PETSc

A brief tutorial

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PETSc resources

- http://www.petsc.org
- Book by Ed Bueler: PETSc for Partial Differential Equations: Numerical Solutions in C and Python
  Codes from the book: https://github.com/bueler/p4pdes
- PETSc has many examples: see http://cpraveen.github.io/teaching/petsc.html

Variable types

- PetscInt: usually 32-bit integer, can be configured for 64-bit integer which is needed for large meshes
- PetscErrorCode: integer return type from Petsc functions
- PetscMPIInt: use this to pass to MPI functions, e.g., to get rank, size, etc.
- PetscReal: usually real double
- PetscScalar: usually real double, can be complex number also. It is used for the scalar field in a vector space.

Printing

- `PetscPrintf`: similar to printf in C
- `PetscPrintf(PETSC_COMM_WORLD, …)`
  prints only on rank=0 process
- `PetscPrintf(PETSC_COMM_SELF, …)`
  prints on every rank

Creating DMDA

- DMDACreate1D
- DMDACreate2D
- DMDACreate3D

DMDA info

- DMDAGetInfo
- DMDAGetCorners
- DMDAGetGhostCorners
- DMDALocalInfo and DMDAGetLocalInfo

Vectors

- Global vector: distributed vector without ghost values
- Local vector: has ghost values
- DMCreateGlobalVector and DMGetGlobalVector
- DMCreateLocalVector and DMGetLocalVector
- VecSetValues
- VecAssemblyBegin and VecAssemblyEnd