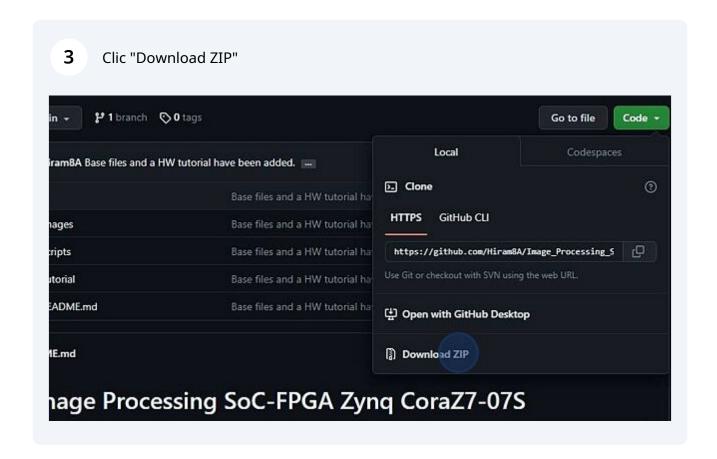
Procesamiento de Imágenes en SoC-FPGA con el uso de Zynq (Cora Z7-07S) [SW]

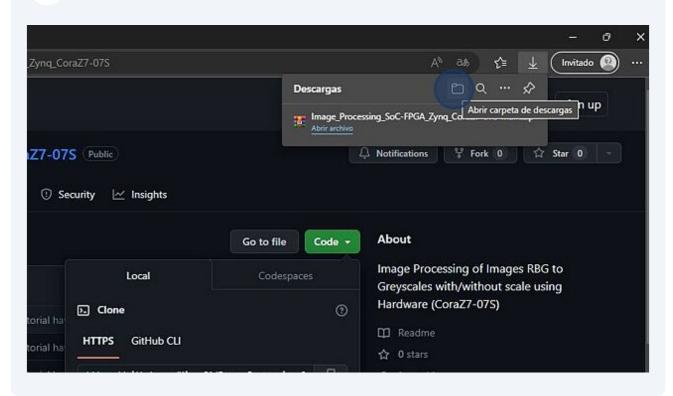


Click "Barra de direcciones y búsqueda y pegar la siguiente URL:" 1 github.com/Hiram8A/Image Processing SoC-FPGA Zy... m/Hiram8A/Image_Processing_SoC-FPGA_Zynq_CoraZ7-07S Open Source Y Pricing essing_SoC-FPGA_Zynq_CoraZ7-07S Public A Notifications About O tags Go to file Code + Image Processin a HW tutorial have been added. 3a2ef1c 6 minutes ago 3 2 commits Greyscales with Hardware (Cora. ☐ Readme Base files and a HW tutorial have been added. 6 minutes ago ☆ 0 stars

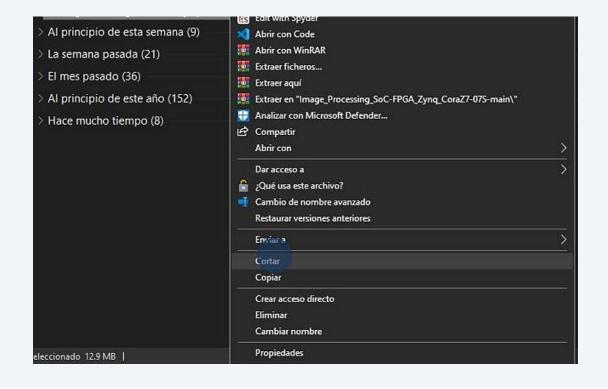
2 Clic "Code" Dpen Source 🗸 Pricing ¥ Fork SoC-FPGA_Zynq_CoraZ7-07S Public △ Notifications Go to file Cocle About Image Processing of Im Greyscales with/withou utorial have been added. 3e2ef1c 6 minutes ago 3 2 commits Hardware (CoraZ7-07S Base files and a HW tutorial have been added. Readme Base files and a HW tutorial have been added. 6 minutes ago ☆ 0 stars Base files and a HW tutorial have been added. 6 minutes ago 1 watching ♥ 0 forks Base files and a HW tutorial have been added. 6 minutes ago



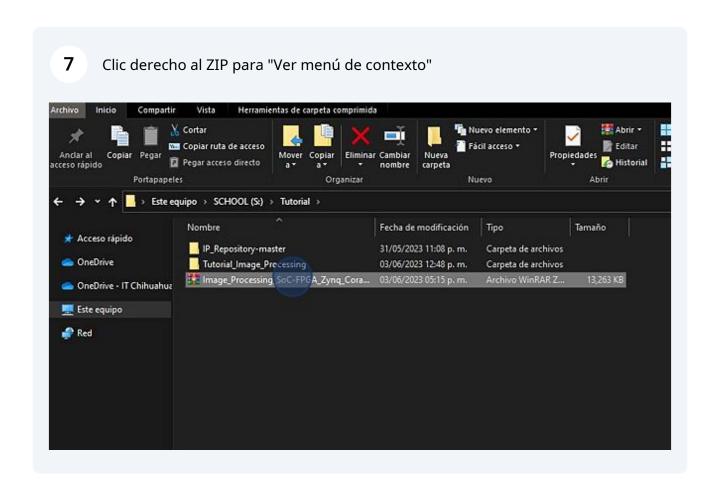
4 Clic "Abrir carpeta de descargas"



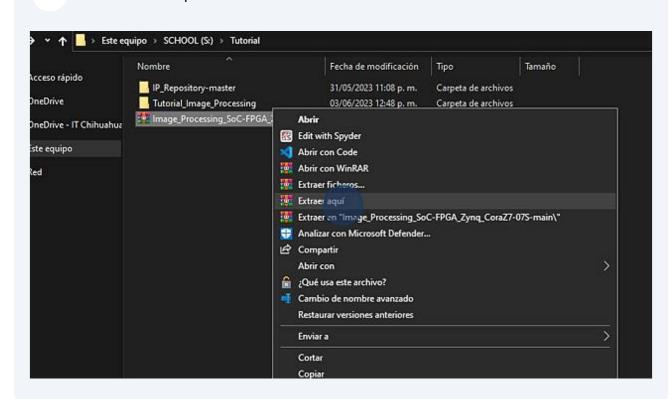
5 Clic derecho "Cortar" y buscamos nuestro directorio de trabajo



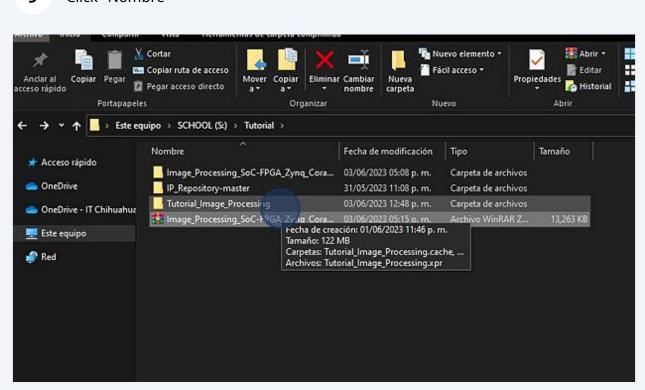
6 Clic derecho "Pegar" OneDrive - IT Chihuahua 💆 Este equipo Red Ver Ordenar por Agrupar por Actualizar Personalizar esta carpeta... Deshacer Eliminar Ctrl+Z Open with GitKraken Git GUI Here Git Bash Here Cambio de nombre avanzado Dar acceso a Nuevo Propiedades elementos |



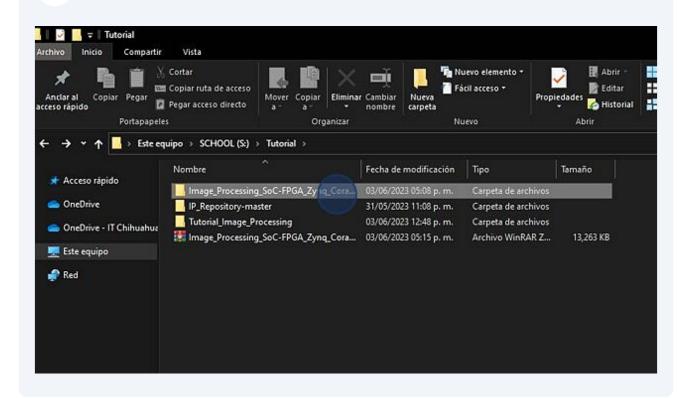
8 Clic "Extraer aquí"



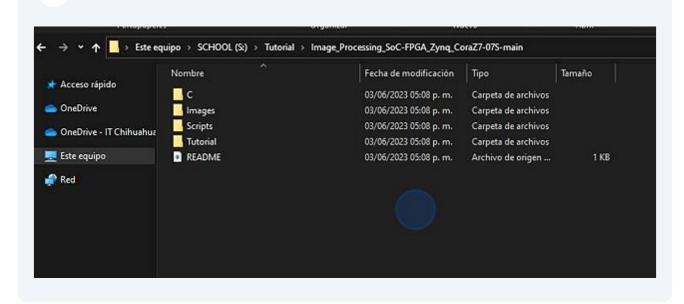
9 Click "Nombre"



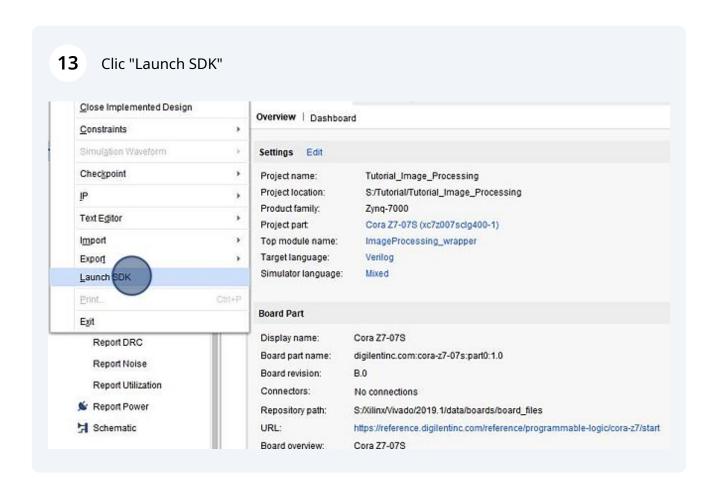
10 Doble clic para entrar a la carpeta extraída

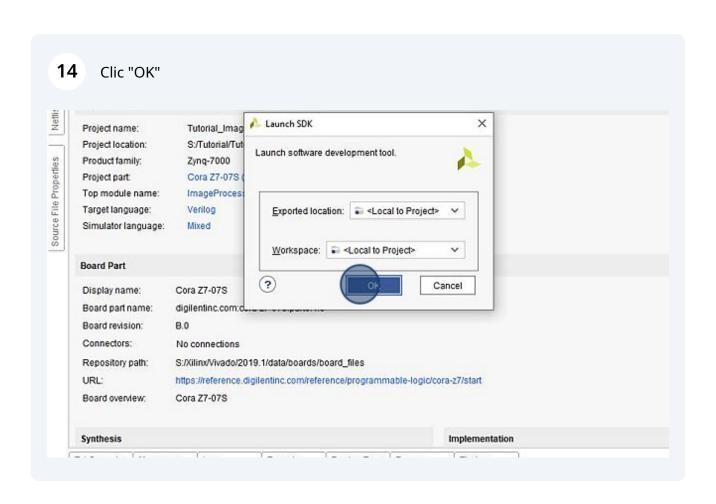


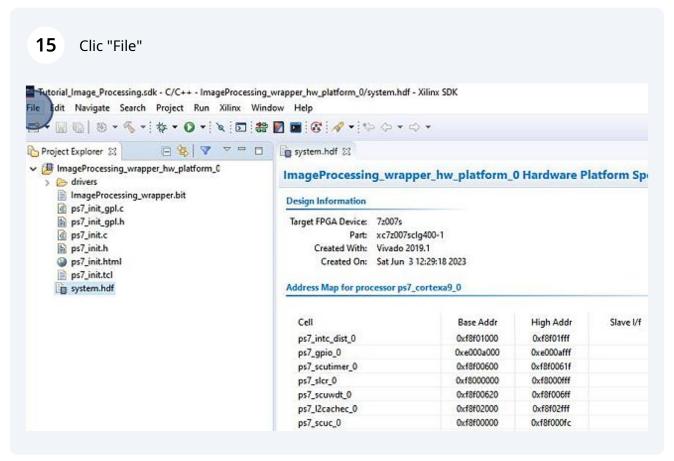
11 Más adelante utilizaremos estos recursos

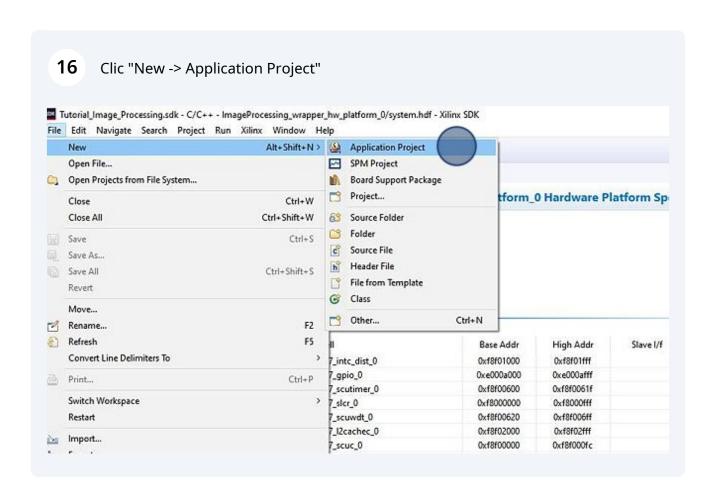


12 Volvemos a nuestro proyecto de Vivado y damos clic en "File" Tutorial_Image_Processing - [S:/Tutorial/Tutorial_Image_Processing/Tutorial_Image_Processing.xpr] - Vivado 2019.1 Q- Quick Access Reports Window Layout View Help Flow Tools **∞** ▶ # # **0** Σ 胎 . IMPLEMENTED DESIGN - xc7z007sclg400-1 Run Synthesis **Project Summary** x Device x Sources > Open Synthesized Design Overview | Dashboard IMPLEMENTATION Settings Edit Nettist Run Implementation Project name: Tutorial_Image_Processing → Open Implemented Design Project location: S:/Tutorial/Tutorial_Image_Processing Source File Properties Product family: Zynq-7000 Constraints Wizard Project part Cora Z7-07S (xc7z007sclg400-1) **Edit Timing Constraints** ImageProcessing_wrapper Top module name: Teport Timing Summary Target language: Verilog Simulator language: Mixed Report Clock Networks Report Clock Interaction **Board Part** Report Methodology Display name: Cora 77-078

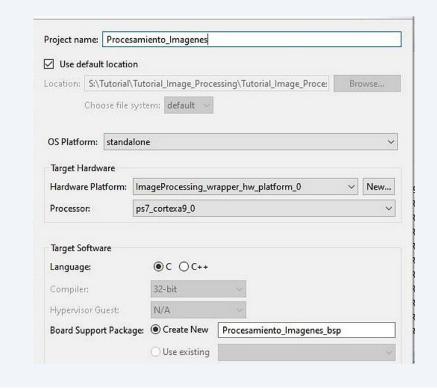




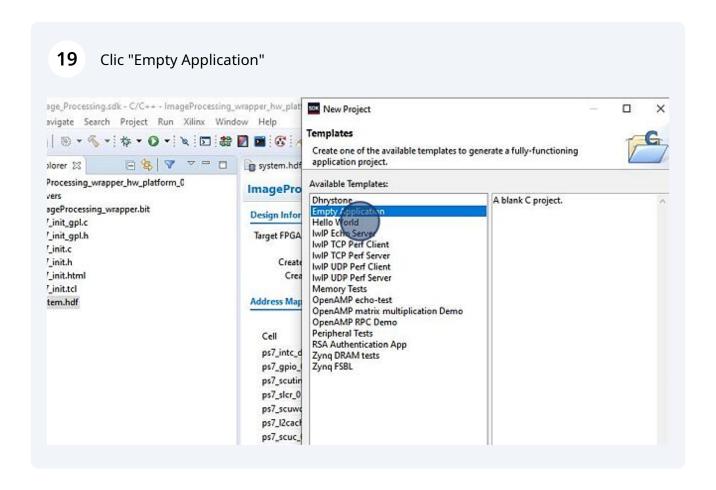




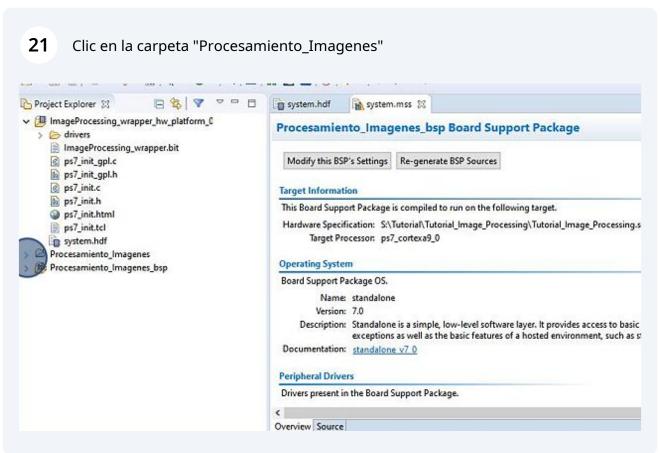
Escribimos el nombre del proyecto "Procesamiento_Imagenes"

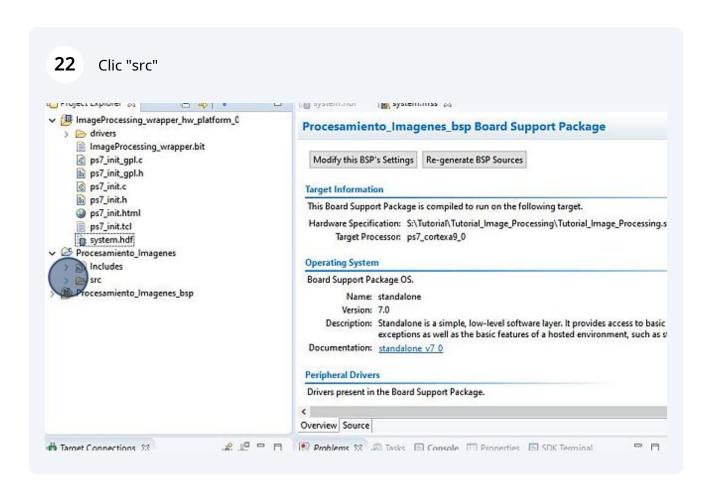


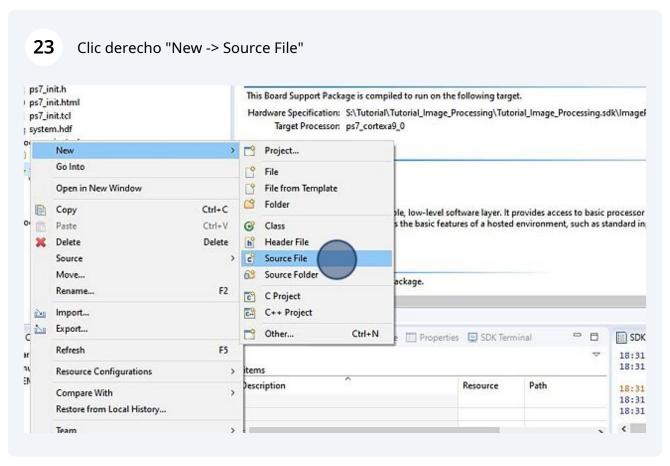
18 Clic "Next " GHOOSE HIE SYSTEM. UCIOUIT OS Platform: standalone Target Hardware ∨ New... Hardware Platform: ImageProcessing_wrapper_hw_platform_0 Processor: ps7_cortexa9_0 Target Software ● C O C++ Language: Compiler: 32-bit Hypervisor Guest: N/A Board Support Package: Create New Procesamiento_Imagenes_bsp Use existing ? < Back Finish Cancel

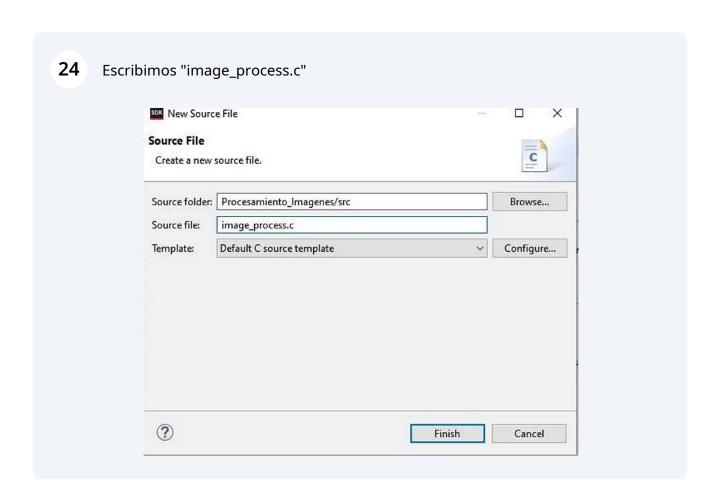


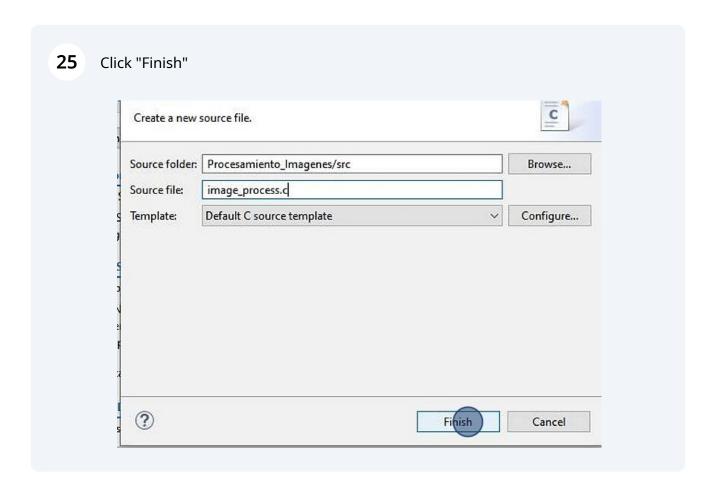




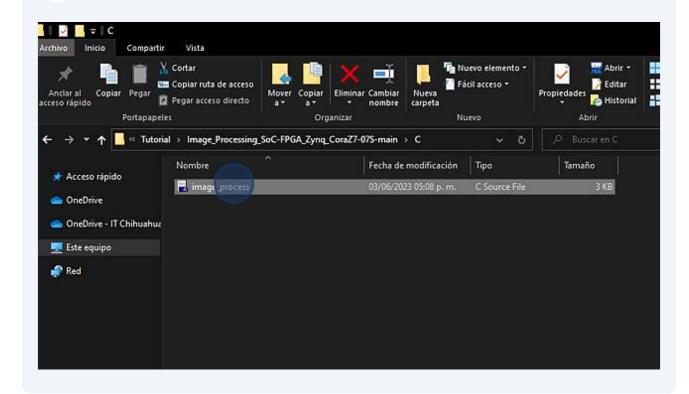




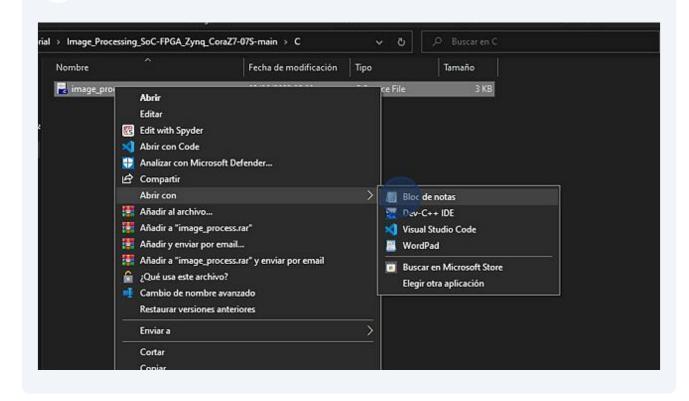




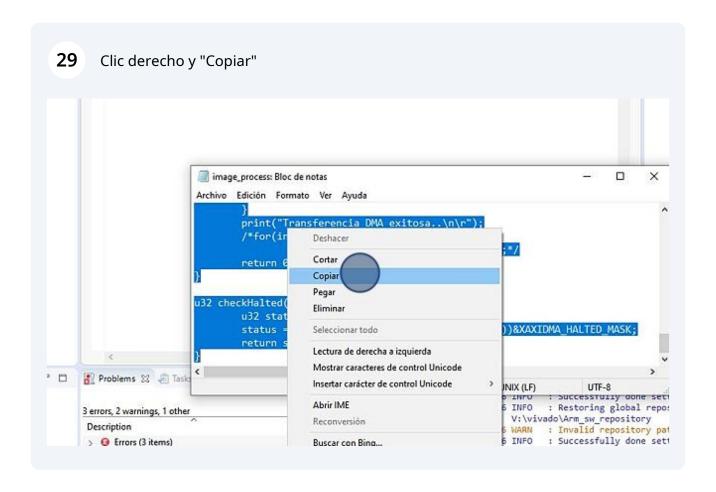
Volvemos a la carpeta que descargamos y damos clic derecho en "image_process"



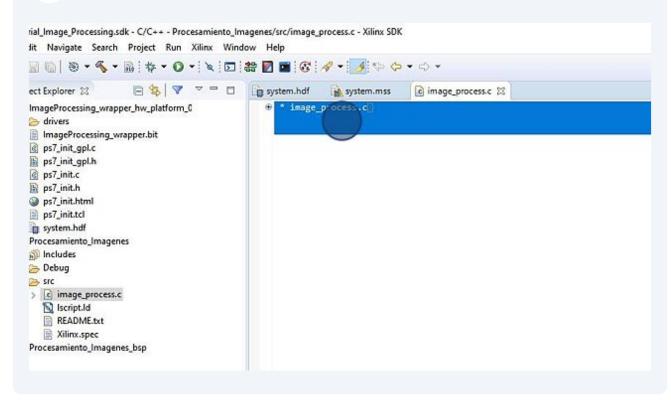
27 Clic derecho y abrir con "Bloc de notas"

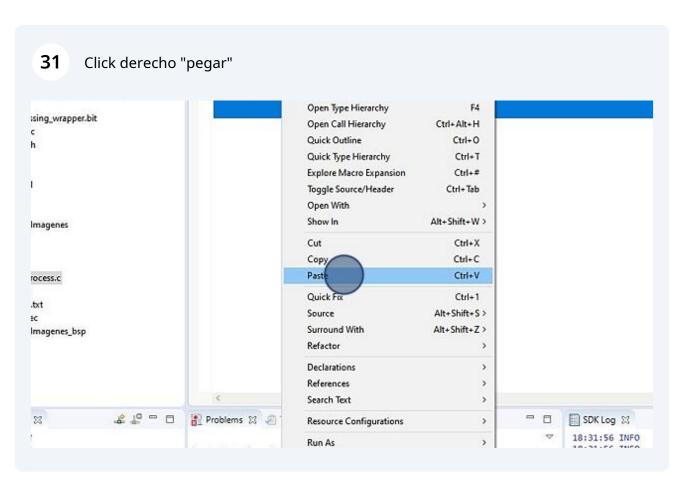


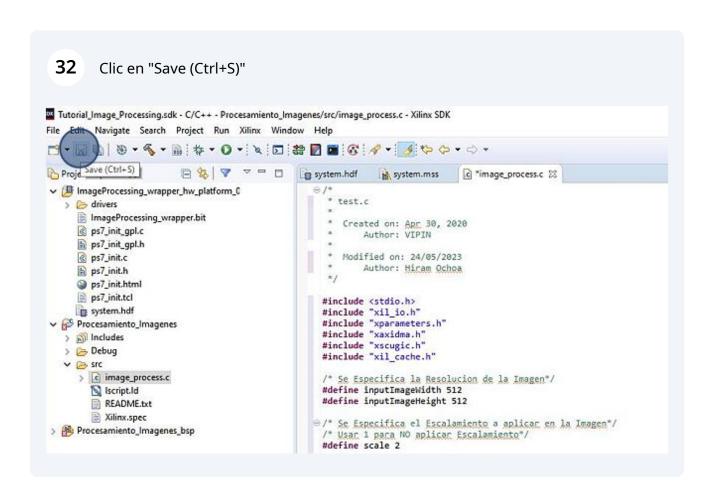
28 Presionamos CTRL + E para seleccionar todo el texto ■ Tutorial_Image_Processing.odk - C/C++ - Procesamiento_Imagenes/src File Edit Navigate Search Project Run Xilina Window Help | 日・日 日 | ち・冬・日 | サ・O・| × | 日 | 数 日 | 8 | ダ・| 多 ウ・ウ・ Quick Access 🖰 Project Explorer 💢 🗎 😩 🔻 🔻 🗢 🗖 📋 system.hdf 🕍 system.mss 🔞 image_process s 🖫 PO SECUL IN THE COME PO v 🖪 ImageProcessing_wrapper_hw_platform_C * ' image_process.d] BARKOR drivers ImageProcessing_wrapper.bit. imageriocess ps7_int_gplc ps7_int_gplh ps7_int.c ps7_int.h ps7_int.h ps7 initaci ig system.hdf > 65 Procesamiento_imagen > 60 Includes > 60 Debug image_process: Bloc de notas Archivo Edición Formato Ver Ayuda Arthor tanco. * test.c * Created on: Apr 30, 2020 * Author: VIPIN > Co image process.c | Ici image process.c | * Modified on: 24/85/2023 * Author: Hiram Ochoa > 6 Procesamiento Imagenes bop # 19 = □ | El Problems 13 @ Task Target Connections ☐ BB - D 100% UNIX (LF) Linea 1, columna 1 > A Hardware Server E Linux TCF Agent O QEMU Tcf Sdb Client 3 errors, 2 warnings, 1 other > @ Enors (Titems) > & Warnings (2 items) > < 18131156 SmartInset 2:1 # ○ 日 | ↑ ○ 日 A ○ → 三 日 □ ES ~ \$\delta \phi() \$\mathbb{T}_1 \text{ ESP } \frac{05x89 \(\rho \) m. \(\mathbb{T}_2 \text{ ESP } \frac{05x89 \(\mathbb{T}_2 \text{ ESP } \frac{05x89 \(\mathbb{T}_2 \text{ ESP } \frac{05x89



Damos clic en programa image_process.c del SDK y presionamos CTRL + A para seleccionar todo el texto

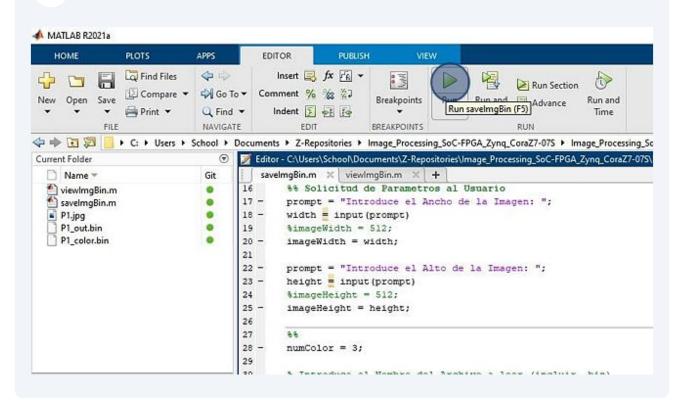




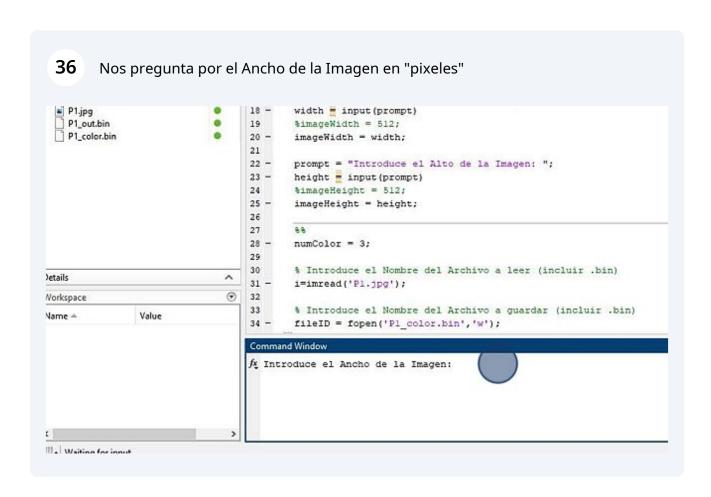


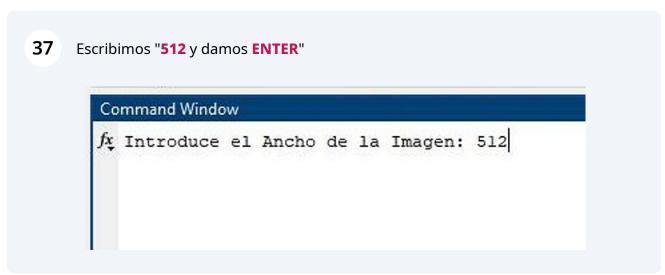
33 Ahora volvemos a la carpeta descargada y abrimos los 2 scripts de MATLAB

34 Clic "Run saveImgBin"

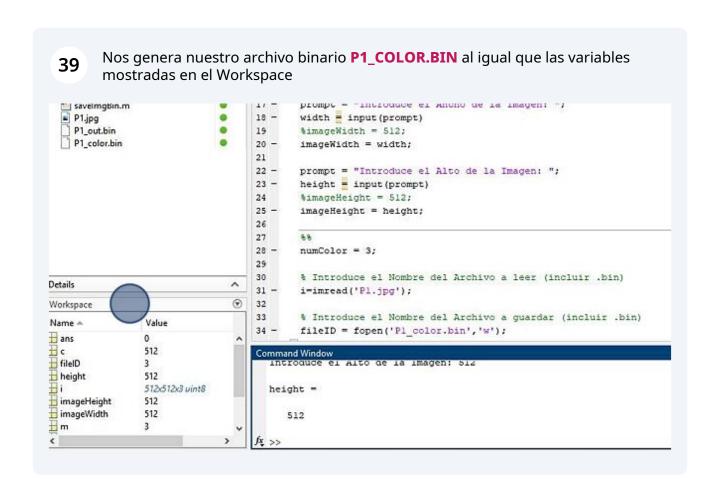


Nótese que P1.jpg ya esta dentro de la carpeta donde se encuentra el script de MATLAB, para procesar otra imagen ponerla dentro de dicha carpeta y poner el nombre del archivo con su extension en donde dice "P1.JPG"





Nos pide el Alto de la Imagen en "pixeles" y nuevamente escribimos "512 y damos 38 16 %% Solicitud de Parametros al Usuario iewlmgBin.m 17 prompt = "Introduce el Ancho de la Imagen: "; . avelmg8in.m 18 width = input (prompt) . 1.jpg . 1_out.bin 19 %imageWidth = 512; 20 -1_color.bin imageWidth = width; 21 22 prompt = "Introduce el Alto de la Imagen: "; 23 height = input (prompt) 24 %imageHeight = 512; 25 imageHeight = height; 26 27 88 28 numColor = 3; 29 % Introduce el Nombre del Archivo a leer (incluir .bin) 30 ^ 31 i=imread('Pl.jpg'); (32 ace 33 % Introduce el Nombre del Archivo a guardar (incluir .bin) Value 34 fileID = fopen('Pl_color.bin','w'); Command Window Introduce el Ancho de la Imagen: 512 width = 512

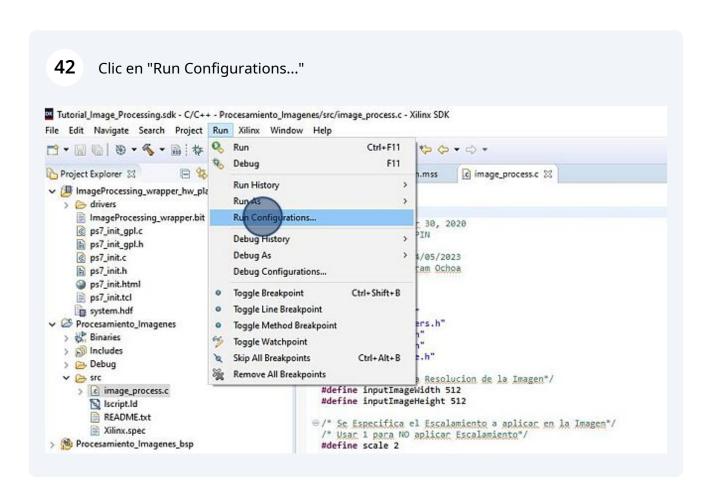


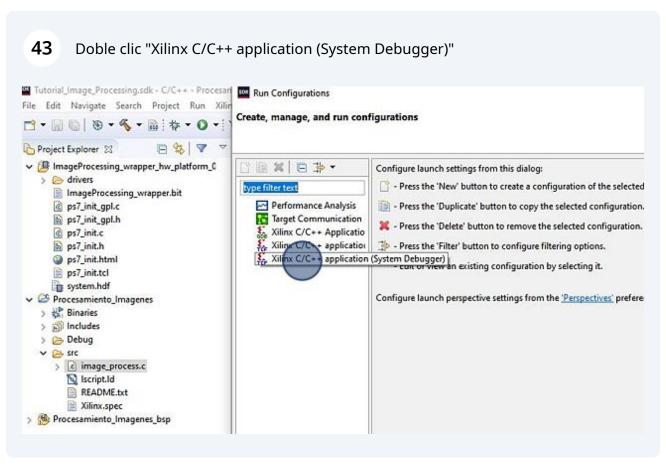
Esta imagen es de una resolución de 512x512 en caso de contar con una resolución distinta se debe especificar como se hace en los pasos anteriores

41 Volvemos al SDK y damos clic en "Run" Tutorial_Image_Processing.sdk - C/C++ Procesamiento_Imagenes/src/image_process.c - Xilinx SDK File Edit Navigate Search Project Run Xlinx Window Help ☆・圖 📵 🔞・多・圖 🎋・ひ・🌂 🖸 😂 🖸 🝱 🚱 🛷・ 📝 🌣 🌣・ウ・ 🕒 Project Explorer 🛭 🕒 😵 🔻 🖛 🗀 📦 system.hdf 🙀 system.mss 🕟 image_process.c 🗵 ⊕ /* * test.c ImageProcessing_wrapper_hw_platform_0 > 🗁 drivers * ImageProcessing_wrapper.bit Created on: Apr 30, 2020 g ps7_init_gpl.c Author: VIPIN ps7_init_gpl.h * Modified on: 24/05/2023 ps7_init.c ps7_init.h Author: Hiram Ochoa ps7_init.html ps7_init.tcl #include <stdio.h>
#include "xil_io.h"
#include "xparameters.h"
#include "xaxidma.h" system.hdf →
Procesamiento_Imagenes > Binaries #include "xscugic.h" #include "xil_cache.h" > 🔊 Includes > 👝 Debug V 🗁 src /* Se Especifica la Resolucion de la Imagen*/
#define inputImageWidth 512 > c image_process.c #define inputImageHeight 512 [3] Iscript.ld README.txt ⊕/* Se Especifica el Escalamiento a aplicar en la Imagen*/ Xilinx.spec /* Usar 1 para NO aplicar Escalamiento*/

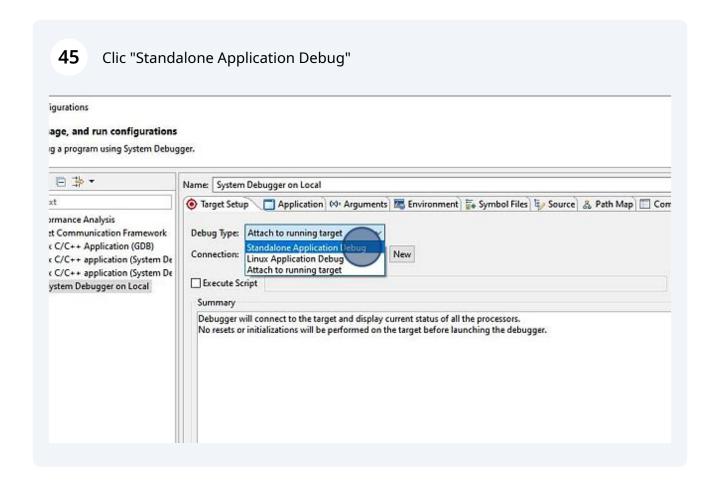
#define scale 2

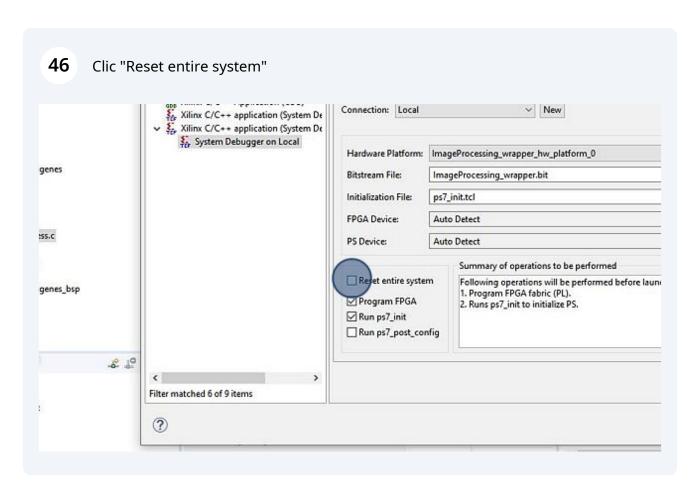
> 🕬 Procesamiento_Imagenes_bsp

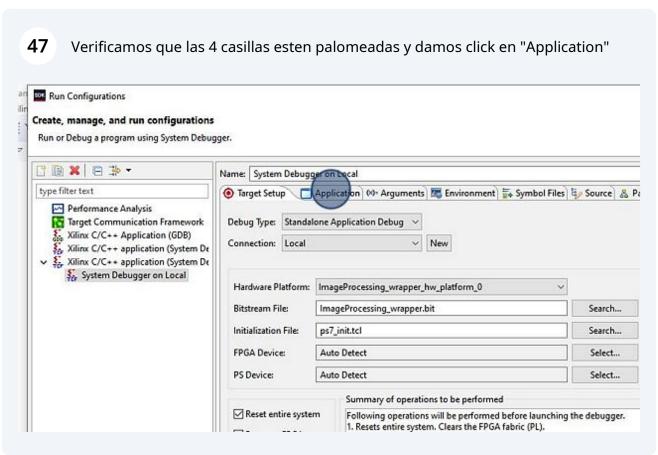


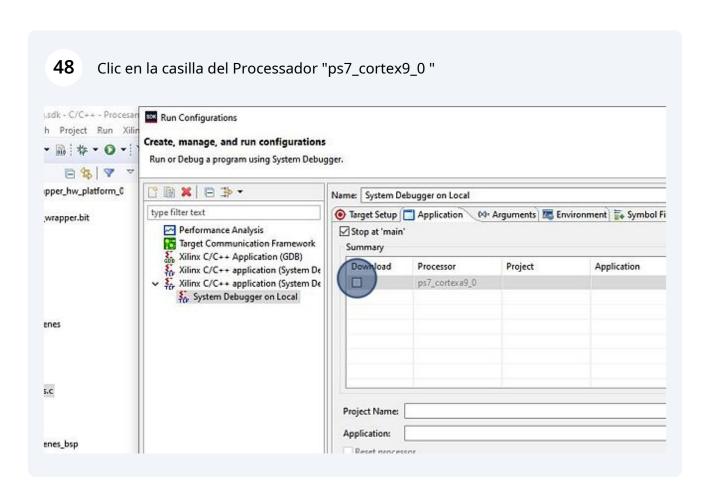


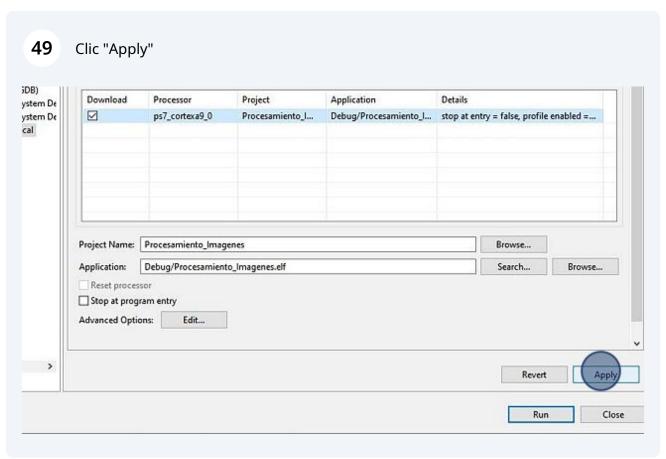
44 Clic "Debug Type: " urations ge, and run configurations a program using System Debugger. E → + Name: System Debugger on Local Target Setup ☐ Application Ø Arguments ☐ Environment ☐ Symbol Files ☐ Source & Path Map ☐ Comm nance Analysis Communication Framework Debug Type: Attach to running target C/C++ Application (GDB) Connection: Local C/C++ application (System De C/C++ application (System De Execute Script tem Debugger on Local Summary Debugger will connect to the target and display current status of all the processors. No resets or initializations will be performed on the target before launching the debugger.

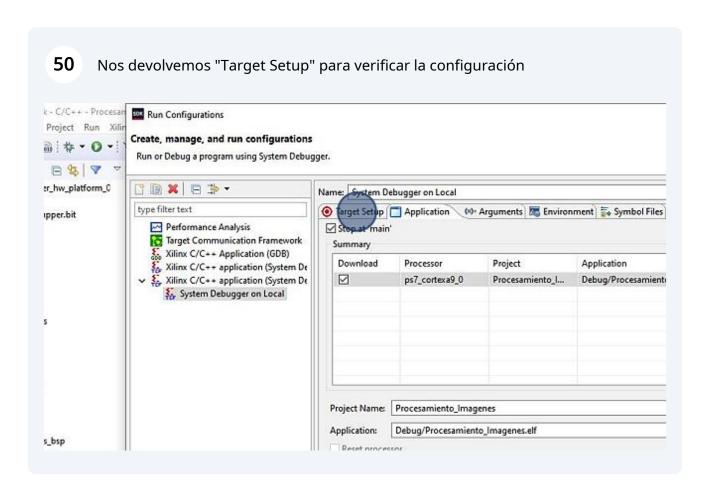


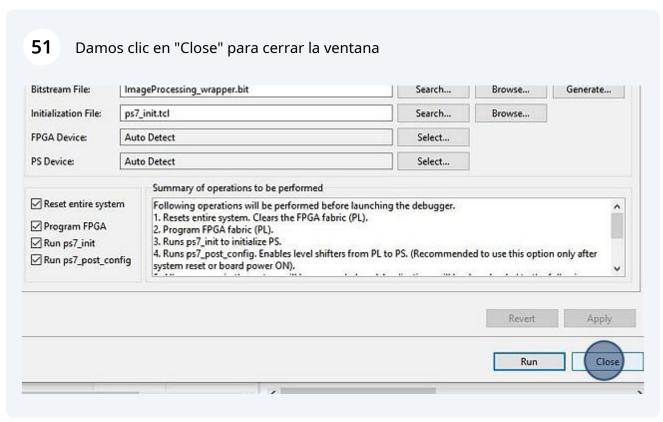




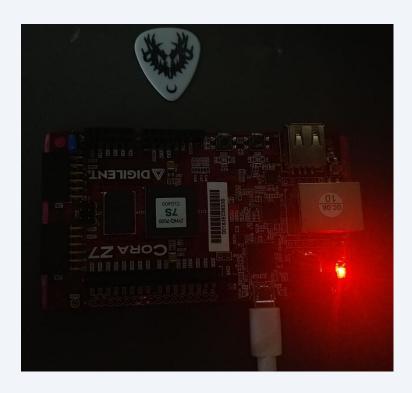




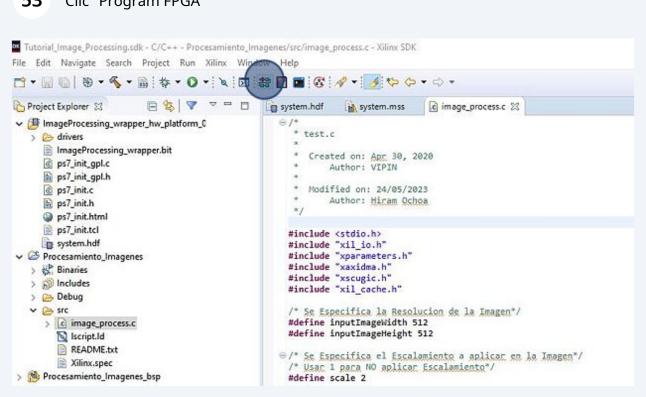




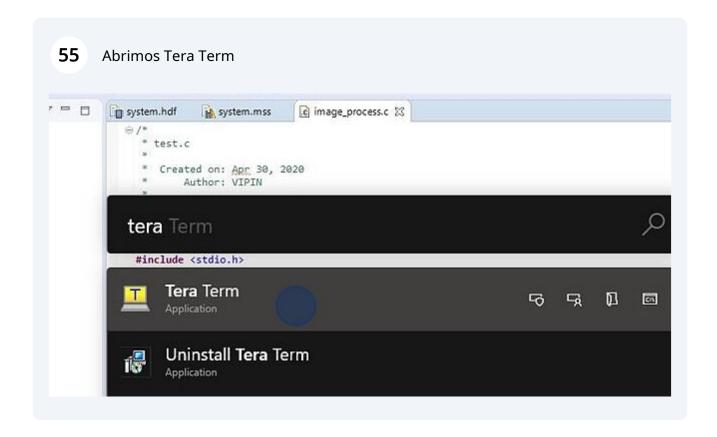
52 Conectamos la Tarjeta Cora Z7-07S y verificamos que prenda el Led Rojo "LD7"

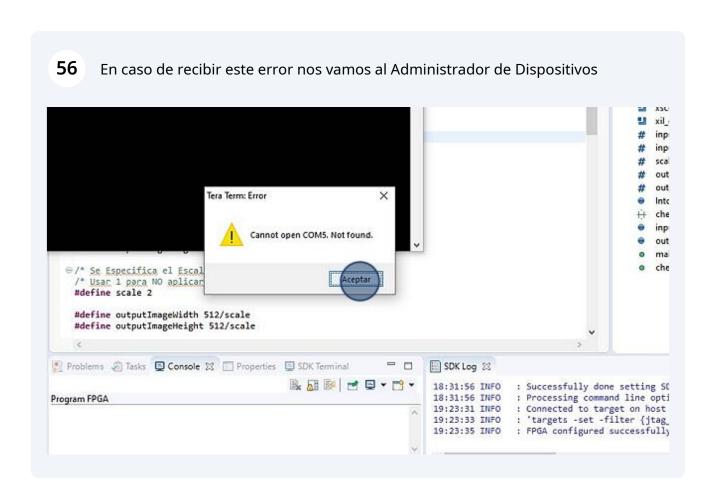


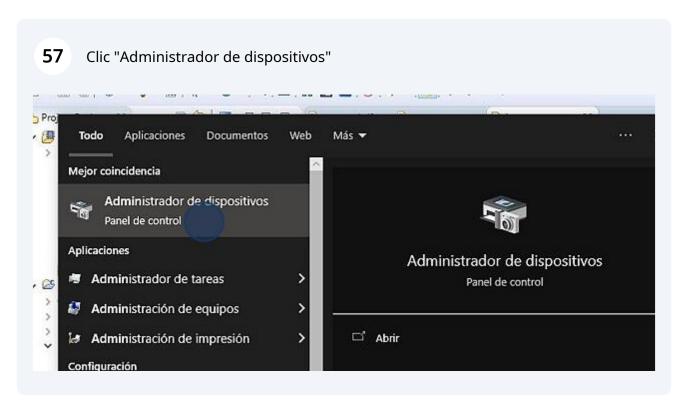
53 Clic "Program FPGA"



54 Clic "Program" y al finalizar encenderá el Led Verde LD6 Hardware Configuration Hardware Platform: | ImageProcessing_wrapper_hw_platform_0 Connection: Local New Device: Auto Detect Select... ImageProcessing_wrapper.bit Bitstream: Search... Browse.. Partial Bitstream BMM/MMI File: Search... Browse.. Software Configuration Processor ELF/MEM File to Initialize in Block RAM ? Program Cancel

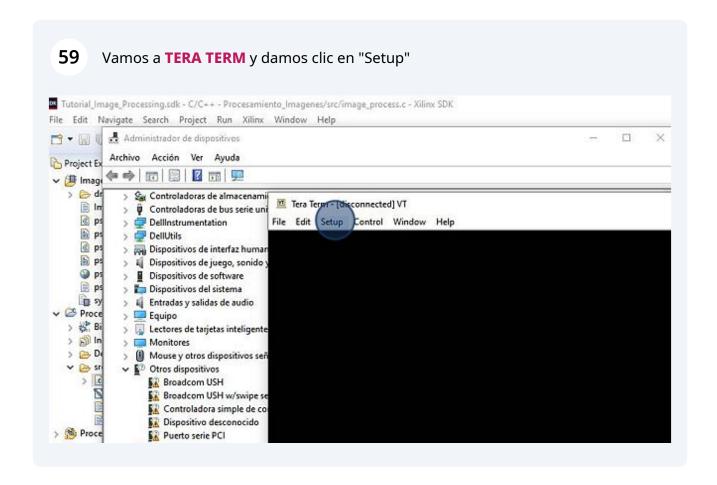


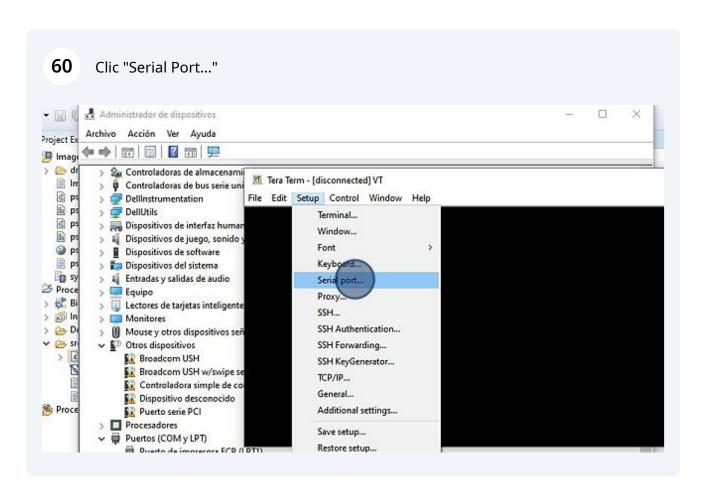


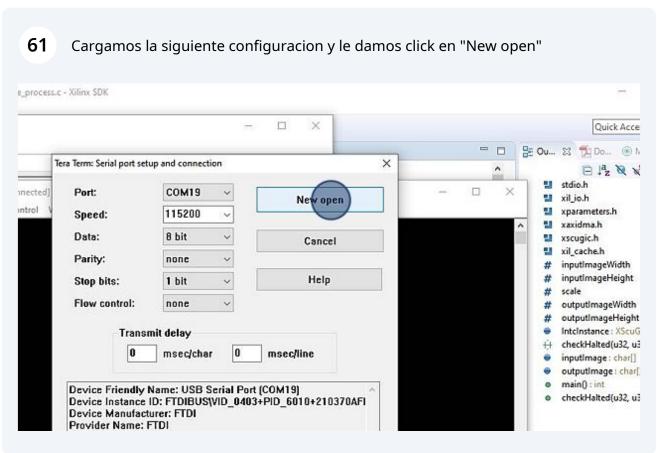


Y buscamos nuestro dispositivo en el apartado de "Puertos COM y LPT", en este caso nuestro dispositivo es "USB Serial Port (COM19)"

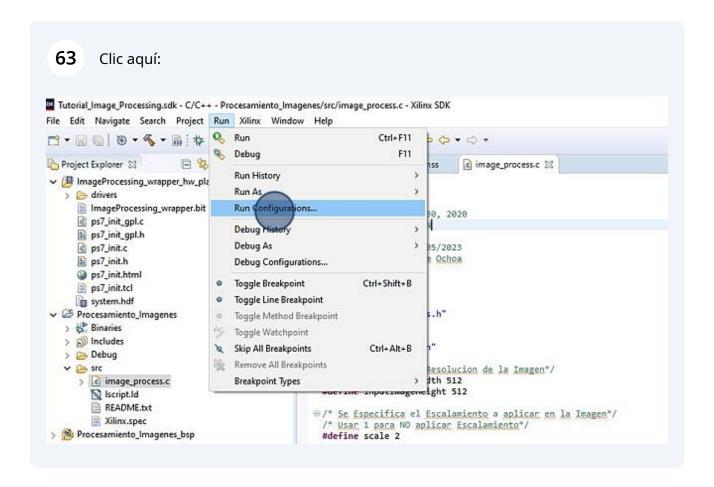




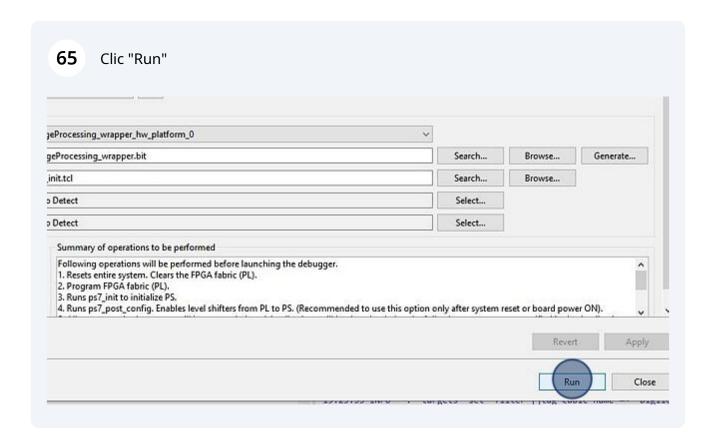




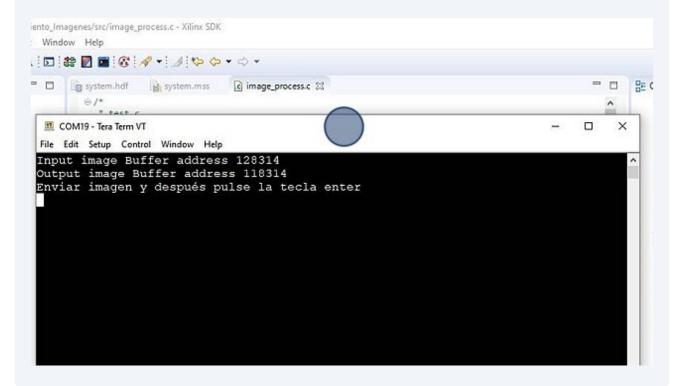
62 Volvemos al SDK y damos clic en "Run" Tutorial_Image_Processing.sdk - C/C++ Procesamiento_Imagenes/src/image_process.c - Xilinx SDK File Edit Navigate Search Project Run Xi inx Window Help Project Explorer 23 system.hdf ☑ image_process.c ⊠ system.mss ImageProcessing_wrapper_hw_platform_0 > 🗁 drivers ImageProcessing_wrapper.bit Created on: Apr 30, 2020 g ps7_init_gpl.c Author: VIPIN ps7_init_gpl.h Modified on: 24/05/2023 g ps7_init.c Author: Hiram Ochoa ps7_init.h ps7_init.html ps7_init.tcl #include <stdio.h> #include "xil_io.h" system.hdf #include "xparameters.h" #include "xaxidma.h" Procesamiento_Imagenes > Binaries #include "xscugic.h" #include "xil_cache.h" > 🔊 Includes > 👝 Debug v 🕞 src /* Se Especifica la Resolucion de la Imagen*/ #define inputImageWidth 512 > c image_process.c #define inputImageHeight 512 script.ld README.txt ⊕ /* Se Especifica el Escalamiento a aplicar en la Imagen*/ Xilinx.spec /* Usar 1 para NO aplicar Escalamiento*/ > 🥦 Procesamiento_Imagenes_bsp #define scale 2



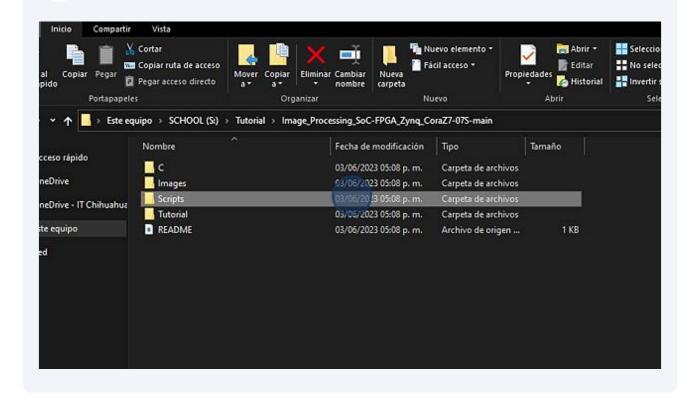
64 Click "System Debugger on Local" Create, manage, and run configurations □ B X E ⇒ · Configure launch settings from this dialog: type filter text Press the 'New' button to create a configuration of the selected type. Performance Analysis Press the 'Duplicate' button to copy the selected configuration. Target Communication Framework 💢 - Press the 'Delete' button to remove the selected configuration. Xilinx C/C++ Application (GDB) Xilinx C/C++ application (System Debugger on Q Xilinx C/C++ application (System Debugger) - Press the 'Filter' button to configure filtering options. - Edit or view an existing configuration by selecting it. System Debugger on Configure launch perspective settings from the 'Perspectives' preference page.



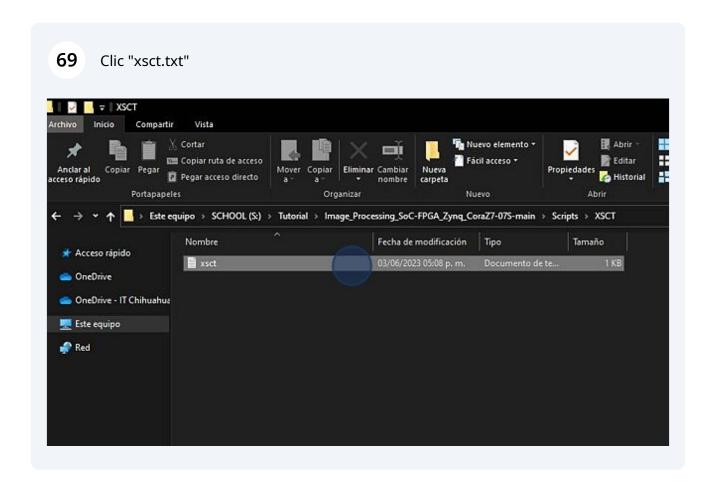
Abrimos la ventana de Tera Term y nos despliega las direcciones que utilizaremos mas adelante, así como indicaciones



67 Nos vamos a la carpeta descargada y luego a la carpeta Scripts

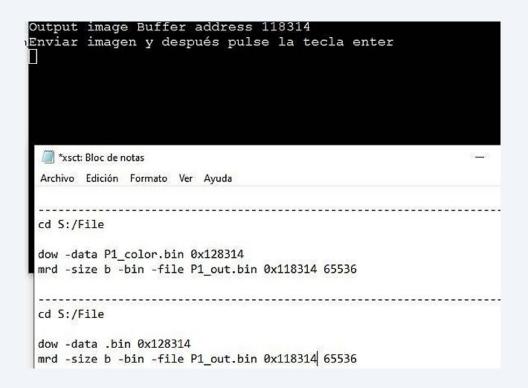


68 Clic "XCST" chivo Inicio Compartir Vista Y. Cortar 👣 Nuevo elemento 🕶 Abrir H **Editar** H Copiar ruta de acceso 🌃 Fácil acceso 🕶 Anclar al Mover Copiar Eliminar Cambiar Nueva Propiedades Pegar acceso directo A Historial H ceso rápido nombre carpeta Portapapeles Nuevo Abrir Organizar Este equipo > SCHOOL (S:) > Tutorial > Image_Processing_SoC-FPGA_Zynq_CoraZ7-07S-main > Scripts > Nombre Fecha de modificación Tamaño * Acceso rápido MATLAB 03/06/2023 05:08 p. m. Carpeta de archivos OneDrive - XSCT 03/06/2023 05:08 p. m. Carpeta de archivos 🍮 OneDrive - IT Chihuahuz 💻 Este equipo 🦨 Red

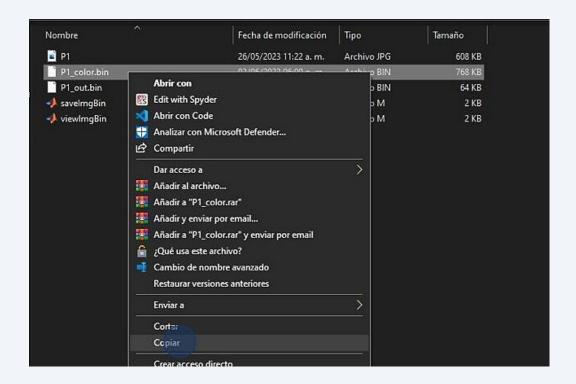


70 Pasamos las direcciones de Input y Output a el archivo txt

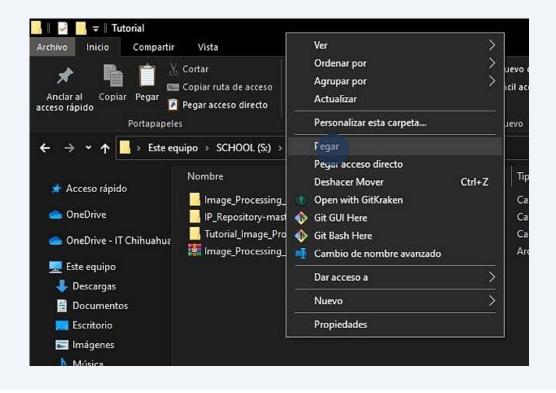
71 Quedando de la siguiente manera:

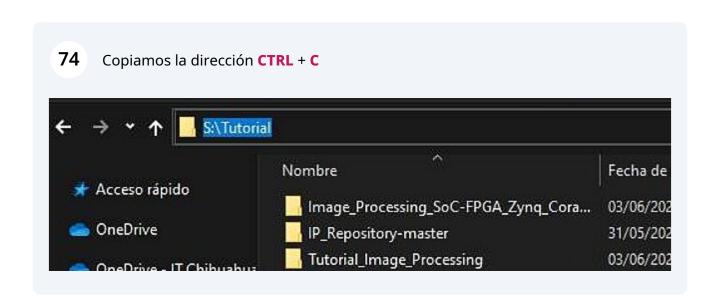


72 Clic P1_COLOR.BIN y copiar

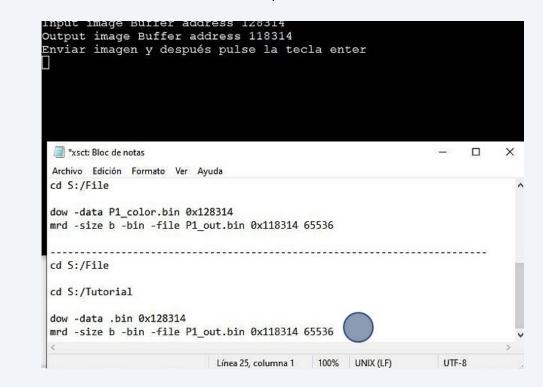


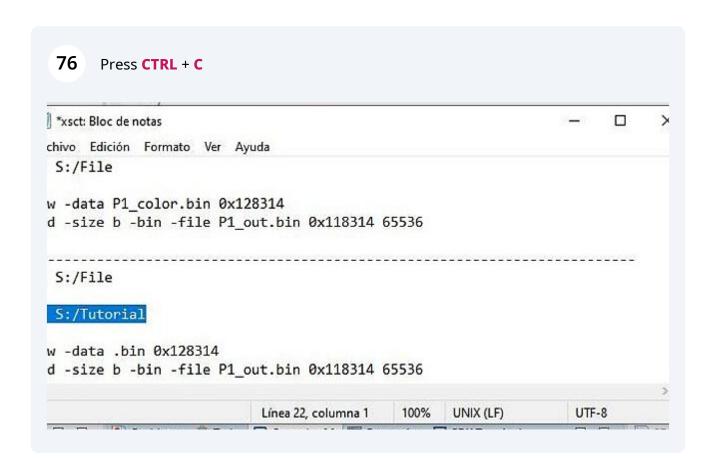
73 Nos vamos a la carpeta deseada y clic derecho "Pegar"



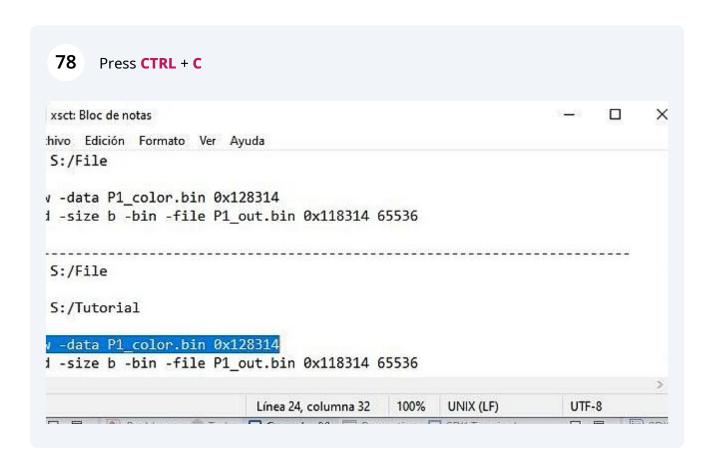


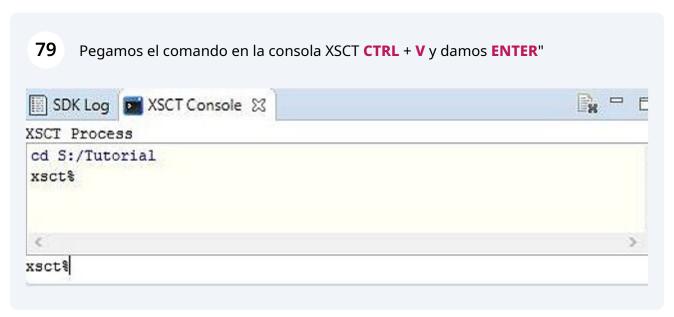
Pegamos la dirección y reescribimos quedando de la siguiente manera. Nota: 65536 es el resultado de multiplicar la resolución de salida (256x256)











SDK Log SXSCT Console SX

CT Process

13% OMB 0.3MB/s 22:22 ETA

10% OMB 0.3MB/s 00:02

1ccessfully downloaded S:/Tutorial/Pl_color.bin

1ct%

Abrimos la ventana de terminal y presionamos ENTER

COM19-Tera Term VT

File Edit Setup Control Window Help

Input image Buffer address 128314

Output image Buffer address 118314

Enviar imagen y después pulse la tecla enter

82 Nos despliega lo siguiente M COM19 - Tera Term VT File Edit Setup Control Window Help Input image Buffer address 128314 Output image Buffer address 118314 Enviar imagen y después pulse la tecla enter 38 5C 3F 27 δE 37 LD B 20 21 50 31 ransferencia DMA exitosa..

83 Copiamos el último comando CTRL + C

```
Input image Buffer address 128314
Output image Buffer address 118314
Enviar imagen y después pulse la tecla enter
38
5C
3F
27
5E
37
🏿 🗐 xsct: Bloc de notas
                                                                    X
                                                               Archivo Edición Formato Ver Ayuda
cd S:/File
dow -data P1_color.bin 0x128314
mrd -size b -bin -file P1_out.bin 0x118314 65536
  ______
 cd S:/File
 cd S:/Tutorial
      1 1 04 7 1 0 430344
```

Pegamos el comando en la consola XSCT CTRL + V y damos ENTER"

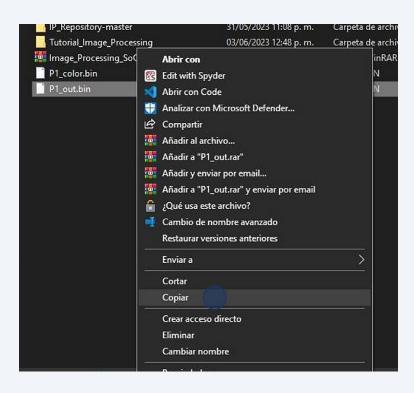
SDK Log XSCT Console

XSCT Process

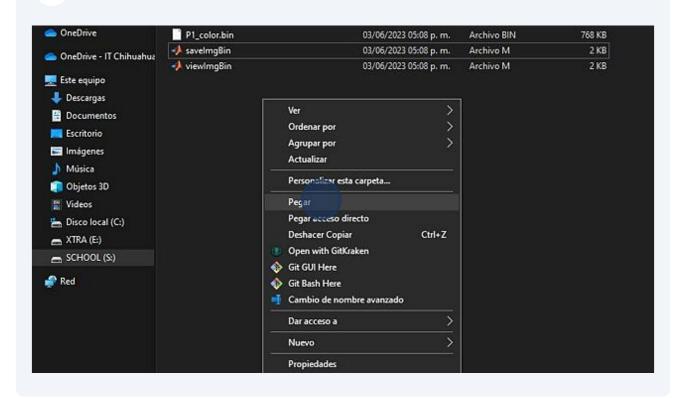
100% 0MB 0.3MB/s 00:02
Successfully downloaded S:/Tutorial/Pl_color.bin
xsct% mrd -size b -bin -file Pl_out.bin 0x118314 65536

Nos dirigimos al directorio, esperamos unos segundos y damos clic "Actualizar 85 "Tutorial" (F5)" Fecha de modificación Tamaño Tipo GA_Zynq_Cora... 03/06/2023 05:08 p. m. Carpeta de archivos 31/05/2023 11:08 p. m. Carpeta de archivos 03/06/2023 12:48 p. m. Carpeta de archivos GA_Zynq_Cora... 03/06/2023 05:15 p. m. Archivo WinRAR Z... 13,263 KB 03/06/2023 06:00 p. m. Archivo BIN 768 KB

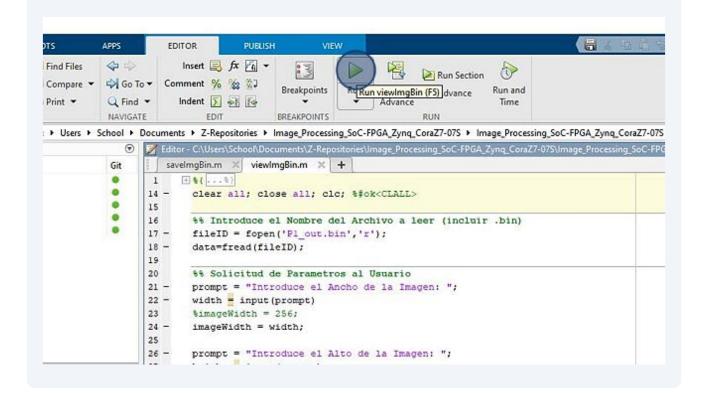
86 Seleccionamos el archivo procesado por la Cora7Z y damos clic en "Copiar"



87 Nos dirigimos a la carpeta Scripts y damos clic en "Pegar"



88 Vamos a MATLAB y abrimos el script "viewImgBin" y damos click en Run



Nos solicita el ancho de la imagen a visualizar, en este caso se le hizo un escalamiento de la mitad por lo cual será de **256** pixeles y damos **ENTER**"

ig Introduce el Ancho de la Imagen: 256

Ahora nos solicita el alto de la imagen a visualizar, en este caso se le hizo un escalamiento de la mitad por lo cual será de **256** pixeles y damos **ENTER**"

```
Command Window
Introduce el Ancho de la Imagen: 256

width =

256

fr Introduce el Alto de la Imagen: 256
```

91 Nos despliega el resultado



Comparamos la imagen de entrada con el resultado y vemos que se ha completado de forma exitosa el procesamiento de imágenes.



