Scientific Computing and Machine Learning on Multi- and Manycore Architectures Exercise 5

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Analysis

To check whether Spmv works, we simply calculate the multiplication of sparse matrix with a vector whose value are all 1. This is equivalent to calculate the row summation, which is a simply way to check if Somv works or not.

Inside the code, I made a small change to calculate row summation when loading matrix. Code before/after chang can be found and compared below.

```
// write Aj,Ax into Bj,Bx
for( i = 0; i < nz; i++ ) {
    int row_  = I[i];
    int dest = row[row_];
    col[dest] = J[i];
    val[dest] = valt[i];
    row[row_]++;
}
```

```
// write Aj,Ax into Bj,Bx
for( i = 0; i < nz; i++ ) {
    int row_  = I[i];
    int dest = row[row_];
    col[dest] = J[i];
    val[dest] = valt[i];
    row[row_]++;
    // used for checking result
    rowsum[row_] += val[dest];
}
```

Run the code

For each program in this exercise, please use

```
nvcc -I./ mmio.cu spmv_framework.cu -o spmv
```

To see computational result, please type

```
./spmv [.mtx file]
```

.mtx file can be found at `https://www.cise.ufl.edu/research/sparse/matrices/`, some test matrix are provided in the same folder such as: bcsstk24.mtx, rotor1.mtx, and Trefethen_2000.mtx. Besiders, two small test matrices are provided with file name test_matrix.mtx, and test_matrix_2.mtx.

The result would looks like:

```
[Input Summary]
This is a 2000-by-2000 matrix with 21953 nonzero.

runtime [ms]: 0.000458

 Error analysis start ..
 Error analysis finished ..
[Analysis Summary]
 Results from gemv and spmv are the same.
```

If my code is incorrect, then you will see how many dismatch between results from gemm and spmv. But I trust my own code, so this would not happened.