i

$jmax$

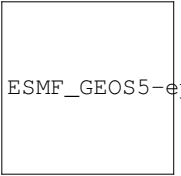

ESMF_sandwich-eps-converted-to.pdf

w_{ij}

$$w_{ij} = f_{ij} * A_{si}/A_{dj}$$

$$w_{ij} = f_{ij} * A_{si} / (A_{dj} * D_j)$$

$$\sum^{all-source-cells}(V_{si} * A'_{si}) = \sum^{all-destination-cells}(V_{dj} * A'_{dj})$$

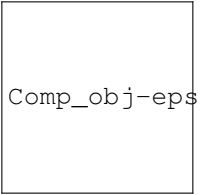

ESMF_GEOS5-eps-converted-to.pdf


ESMF_appunit-eps-converted-to.pdf


ESMF_serial-eps-converted-to.pdf


ESMF_concurrent-eps-converted-to.pdf


ESMF_reconcile-eps-converted-to.pdf


Comp_obj-eps-converted-to.pdf


Excl_src_grid-eps-converted-to.pdf


Excl_dst_grid-eps-converted-to.pdf


Excl_src_grid_cpl-eps-converted-to.pdf


Excl_dst_grid_cpl-eps-converted-to.pdf


State_obj-eps-converted-to.pdf


webservices-eps-converted-to.pdf

d

$$d = \sum_{i}^{intersecting-source-cells} (s_i + \nabla s_i \cdot (c_{si} - c_d))$$

s_i

c_d

$$\sum^{all-source-cells}(V_{si} * A_{si}) = \sum^{all-destination-cells}(V_{dj} * A_{dj})$$

$$u_t + uu_x + vu_y + \frac{1}{\rho}p_x = 0$$

$$v_t + uv_x + vv_y + \frac{1}{\rho}p_y = 0$$

$$\rho_t + \rho u_x + \rho v_y = 0$$

$$\frac{\rho}{\rho^\gamma} + u\left(\frac{p}{\rho^\gamma}\right)_x + v\left(\frac{p}{\rho^\gamma}\right)_y = 0$$

p

ρ

u

v

< 0

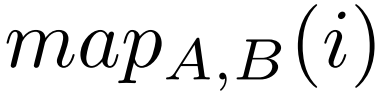
$$n_{DE} = n_{PET}$$

$$map_{A,B}(i = 1...n_A) = i_B$$

$i_B \in [\phi, 1...n_B]$

n_A

n_B



$$i_B = \phi$$


FieldParameterSetup-eps-converted-to.pdf

$$dstField(i) = i * srcField(i), i = 1...4$$

dst_i

$M_{i,j}$

$$u_t = \alpha^2 u_{xx}$$

$u(0, x) = 20$

$u(t,0) = 10, u(t,1) = 40$

x

n

$rank \times tileCount$

10×10

$localDeCount > 1$

$[-10, 5]$

$$4 \times 4 \times 4 = 64$$

$f(i, j)$

$$f(i,j) = \sin(\alpha i)\cos(\beta j),$$

$\alpha = 2\pi/N_i, i = 1, ...N_i$

$\beta = 2\pi/N_j, j = 1, ...N_j,$

$N_i = 10$

$N_j = 20$

2

5

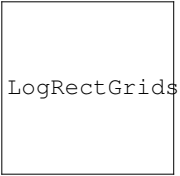
$2 \times 5 = 10$

10

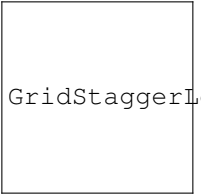
1

[]


GridDecomps-eps-converted-to.pdf


LogRectGrids-eps-converted-to.pdf


GridStaggerLoc2D-eps-converted-to.pdf


GridStaggerLoc3D-eps-converted-to.pdf


GridExclusiveReg-eps-converted-to.pdf

$(-1, -1)$

$(1, 1)$

-1


GridCustStaggerLoc-eps-converted-to.pdf

$(0, 0)$

$(0, 0, 0)$

$(1, 1, 1)$


GridCellsAndCorners-eps-converted-to.pdf

$(10, 10)$

10^8

e

$number\_of\_nodes\_in\_element(1) + number\_of\_nodes\_in\_element(2) + \cdots + number\_of\_nodes\_in\_element(e-1) + 1$

$(n-1) * spatialDim + 1$

$number\_of\_corners\_in\_element(1) + number\_of\_corners\_in\_element(2) + \cdots + number\_of\_corners\_in\_element(e-1) + 1$

F

$$\sum_{g=1}^{g=n\_srcgrid} \sum_{s=1}^{s=n\_srccell} f_{1s} f_{2s} A_s F_s$$

$$\sum_{g=1}^{g=n\_dstgrid} \sum_{d=1}^{d=n\_dstcell} \sum_{s=1}^{s=n\_intersect} (w_{sd} F_s) f_{2d} A_d$$

w_{sd}


XGridEx1-eps-converted-to.pdf

N

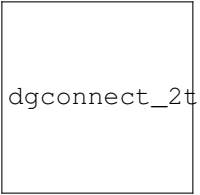
$(nDEs \times 1 \times ... \times 1)$

$nDEs$

$N-1$

4×1

$2 \times 3 = 6$


dgconnect_2tiles_not_connected-eps-converted-to.pdf

$$\vec{a} \rightarrow \vec{b} = \hat{R}\vec{a} + \vec{P}.$$

$\vec{a}$

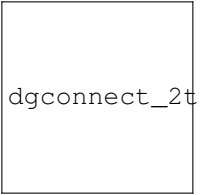
$\vec{b}$

$\hat{R}$

$$\hat{R} = \mathbb{1}$$

$\vec{P} = (0, 0)$

$$\vec{P} = \vec{b} - \vec{a} = (1, 3) - (11, 3) = (-10, 0)$$


dgconnect_2tiles_connected-eps-converted-to.pdf

$$\vec{b} \to \vec{a} = \hat{R}^{-1}\vec{b} - \hat{R}^{-1}\vec{P}.$$

$\vec{p}$

$$\hat{R}(\vec{a} - \vec{p}) + \vec{p}$$

$$\hat{R}\vec{a} + (\mathbb{1} - \hat{R})\vec{p}$$

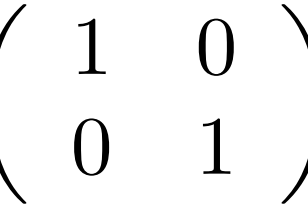
$$\vec{P} = (\mathbb{1} - \hat{R})\vec{p}$$

$$\vec{a} \rightarrow \vec{b} = \hat{R}\vec{a} + (\mathbb{1} - \hat{R})\vec{p} + \vec{t}.$$

$$\vec{P} = (\mathbb{1} - \hat{R})\vec{p} + \vec{t}.$$

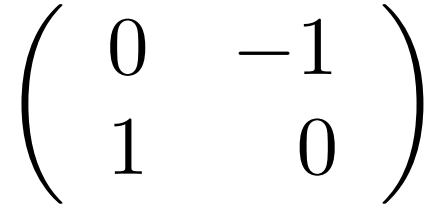
90°

0°



$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

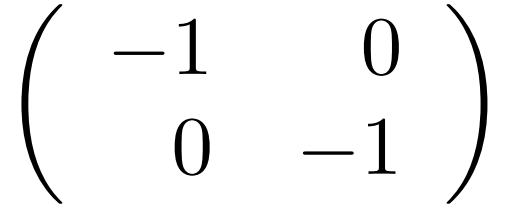
$$\begin{pmatrix} 1 \\ 2 \end{pmatrix}$$



$$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} -2 \\ 1 \end{pmatrix}$$

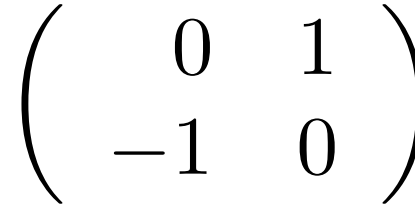
180°



$$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$$

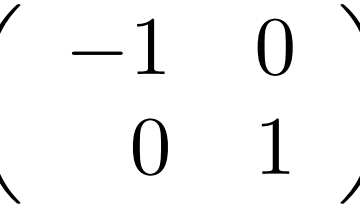
$$\begin{pmatrix} -1 \\ -2 \end{pmatrix}$$

270°



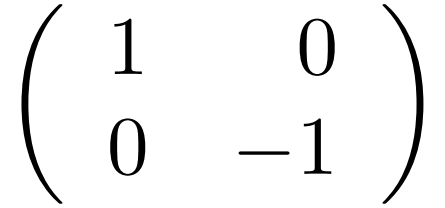
$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 2 \\ -1 \end{pmatrix}$$



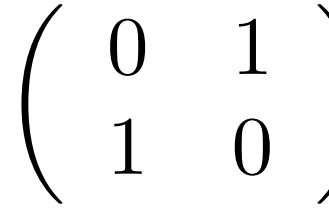
$$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} -1 \\ 2 \end{pmatrix}$$



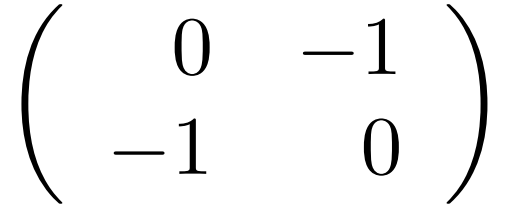
$$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ -2 \end{pmatrix}$$



$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 2 \\ 1 \end{pmatrix}$$

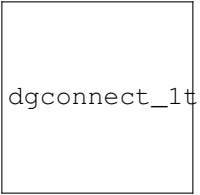


$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

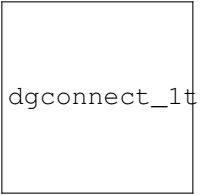
$$\begin{pmatrix} -2 \\ -1 \end{pmatrix}$$

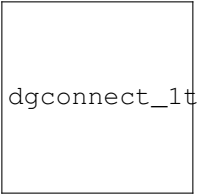
$0°..360°$

$-80° .. +80°$


dgconnect_1tile_not_connected-eps-converted-to.pdf

$$\vec{P} = \vec{b} - \vec{a} = (1, j) - (51, j) = (-50, 0)$$


dgconnect_1tile_periodic1_connected-eps-converted-to.pdf


dgconnect_1tile_periodic2_connected-eps-converted-to.pdf

$i + 1$

$j = jmax$

180°

$$i = mod(i + i_{size}/2, i_{size})$$

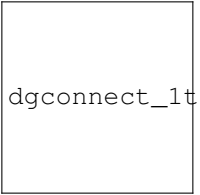
$$i_{size} = i_{max} - i_{min} + 1$$

$$\vec{a} = \begin{pmatrix} i \\ jmax + 1 \end{pmatrix} \rightarrow \vec{b} = \begin{pmatrix} i + i_{size}/2 \\ jmax \end{pmatrix}.$$

$\vec{b} - \hat{R}\vec{a}$

$$\begin{pmatrix} i + i_{size}/2 \\ j_{max} \end{pmatrix} - \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} i \\ j_{max} + 1 \end{pmatrix}$$

$$\left(\begin{array}{l} i_{size}/2 \\ 2j_{max}+1 \end{array} \right).$$

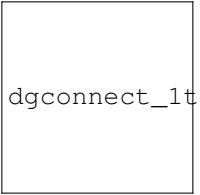

dgconnect_1tile_peripole_connected-eps-converted-to.pdf

$(i_{min}, j_{max} + 1) \rightarrow (i_{max}, j_{max})$

$$(i_{min}+1, j_{max}+1) \rightarrow (i_{max}-1, j_{max})$$

$$\begin{pmatrix} i_{max} \\ j_{max} \end{pmatrix} - \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} i_{min} \\ j_{max}+1 \end{pmatrix}$$

$$\begin{pmatrix} i_{max} + i_{min} \\ 2j_{max} + 1 \end{pmatrix}.$$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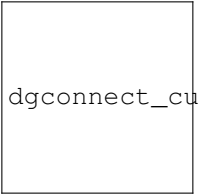
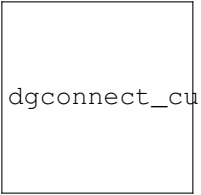

dgconnect_cusph_not_connected-eps-converted-to.pdf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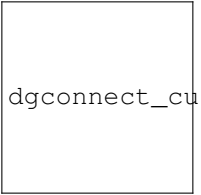

dgconnect_cusph_6connected-eps-converted-to.pdf

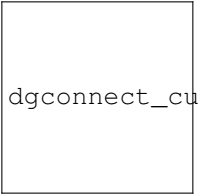
$$\vec{P} = \vec{b} - \hat{R}\vec{a}.$$

90°

270°

$$\hat{R} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

$$\hat{R} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$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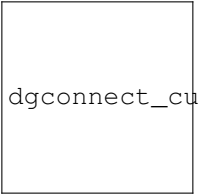
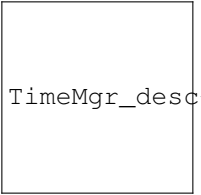

dgconnect_cusph_12connected-eps-converted-to.pdf

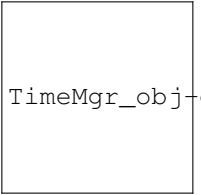
$> 2^{31} - 1 = 2,147,483,647$

$1 + n$

$n =$


TimeMgr_desc-eps-converted-to.pdf

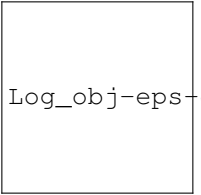
$$+\frac{\mathrm{sN}}{\mathrm{sD}}$$


TimeMgr_obj-eps-converted-to.pdf

14

2^{63}

2^{31}


Log_obj-eps-converted-to.pdf

$[0...localDeCount-1]$

$[1...localDeCount]$


VM_design-eps-converted-to.pdf

$[0..petCount-1]$


Appendix_uml-eps-converted-to.pdf