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**Algorithm 3** Creates  $[H]_{\text{dyn}}, [G]_{\text{dyn}} \in \mathbb{C}^{(3m) \times (3n)}$

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1: procedure GH_DYN_KERNEL( $H_{\text{stadiag}}, G_{\text{stadiag}}$ )
2:    $j := \text{blockIdx}.x; i := \text{blockIdx}.y; x := \text{threadIdx}.x; y := \text{threadIdx}.y$ 
3:    $l := \text{laneId}; w := \text{warpId}; \text{numWarps} = \lceil g^2/32 \rceil$ 
4:    $H_{\text{local}} \leftarrow \text{GenerateMatrixHdyn}(i, j, x, y)$   $\triangleright$  Return  $3 \times 3$  matrix
5:    $G_{\text{local}} \leftarrow \text{GenerateMatrixGdyn}(i, j, x, y)$ 
6:   if  $i = j$  then  $\triangleright$  Singularity
7:      $\text{OvercomeSingularity}(H_{\text{buffer}}, G_{\text{buffer}})$ 
8:    $\text{shfl\_down}(H_{\text{local}})$   $\triangleright$  Reduces matrices in the same warp
9:    $\text{shfl\_down}(G_{\text{local}})$ 
10:  if  $l = 0$  then
11:     $H_{\text{buffer}}[\text{warpId}] = H_{\text{local}}$ 
12:     $G_{\text{buffer}}[\text{warpId}] = G_{\text{local}}$ 
13:  if  $w = 0$  and  $l < 9$  then
14:     $v = l \% 3; u = l / 3;$ 
15:     $Helem[u][v] \leftarrow \text{thrust}::\text{reduce}(H_{\text{buffer}}[u][v][0], H_{\text{buffer}}[u][v][\text{numWarps}])$ 
16:    if  $i = j$  then
17:       $Helem[u][v] \leftarrow Helem[u][v] + H_{\text{stadiag}}[i][u][v]$ 
18:     $H[i][j] \leftarrow Helem$   $\triangleright H[i][j]$  is a  $3 \times 3$  matrix
19:  else if  $w = 1$  and  $l < 9$  then
20:    Repeat code from lines 14-18, but for  $G, G_{\text{buffer}}, Gelem$  and  $G_{\text{stadiag}}$ 
21: procedure GH_DYN_ASSEMBLY
22:   Move data to GPU memory
23:   Allocate  $H$  and  $G \in \mathbb{C}^{(3m) \times (3n)}$  in GPU memory
24:   Allocate  $H_{\text{buffer}}, G_{\text{buffer}}$  in GPU shared memory, buffer of matrices  $3 \times 3$  of size  $g^2$ 
25:   Run GHdyn_kernel with  $m \times n$  blocks and  $g \times g$  threads. Await for return
26:   Reorder matrices columns regarding the boundary conditions
27:   Keep  $H, G$  in GPU memory, if enough memory. Else retrieve both matrices

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