并行计算大作业

——并行优化矩阵乘法

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Outline

code: buffered input

```
inline char next_char()
{
    static char buf[100000], *p1 = buf,
        *p2 = buf;
    return p1 == p2 && (p2 = (p1 = buf)
        + fread(buf, 1, 100000, fin), p1 == p2)
        ? EOF : *p1++;
}
```

code: buffered output

```
inline void flush() {
    fwrite(buffer, 1, s-buffer, stdout);
    s = buffer;
    fflush(stdout);
}
inline void print(const char ch) {
    // putchar(ch); return;
    if (s-buffer>OutputBufferSize-2) flush();
    *s++ = ch;
}
```

code: share memory, block partition

```
__shared__ ld c_a[max_shared_size];
int index = blockDim.x * blockIdx.x + threadIdx.x;
if (index >= an * bm) return;
int st = min(index, addi) * (workload+1) +
max(0, index - addi) * workload, ed =
st + workload + (index < addi ? 1 : 0);
int shareda = min(am, max_shared_size);
for (int p=st; p<ed; ++p) {
    // ...
```

code: share memory, block partition

```
for (int p=st; p<ed; ++p) {
    int i = p / bm, j = p % bm;
    if (p % bm == 0) {

        for (int j=0; j<shareda; ++j) {
            c_a[j] = d_a[i * am + j];
        }
        __syncthreads();
    }
    ...
```

code: share memory, block partition

```
for (int p=st; p<ed; ++p) {
    int i = p / bm, j = p % bm;
    if (p % bm == 0) {

        for (int j=0; j<shareda; ++j) {
            c_a[j] = d_a[i * am + j];
        }
        __syncthreads();
    }
    ...
```

code: async IO, creating streams

```
int st = 0, ed = n * m;
// printf("st=%d ed=%d, a=%p\n", st, ed, a);
cudaStream_t stream[2];
int mask = 0;
cudaStreamCreate(&stream[0]);
cudaStreamCreate(&stream[1]);
int size;
```

code: async IO, creating streams

```
cudaStream_t mainstream;
cudaStreamCreate(&mainstream);
// ...
copyMatrixAsync(h_a, d_a, an, am, mainstream);
// ... read h_b
copyMatrixAsync(h_b, d_b, bn, bm, mainstream);
// ...
matrixMult<<<grids, block_size, 0, mainstream>>>
(d_a, d_b, d_c, an, bm, am);
// ...
handleCudaError(cudaStreamSynchronize(mainstream));
// ...
outputMatrixAsync(h_c, d_c, n, m);
// pipeline: memcpy from device & output each rows
```

code: async IO, pipelines

```
for (; st<ed; st+=size, mask^=1) {
    size = min(chunk_size, ed - st);
    handleCudaError(cudaMemcpyAsync(a + st,
     d_a + st, size * sizeof(ld),
     cudaMemcpyDeviceToHost, stream[mask]));
    // exit(0);
    if (st - chunk_size >= 0) {
        // printf("%d %d\n",st-chunk_size, st);
        handleCudaError(cudaStreamSynchronize(strean
        outputinterval(a, st-chunk_size, st);
    }
}
```

Backgrounds

- 1111111111111
- 2222222222222
- 3333333333333
- 4444444444444

My Photo

图: hahahaha...

Emmm...

Sequence Tagging Loss

$$\mathcal{L}_p = -\sum_{i=1}^{S}\sum_{j=1}^{N} p_{i,j}\log(\hat{p}_{i,j})$$

Language Classifier Loss

$$\mathcal{L}_a = -\sum_{i=1}^{S} l_i \log(\hat{l}_i)$$

Bidirectional Language Model Loss

$$\mathcal{L}_l = -\sum_{i=1}^{S}\sum_{j=1}^{N} \log(P(w_{j+1}|f_j)) + \log(P(w_{j-1}|b_j))$$

References

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Semi-supervised Multitask Learning for Sequence Labeling.

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