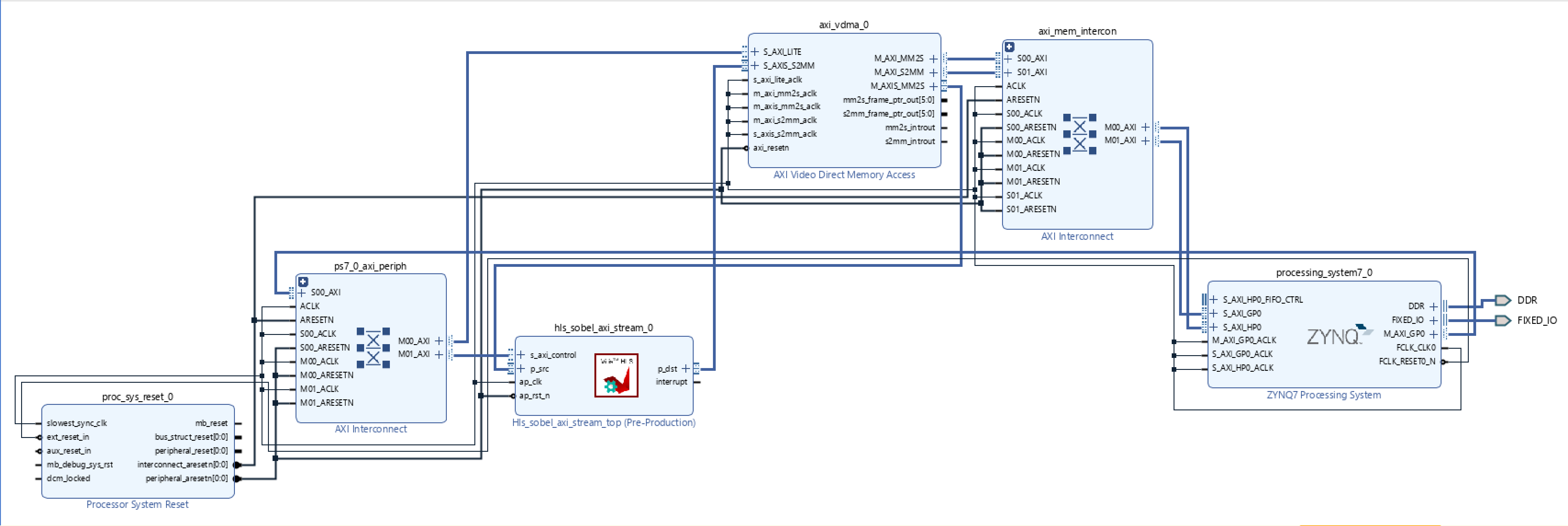


8 Implementación en Vitis HLS

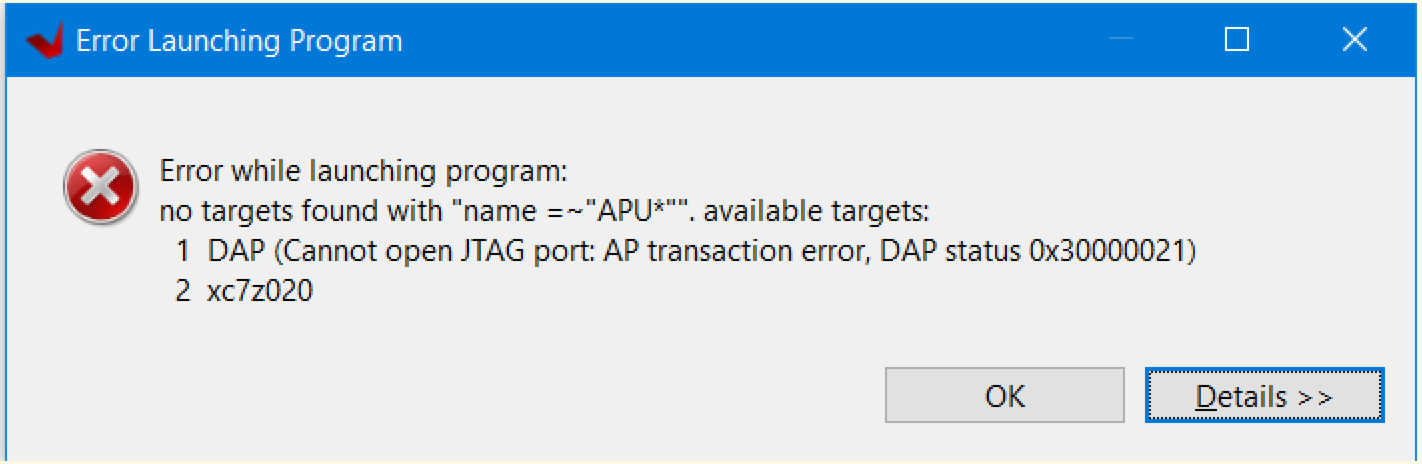




9 Integración en Vivado



10 Aplicación en Vitis



Error Launching Program

```
Error while launching program:
no targets found with "name =~"APU*"". available targets:
  1  DAP (Cannot open JTAG port: AP transaction error, DAP status 0x30000021)
  2  xc7z020
```

Gracias