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**Design of geometric multigrid methods on  
semi-structured grids**

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We are interested in the design of efficient geometric multigrid methods on hierarchical triangular grids for problems in two dimensions. Assuming that the coarsest grid is rough enough in order to fit the geometry of the domain, a hierarchy of globally unstructured grids is generated. This kind of meshes are suitable for use with geometric multigrid. To discretize problems with constant coefficients on these type of meshes, explicit assembly of the global stiffness matrix for the finite element method is not necessary and this can be implemented using stencils. As the stencil for each coarsest triangle is the same for all unknowns that are interior to it, one stencil suffices to represent the discrete operator reducing drastically the memory required. Fourier analysis is a well-known useful tool in multigrid for the prediction of two-grid convergence rates. With the help of the Fourier Analysis on triangular grids, we design efficient geometric multigrid methods for different problems on hierarchical triangular grids.