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1: procedure GHDYN_NONSING_KERNEL
2:    $j := \text{blockIdx}.x$ ;  $i := \text{blockIdx}.y$ 
3:    $x := \text{threadIdx}.x$ ;  $y := \text{threadIdx}.y$ 
4:   if  $i \neq j$  then                                      $\triangleright$  Singularity case will be computed by CPU
5:      $H\text{buffer}[x][y] \leftarrow \text{GenerateMatrixHdyn}(i, j, x, y)$ 
6:      $G\text{buffer}[x][y] \leftarrow \text{GenerateMatrixGdyn}(i, j, x, y)$ 
7:     if  $x < 3$  and  $y < 3$  then
8:        $Helem[x][y] \leftarrow \text{thrust}::\text{reduce}(H\text{buffer}[x][y][0], H\text{buffer}[x][y][g^2])$ 
9:        $H[i][j] \leftarrow Helem$                                 $\triangleright H[i][j]$  is a  $3 \times 3$  matrix
10:    else if  $g - 3 \leq x \leq g$  and  $g - 3 \leq y \leq g$  then    $\triangleright$  Make sure this runs in another
warp
11:       $u := g - 3$ ;  $v := g - 3$ 
12:       $Gelem[u][v] \leftarrow \text{thrust}::\text{reduce}(G\text{buffer}[u][v][0], G\text{buffer}[u][v][g^2])$ 
13:       $G[i][j] \leftarrow Gelem$                                 $\triangleright G[i][j]$  is a  $3 \times 3$  matrix
14: procedure GHDYN_SINGULAR
15:   #pragma omp parallel for
16:   for  $i := 1, m$  do
17:      $G_{\text{elem}} \leftarrow 0$ 
18:      $H_{\text{elem}} \leftarrow 0$ 
19:     for  $y := 1, g$  do
20:       for  $x := 1, g$  do
21:          $G_{\text{elem}} \leftarrow G_{\text{elem}} + \text{GenerateMatrixGsing}(i, x, y)$ 
22:          $H_{\text{elem}} \leftarrow H_{\text{elem}} + \text{GenerateMatrixHsing}(i, x, y)$ 
23:      $G\text{diag}[i] \leftarrow G_{\text{elem}}$ 
24:      $H\text{diag}[i] \leftarrow H_{\text{elem}}$ 
25: procedure GHDYN_ASSEMBLY
26:   Allocate  $H\text{diag}, G\text{diag}$  in Host memory
27:   Run GHdyn_singular( $H\text{diag}, G\text{diag}$ ) in another CPU thread
28:   Move data to GPU memory
29:   Allocate  $H$  and  $G \in \mathbb{C}^{(3m) \times (3n)}$  in GPU memory
30:   Allocate  $H\text{buffer}, G\text{buffer}$  in GPU shared memory, buffer of matrices  $3 \times 3$  of size  $g^2$ 
31:   Run GHdyn_kernel with  $m \times n$  blocks and  $g \times g$  threads.
32:   Retrieve  $H, G$  from GPU memory.
33:   Retrieve  $H\text{diag}, G\text{diag}$  from GHdyn_singular when completed.
34:   for  $i := 1, m$  do
35:      $G[i][i] \leftarrow G\text{diag}[i]$ 
36:      $H[i][i] \leftarrow H\text{diag}[i]$ 
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