C-sharp windows example

Online version: https://wiki.advacam.cz/wiki/C-sharp_windows_example

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Overview & notes

This is C# example of the Windows program with list devices, simple measurement and view of the output data.
Timepix3 only.

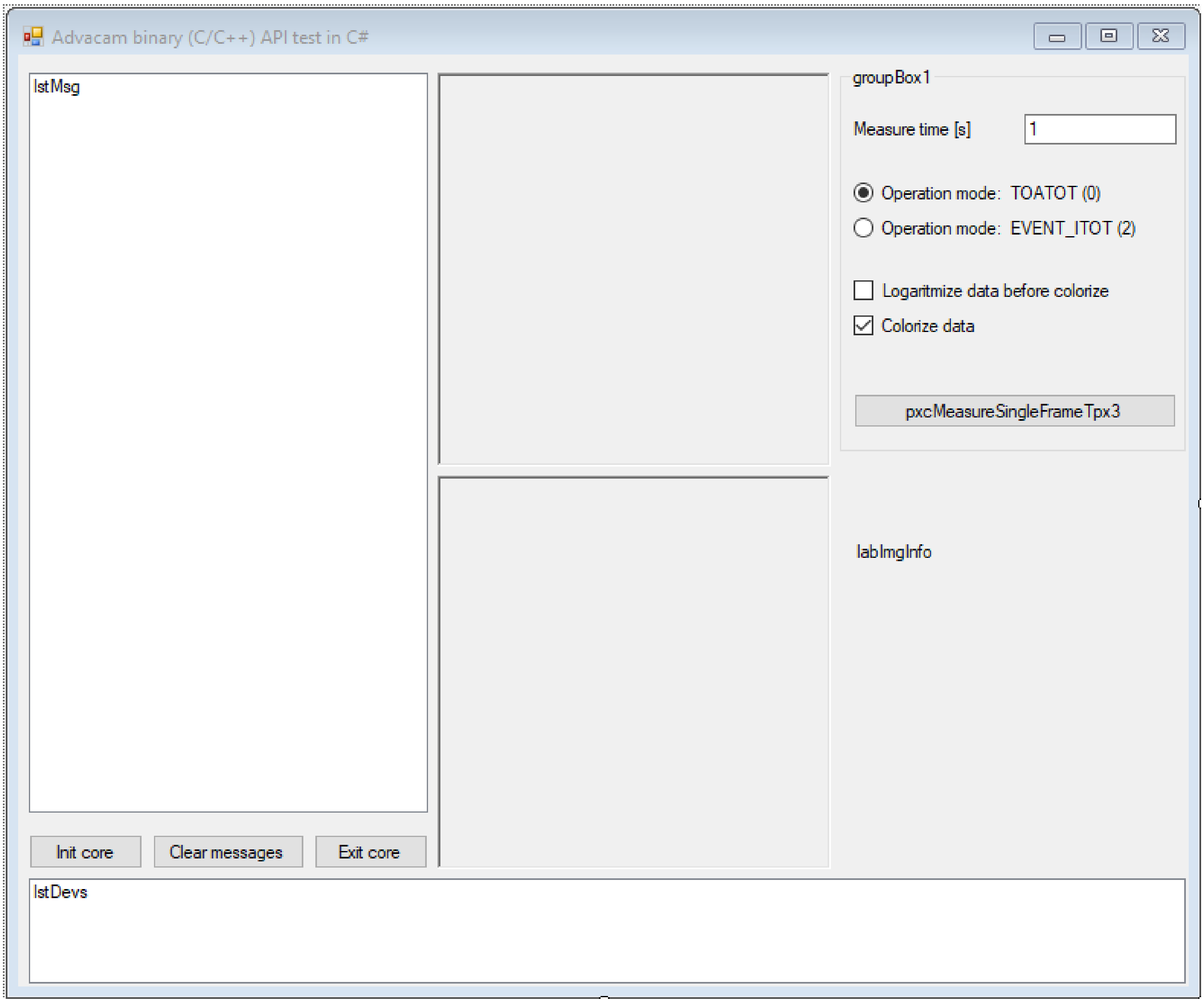
Notes:

- Use the release/64 bit configuration
- The working directory is directory with the exe file. Typically **project\bin\Release**. Copy pixet.ini and other auxilliary files here.
- In the MS Visual studio 2019, **project first not working**. You must click Properties, change .NET version to old, save it, change .NET version back to actual and save. Now project can work.

Window

Create window with components:

1. lstMsg - Listbox for messages
2. lstDevs - Listbox for devices list
3. btnInit - Button for init the Pixet core
4. btnClearMsg - Button for clear lstMsg
5. btnExit - Button for exit the Pixet Core
6. pbFrame1 - Picturebox for first output subframe, sixe equal 256x256 inside, Border Fixed3D
7. pbFrame2 - Picturebox for second output subframe, sixe equal 256x256 inside, Border Fixed3D
8. txtMeasTime - Textbox for measure time input, default text "1"
9. rbOPM0 - Radiobutton for operation mode 0
10. rbOPM2 - Radiobutton for operation mode 2
11. checkLogView - Checkbox to enable logaritmized view
12. checkColView - Checkbox to enable colorized view
13. btnMeasSinTpx3 - Button to run the pxcMeasureSingleFrameTpx3 example measuring
14. labImgInfo - Label for informations about measured images


Advacam binary (C/C++) API test in C#
lstMsg
groupBox1
Measure time [s]
1
Operation mode: TOATOT (0)
Operation mode: EVENT_ITOT (2)
Logaritmize data before colorize
Colorize data
pxcMeasureSingleFrameTpx3
labImgInfo
Init core
Clear messages
Exit core
lstDevs

C-sharp windows example - window edit screenshot

Code

```
using System;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Windows.Forms;
using System.Runtime.InteropServices;

namespace WindowsFormsApp1 {
    public partial class Form1 : Form {

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcInitialize(Int32 a, UInt64 b);
        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcExit();

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcGetDevicesCount();

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcGetDeviceChipID(UInt32 deviceIndex, UInt32 chipIndex,
StringBuilder chipIDBuffer, UInt32 size);

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcGetDeviceName(UInt32 deviceIndex, StringBuilder
nameBuffer, UInt32 size);

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcGetDeviceChipCount(UInt32 deviceIndex);

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcGetDeviceInfo(UInt32 deviceIndex, UInt64 devInfo); //
devInfo is struct, but not used here

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcMeasureSingleFrameTpx3(UInt32 deviceIndex, double
frameTime, [Out] double[] frameToaITot, [Out] UInt16[] frameTotEvent, ref UInt32 size,
UInt32 trgStg = 0);
        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcGetDeviceDimensions(UInt32 deviceIndex, ref UInt32
width, ref UInt32 height);

        [DllImport("pxcore.dll", CallingConvention = CallingConvention.Cdecl)]
        public static extern int pxcSetTimepix3Mode(UInt32 deviceIndex, int mode);

        int devicesCout = 0;
        int[] devTypesN = Enumerable.Repeat(-1, 1000).ToArray();
        UInt32 deviceIdx = uint.MaxValue;
        UInt32 devXsize = 256, devYsize =256;
        UInt32 devPixels = 65536;

        public Form1() {
            InitializeComponent();
        }

        void msgToList(String msg) { //
============================================================
            lstMsg.Items.Add(msg);
        }
        void msgToList(String msg, int rc) {
            lstMsg.Items.Add($"{msg:S} rc={rc:D} (0 is OK)");
        }
        void msgToList(String msg1, int n, String msg2) {
            lstMsg.Items.Add($"{msg1:S} {n:D} {msg2:S}");
        }
        void msgToList(String msg1, UInt32 n, String msg2) {
            lstMsg.Items.Add($"{msg1:S} {n:D} {msg2:S}");
        }

        int setPixelRGB(int r, int g, int b) { //
=================================================
            return b + (g << 8) + (r << 16);
        }

        // value 0-1280 to RGB color or 0-255 to grayscale
        int valToRGB(double val) { //
=============================================================
            int v = (int)val;

            if (!checkColView.Checked) return setPixelRGB(v, v, v);

            if (v < 256) return setPixelRGB(0, 0, v);     // 0   black to blue
            v -= 256;
            if (v < 256) return setPixelRGB(0, v, 255); // 256   blue to blue-green
            v -= 256;
            if (v < 256) return setPixelRGB(0, 255, 255 - v); // 512   blue-green to green
            v -= 256;
            if (v < 256) return setPixelRGB(v, 255, 0); // 768   green to yellow
            v -= 256;
            if (v < 256) return setPixelRGB(255, 255 - v, 0); // 1024   yellow to red
            v -= 256;
            if (v < 256) return setPixelRGB(255, 0, v); // 1280   red to violet
            v -= 256;
            if (v < 256) return setPixelRGB(255, v, 255);   // 1536  violet to white
            else return setPixelRGB(255, 255, 255);     // over 1792
        }

        const double cColorizeIniMin = 1e30, cColorizeIniMax = -1e30;
        double colorizeMin = cColorizeIniMin, colorizeMax = cColorizeIniMax;
        int colorizePixCount = 0;
        // normalize data (, logaritmize), convert to color RGB (or grayscale), count non-
zero, count values
        // note: logaritmize not usable if data<=0
        void colorizeData(double[] dataIn, int[] dataOut) { //
====================================
            double colMin=0, colMax=0, pixVal, p;
            colorizeMin = cColorizeIniMin;
            colorizeMax = cColorizeIniMax;
            colorizePixCount = 0;

            for (int n = 0, i = 0; n < devPixels; n++) { // find min, max
```

```
                if (dataIn[n] != 0) {
                    if (checkLogView.Checked) pixVal = Math.Log(dataIn[n]); else pixVal =
dataIn[n];
                    if (dataIn[n] > colorizeMax) { colorizeMax = dataIn[n]; colMax =
pixVal; };
                    if (dataIn[n] < colorizeMin) { colorizeMin = dataIn[n]; colMin =
pixVal; };
                    colorizePixCount++;
                }
            }

            if (checkColView.Checked) p = 1792.0 / (colMax - colMin);
            else p = 255.0 / (colMax - colMin);
            if (p < 0) p = -p;

            for (int n = 0; n < devPixels; n++) { // colorize data
                if (dataIn[n] != 0) {
                    if (checkLogView.Checked) pixVal = Math.Log(dataIn[n]); else pixVal =
dataIn[n];
                    dataOut[n] = valToRGB((pixVal - colMin) * p);
                } else {
                    dataOut[n] = setPixelRGB(128, 128, 128);
                }
            }
        }
        void colorizeData(UInt16[] dataIn, int[] dataOut) { //
====================================
            double[] tmpColData = new double[devPixels];
            for (int n = 0; n < devPixels; n++) tmpColData[n] = (double)dataIn[n];
            colorizeData(tmpColData, dataOut);
        }

        private void btnInit_Click(object sender, EventArgs e) { //
===============================
            btnInit.Enabled = false;
            int rc = pxcInitialize(0, 0);
            msgToList("pxcInitialize", rc);
            rc = pxcGetDevicesCount();
            msgToList("pxcGetDevicesCount", rc, "(>=0 devCnt, <0 error)");
            lstDevs.Items.Clear();
            if (rc>0) {
                devicesCout = rc;
                for (UInt32 n=0; n<devicesCout; n++) {
                    UInt32 bufLen = 100;
                    StringBuilder buff = new StringBuilder((int)bufLen);

                    rc = pxcGetDeviceName(n, buff, bufLen);
                    String devName;
                    if (rc == 0) { devName = buff.ToString(); }
                    else { devName = "(failed)"; }

                    rc = pxcGetDeviceChipID(n, 0, buff, bufLen);
                    String chipID;
                    if (rc == 0) { chipID = buff.ToString(); }
                    else { chipID = "(failed)"; }

                    int chipCnt = pxcGetDeviceChipCount(n);

                    String[] devTypes = { "unknown", "TPX", "MPX3", "TPX3", "TPX2" };
                    rc = pxcGetDeviceInfo(n, 0);
                    String dt;
                    if (rc >= 0 && rc < devTypes.Length) {
                        dt = devTypes[rc];
                        devTypesN[n] = rc;
                    } else { dt = "(failed)"; }

                    lstDevs.Items.Add($"{n:D}: ID:{devName:S}, ID0:{chipID:S}, 
chipCnt:{chipCnt:D}, type:{dt:S}");
                }
                btnExit.Enabled = true;
            } else {
                msgToList("No devs found");
                btnInit.Enabled = true;
                btnExit.Enabled = false;
                btnMeasSinTpx3.Enabled = false;
            }
        }

        private void btnClearMsg_Click(object sender, EventArgs e) { // 
===========================
            lstMsg.Items.Clear();
        }

        private void Form1_Load(object sender, EventArgs e) {
            lstMsg.Items.Add("Messages");
            lstDevs.Items.Add("Devices list - click the 'Init core' button");
        }

        private void Form1_FormClosing(object sender, FormClosingEventArgs e) {
            pxcExit();
        }

        private void btnExit_Click(object sender, EventArgs e) { // 
===============================
            int rc = pxcExit();
            msgToList("pxcExit", rc);
            lstDevs.Items.Clear();
            deviceIdx = uint.MaxValue;
```

```
            devicesCout = 0;

            btnInit.Enabled = true;
            btnExit.Enabled = false;
            btnMeasSinTpx3.Enabled = false;
        }

        private void lstDevs_SelectedIndexChanged(object sender, EventArgs e) { //
================
            UInt32 i = (UInt32)lstDevs.SelectedIndex;
            if (devTypesN[i]==3) {
                deviceIdx = i;
                msgToList("Selected device:", deviceIdx, "");
                UInt32 width = 256, height = 256;
                int rc = pxcGetDeviceDimensions(deviceIdx, ref width, ref height);
                if (rc==0) {
                    devXsize = width; devYsize = height;
                    devPixels = devXsize * devYsize;
                    msgToList($"Dev dimm: w:{devXsize:D}, h:{devYsize:D}");
                } else {
                    msgToList("pxcGetDeviceDimensions", rc);
                }
                btnMeasSinTpx3.Enabled = true;
            } else {
                deviceIdx = uint.MaxValue;
                btnMeasSinTpx3.Enabled = false;
            }
        }

        private void btnMeasSinTpx3_Click(object sender, EventArgs e) { //
========================
            btnMeasSinTpx3.Enabled = false;

            int opm;
            if (rbOPM0.Checked) opm = 0; else opm = 2;
            int rc = pxcSetTimepix3Mode(deviceIdx, opm);
            msgToList("pxcSetTimepix3Mode", rc);

            double[] frameToaITot = new double[devPixels];
            UInt16[] frameTotEvent = new UInt16[devPixels];
            UInt32 size = devPixels;
            double t = Convert.ToDouble(txtMeasTime.Text);

            rc = pxcMeasureSingleFrameTpx3(deviceIdx, t, frameToaITot, frameTotEvent, ref
size, 0);
            msgToList("pxcMeasureSingleFrameTpx3", rc);

            btnMeasSinTpx3.Enabled = true;
            int[] imgData1 = new int[devPixels];
            int[] imgData2 = new int[devPixels];
            colorizeData(frameToaITot, imgData1);
            String colInfo1 = $"min:{colorizeMin:F}, max:{colorizeMax:F}, hit
pixels:{colorizePixCount:D}";
            colorizeData(frameTotEvent, imgData2);
            String colInfo2 = $"min:{colorizeMin:F}, max:{colorizeMax:F}, hit
pixels:{colorizePixCount:D}";
            pbFrame1.SizeMode = PictureBoxSizeMode.StretchImage;
            pbFrame2.SizeMode = PictureBoxSizeMode.StretchImage;

            IntPtr imgDataPtr1 = Marshal.AllocHGlobal(Marshal.SizeOf(typeof(int)) *
(int)devPixels);
            Marshal.Copy(imgData1, 0, imgDataPtr1, (int)devPixels);
            IntPtr imgDataPtr2 = Marshal.AllocHGlobal(Marshal.SizeOf(typeof(int)) *
(int)devPixels);
            Marshal.Copy(imgData1, 0, imgDataPtr2, (int)devPixels);

            Bitmap bmp1 = new Bitmap((int)devXsize, (int)devYsize, (int)devXsize * 4,
System.Drawing.Imaging.PixelFormat.Format32bppRgb, imgDataPtr1);
            Bitmap bmp2 = new Bitmap((int)devXsize, (int)devYsize, (int)devXsize * 4,
System.Drawing.Imaging.PixelFormat.Format32bppRgb, imgDataPtr2);

            pbFrame1.Image = bmp1;
            pbFrame2.Image = bmp2;

            labImgInfo.Text = $"Frame1 - ToA/IToT:\n{colInfo1:S}\n\nFrame2 -
ToT/Event:\n{colInfo2:S}";
        }
    }
}
```

Related

- Binary core API
- Pixet SDK
- Simple C# commandline example