$\Omega = [0,1]^2 h vertex\_matrix\, cell\_matrix vertex\_matrix\, cell\_matrix$
$Example h = 0.5$

$nodes \hat{T} = [0,1]^2 p_i$
$p_i(x_j) = \delta_{ij}, x_j$
p_i
$k\{x^i y^j, i, j = 0...k\} 2kkk\frac{1}{k}k + 1$
$Remark$
$sf\_generate kk mesh\_generate \frac{1}{k}(k+1)^2 := n$

SF
$Example SF$

$A_{ij} = a(\phi_i, \phi_j) local see\ also$
$sm\_assemble\_local h SF$
hf_eval_poly
$sf\_derivate$
$int\_gauss\_weights$
int_gauss
$(a_{ij})^T T ij$

ρ
$\rho mesh\_nodes i i j j j i mesh\_nodes$
$rhs\_integration$
$mesh\_nodes repmat f hf\_eval\_poly$
$minimal\ residual\ method conjugate\ gradient\ method u \phi_i u$

$\phi_i u_h$
$hf\_eval\_solution (x, y) u$
$(x, y) u_h hf\_eval\_solution (x, y) u_h$
$m\_plot\_solution hf\_eval\_solution u_h$
$hf\_vtk m\_plot\_paraview$
$linear\_solver\_analytics$
$error\_map$
$error\_runge\_evaluation$
$Evaluation\ of\ a\ Polynomial$
$p(x, y) \in R hf\_eval\_poly SF$

Gauss quadrature
$(x_1, ..., x_n)^T (w_1, ..., w_n)^T f$

$meshgrid W_1, W_2 w_i X, Y x_i f(X, Y)$

$int\_gauss\_vectorized int\_gauss\_vectorized\_matrices$
f

$repmat$

$A, B, C, D, E, F \in R^{3\times 3} M$

(1) 0
10
10
01
01
01 $(^{-})$ $A_1 \bar{B}_1$
$\bar{A}_2 \bar{B}_2$
$\bar{A}_3 \bar{B}_3$
$\bar{C}_1 \bar{D}_1$
$\bar{C}_2 \bar{D}_2$
$\bar{C}_3 \bar{D}_3$
$\bar{E}_1 \bar{F}_1$
$\bar{E}_2 \bar{F}_2$
$E_3 F_3$
$\bar{A}_i i A$

$A^* A$
Vectorization of sm_local_assembly
$p_1, ..., p_n SM local$

$P_i p_i$

$.*(P_1, ..., P_n)^T hf\_eval\_poly repmat$

$P_1^T xy P_i$