

M3DC1 skeleton code with OpenACC on CGPU

10/26/2020

main->matdefall->matdefphi->flux_lin

M3DC1.git

m3dc1_scorec
unstructured
skeleton

README.new

1. login CORIGPU

module purge; module load esslurm;

module load cuda/10.2.89 pgi/19.10 mvapich2/2.3.2

module load gsl fftw/3.3.8 hdf5-parallel/1.10.5-pgi

salloc -C gpu -N 1 -n 20 -G 8 -A m1759 -t 03:59:59 --exclusive -q special

m3dc1_skeleton_big_spec_omp

m3dc1_skeleton_big_spec_acc

2. compile

make USEOPENACC=1

3. run

batchscript.corigpu

matdefall

!\$acc routine (matdef) vector

!\$acc routine (define_element_quadrature,define_fields,int0,int1) seq

!\$acc parallel loop gang present(psi_field, eta_field) &

!\$acc private(ss,dd,eta79_I,psi79_I,f79_I,mu79_I,nu79_I,weight_79_I,fterm, xi_79_I,zi_79_I,norm79_I) &

!\$acc reduction(+:volume,current)

do itri=1,numelms

it=itri

call define_element_quadrature(it, 12, 5,weight_79_I, xi_79_I, zi_79_I, eta_79_I, norm79_I)

call define_fields(it,psi_field, eta_field,eta79_I,psi79_I,f79_I,fterm,nu79_I,mu79_I)

call matdefphi(it,ss,dd,mu79_I,nu79_I,eta_79,f79_I)

volume = volume + int0(weight_79_I)

current = current + int1(psi79_I(:,OP_LP),weight_79_I)

end do

matdefall

```
subroutine matdefphi(itri,ss,dd,mu79_l,nu79_l,eta79_l,f79_l)
```

```
!$acc routine vector
```

```
ss = 0.
```

```
dd = 0.
```

```
!$acc loop vector
```

```
do j=1,dofs_per_element
```

```
call flux_lin(mu79_l(:,:,:),nu79_l(:,:,:),ss(:,:,:),dd(:,:,:), j, eta79_l,f79_l)
```

```
end do
```

flux_lin

```
subroutine flux_lin(trial, lin, ssterm, ddterm, j, eta79_l, f79_l)
```

```
!$acc routine
```

```
!!$acc data present (f79, trial, lin, ssterm, ddterm) create (tempg)
```

```
!!$acc kernels
```

```
  ssterm = 0.
```

```
  ddterm = 0.
```

```
!!$acc end kernels
```

```
!!$acc kernels
```

```
  tempg = int2(trial(:, :, OP_1), lin(:, OP_1, j))
```

```
!!$acc end kernels
```

```
!$acc loop independent
```

```
do i=1,dofs_per_element
```

```
  ssterm(i,psi_g) = ssterm(i,j,psi_g) + tempg(i)
```

```
  ddterm(i,psi_g) = ddterm(i,j,psi_g) + tempg(i)
```

```
enddo
```

Flux-lin cont.

```
!!$acc update device (ssterm, ddterm)
```

```
!!$acc serial
```

```
    tempg = -int3(trial(:, :, OP_DR), lin(:, OP_DR, j), eta79_l(:, OP_1)) - int3(trial(:, :, OP_DZ), lin(:, OP_DZ, j), eta79_l(:, OP_1))
```

```
!!$acc end serial
```

```
!$acc loop independent
```

```
do i=1, dofs_per_element
```

```
    ssterm(i, j, psi_g) = ssterm(i, j, psi_g) - thimp * dt * tempg(i)
```

```
    ddterm(i, j, psi_g) = ddterm(i, j, psi_g) + (1. - thimp) * dt * tempg(i)
```

```
enddo
```

```
!$acc loop independent private(temp)
```

```
do i=1, 100
```

```
    j = mod((i-1), nfield) + 1
```

```
    temp = -int3(trial(:, :, OP_DR), lin(:, OP_DR, j), f79_l(:, OP_1, j)) - int3(trial(:, :, OP_DZ), lin(:, OP_DZ, j), f79_l(:, OP_1, j)) + int3(trial(:, :, OP_1), lin(:, OP_1, j), f79_l(:, OP_GS, j))
```

```
    ssterm(:, j, psi_g) = ssterm(:, j, psi_g) - thimp * dt * temp(:)
```

```
    ddterm(:, j, psi_g) = ddterm(:, j, psi_g) + (1. - thimp) * dt * temp(:)
```

```
end do
```

```
!!$acc end data
```

