

# Advanced Programming for HPC - Report 3

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## Implementation

```
--global-- void grayscale(uchar3 *input, uchar3 *output) {
    int tid = threadIdx.x + blockIdx.x * blockDim.x;
    output[tid].x = (input[tid].x + input[tid].y + input[tid].z) / 3;
    output[tid].z = output[tid].y = output[tid].x;
}

void Labwork::labwork3_GPU() {
    // Calculate number of pixels
    int pixelCount = inputImage->width * inputImage->height;
    char *hostInput = inputImage->buffer;
    outputImage = static_cast<char *>(malloc(pixelCount * 3));
    for (int j = 0; j < 100; j++) { // let's do it 100 times, otherwise it$
        # pragma omp parallel for
        for (int i = 0; i < pixelCount; i++) {
            outputImage[i * 3] =
                (char) (((int) inputImage->buffer[i * 3] + (int) inputImage->buffer[i * 3 + 1]
                + (int) inputImage->buffer[i * 3 + 2]) / 3);
            outputImage[i * 3 + 1] = outputImage[i * 3];
            outputImage[i * 3 + 2] = outputImage[i * 3];
        }
    }

    // Allocate CUDA memory
    uchar3 *devInput;
    uchar3 *devOutput;
    cudaMalloc(&devInput, pixelCount * 3);
    cudaMalloc(&devOutput, pixelCount * 3);

    // Copy CUDA Memory from CPU to GPU
    cudaMemcpy(devInput, hostInput, pixelCount * 3, cudaMemcpyHostToDevice);

    // Processing
    int blockSize = 64;
    int nBlock = pixelCount / blockSize;
    grayscale<<<nBlock, blockSize>>>(devInput, devOutput);

    // Copy CUDA Memory from GPU to CPU
    cudaMemcpy(outputImage, devOutput, pixelCount * 3, cudaMemcpyDeviceToHost);

    free(hostInput);
    cudaFree(devInput);
    cudaFree(devOutput);
}
```

```
} // Cleaning
```

## Result



Figure 1: Original input image



Figure 2: Output image