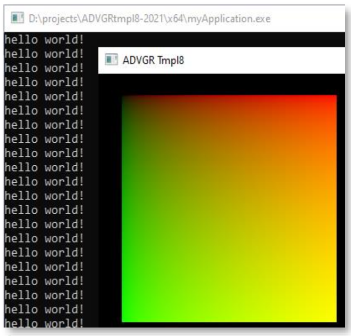
“Getting Started with the tmpl8-2024”

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 (now known as BUas/CMGT), 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; limited in important aspects but rather accommodating for some advanced stuff at the same time. So, great 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 2022, all flavors).

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"

// -----------------------------------------------------------
// 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 */ )
{
    // NOTE: clear this function before actual use; code is only for
    // demonstration purposes. See _ getting started.pdf for details.

    // clear the screen to black
    screen->Clear( 0xff );

    //  draw a sprite
    //  ...
}
```

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

- A window is opened.
- The size of the screen can be obtained from `SCRWIDTH` and `SCRHEIGHT`.
- The display is cleared with a blue backdrop.
- A sprite is loaded into a static variable and drawn, with animation.
- Some text is drawn to a text window behind the graphics window.
- Some text is rendered to the graphics window.
- A square with 32-bit colors is rendered. In these 32 bits, red starts at bit 16, green at 8 and blue at 0. Each color component has a range of 0..255.
- And finally, another square is rendered, this time on the GPU, using an OpenCL kernel.

Basic math classes can be found in tmplmath.h. Here you will find `float2`, `float3`, `float4` as well as int and uint counterparts, with an extensive set of operators. There are also basic classes for storing bounding boxes and for matrix and quaternion 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 * 4, 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:

bikker.j@gmail.com / bikker.j@buas.nl

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