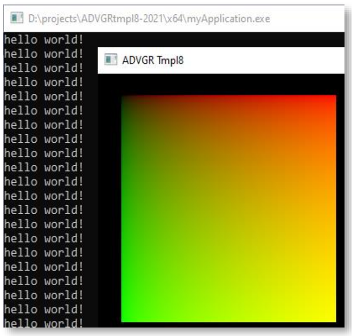
“Getting Started with the tmpl8-2023”

This template is only the current final evolution of a long list of ‘templates’, that started with EasyCE, a minimalistic code base for writing Windows CE games / graphics applications without worrying about OS base code. It evolved though Tmpl8 in various versions for IGAD, then UU, then IGAD again, and in the meantime it has been used to start virtually all my personal mini-projects. In practice, it is great as a basic starting point, but very limited at the same time. Good for teaching. 😊

To use the template:

- you simply extract it from the zip file to a directory of your choice
- you open the .sln file using Visual Studio (versions 2019 and later).

At the time of writing, Visual Studio 2022 Community Edition is an excellent choice. Get it for free, install it using the default options, and you’re good to go.



The magic (as seen on the right) happens in game.cpp:

```cpp
#include "precomp.h"
#include "game.h"

TheApp* CreateApp() { return new Game(); }

// -----------------------------------------------------------
// Initialize the application
// -----------------------------------------------------------
void Game::Init()
{
    // anything that happens only once at application start goes here
}

// -----------------------------------------------------------
// Main application tick function - Executed once per frame
// -----------------------------------------------------------
void Game::Tick( float deltaTime )
{
    // clear the screen to black
    screen->Clear( 0 );
    // print something to the console window
    printf( "hello world!\n" );
    // plot some colors
    for( int red = 0; red < 256; red++ ) for( int green = 0; green < 256; green++ )
    {
        int x = red, y = green;
        screen->Plot( x + 200, y + 100, (red << 16) + (green << 8) );
    }
    // plot a white pixel in the bottom right corner
    screen->Plot( SCRWIDTH - 2, SCRHEIGHT - 2, 0xffffff );
}
```

The default example code shows you the basic functionality implemented by the template:

- A window is opened.
- A pixel is plotted using `screen->Plot( x, y, color )`.
- The size of the screen can be obtained from `SCRWIDTH` and `SCRHEIGHT`.
- A ‘color’ is a 32-bit unsigned value, where red starts at bit 16, green at 8 and blue at 0. Each color component has a range of 0..255.
- You can write debugging info to the text window using `printf`.

From here: draw your own images using `screen->Plot` and other `Surface` methods, handle keys and mouse input using the methods of the `Game` class (see game.h) and add .cpp and .h files to extend and structure your project.

Basic math classes can be found in precomp.h (starting at line 191). Here you will find `float2`, `float3`, `float4` as well as (a.o.) int and uint counterparts, with an extensive set of operators. There are also basic classes for storing bounding boxes and for matrix calculations. As with the rest of the template, this serves as a basis; you may find it desirable to add some code of your own depending on what your project needs.

Advanced users may benefit from the integration of OpenCL; see the GPGPU section later in this document. The math classes are designed to work well with the OpenCL functionality.

Useful things

In the `precomp.h` file you will also find the class `JobManager`, which you can use to run your code on multiple CPU cores. A quick overview of how it is used:

Do once (e.g. in `Game::Init`), to initialize the job system:

```
JobManager::CreateJobManager( 8 /* your logical core count */ );
```

Then, for the actual parallel code:

```
JobManager* jm = JobManager::GetJobManager();
for( int i = 0; i < jobCount; i++ ) jm->AddJob2( &theJob[i] );
jm->RunJobs();
```

Here, `theJob` is an array of objects of a class derived from `Job`, which must implement `Main()`:

```
class theJob : public Job { public: void Main() { /* work */ }; }
```

A high-resolution timer is also provided. See struct `Timer` for details. A timer is created in an arbitrary scope and queried using its `elapsed` method:

```
Timer myTimer;
for (int i = 0; i < 10; i++)
{
    myTimer.reset();
    // ... do something ...
    printf( "iteration took % f milliseconds.\n", myTimer.elapsed() * 1000);
}
```

GPGPU*

The template provides OpenCL support to deploy the GPU in your calculations. Here is an example of its use:

```
static Kernel* kernel = 0;          // statics should be members of Game of course.
static Surface bitmap( 512, 512 ); // having them here allows us to disable the OpenCL
static Buffer* clBuffer = 0;       // demonstration using a single #if 0.
if (!kernel)
{
    // prepare for OpenCL work
    Kernel::InitCL();
    // compile and load kernel "render" from file "kernels.cl"
```

```
    kernel = new Kernel( "cl/kernels.cl", "render" );
    // create an OpenCL buffer over using bitmap.pixels
    clBuffer = new Buffer( 512 * 512, Buffer::DEFAULT, bitmap.pixels );
}
// pass arguments to the OpenCL kernel
kernel->SetArgument( 0, clBuffer );
// run the kernel; use 512 * 512 threads
kernel->Run( 512 * 512 );
// get the results back from GPU to CPU (and thus: into bitmap.pixels)
clBuffer->CopyFromDevice();
// show the result on screen
bitmap.CopyTo( screen, 500, 200 );
```

The code demonstrates the most important steps in writing GPGPU code: loading and compiling a kernel, creating buffers to pass data between ‘host’ and ‘device’, setting kernel arguments, executing a kernel on the device, and retrieving data from device to host.

A full OpenCL tutorial is outside the scope of this document. If you want to see an example of OpenCL used in the `tmpl8`, please refer to the voxel template on GitHub.

Go Forth and Code

That should do the job for now; if you have any questions do not hesitate to contact me:

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*: the use of GPGPU is totally optional and only provided for your enjoyment.