Midterm evaluation: Activity analysis for reverse-mode differentiation of (CUDA) GPU kernels

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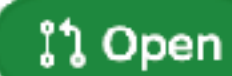
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Recap: Removing exessive AtomicAdd's

```
__global__ void kernel_call(double *out, double *in) {
    int index = threadIdx.x + blockIdx.x * blockDim.x;
    out[index] = in[index];
}

void fn(double *out, double *in) {
    kernel_call<<<1, 10>>>(out, in);
}
```

```
{
    out[index0] = _t2;
    double _r_d0 = _d_out[index0];
    _d_out[index0] = 0.;
    atomicAdd(&_d_in[index], _r_d0);
}
```

```
    _d_in[index] += _rd0;
```

Don't create CUDA atomics for basic indices #1441

Open · ovdiiuv wants to merge 1 commit into `vgvassilev:master` from `ovdiiuv:atomics-ana`

- Support direct and indirect indexes

- All linear combinations of the above

- Potentially adding new indices is easy!

```
int index = threadIdx.x + blockIdx.x * blockDim.x;

out[index] = in[index];

out[index] = in[threadIdx.x + blockIdx.x * blockDim.x];

out[index] = in[2*index+1];
```

```
int index = threadIdx.x + blockIdx.x * blockDim.x;

index = . . .;

out[index] = in[index];
```

Future goals

- Account for reassignments when checking for index injectivity

- Compare speedup on LULESH/RSBench

- Make Activity default with same infrastructure as TBR

Move TBR infrastructure to AnalysisBase #1456

Open ovdiiuv wants to merge 1 commit into `vgvassilev:master` from `ovdiiuv:vadef`

Avoid repetetive CFG construction #1417

Merged ovdiiuv merged 1 commit into `vgvassilev:master` from `ovdiiuv:cudaana` 28 days ago

Recompute the values of CUDA built-in index functions #1430

Merged vgvassilev merged 1 commit into `vgvassilev:master` from `ovdiiuv:remove-atomics` 3 weeks ago

Don't create CUDA atomics for basic indices #1441

Open ovdiiuv wants to merge 1 commit into `vgvassilev:master` from `ovdiiuv:atomics-ana`

Add support for sparsity pattern generation for jacobians #1388

Open ovdiiuv wants to merge 3 commits into `vgvassilev:master` from `ovdiiuv:sppat`

Questions?