Step 1 - RHEA compilation

Clone RHEA

MOOSE

```
>>
cd ~/projects
git clone https://github.com/josebastiase/RHEA.git
```

Block 1 - Kernels

```
>>
QPResidual()
{
   return _velocity[_qp] *_grad_u[_qp];
}
```

Block 2 - Material properties

```
>>
QpStatefulProperties()
{
  _material[_qp] = _input_material;
}
```

Material plumbing

Block 3 - Physics coupling

```
>>
 Kernel(parameters),
  _coupled_var(
   coupledGradient("coupled_variable"))
```

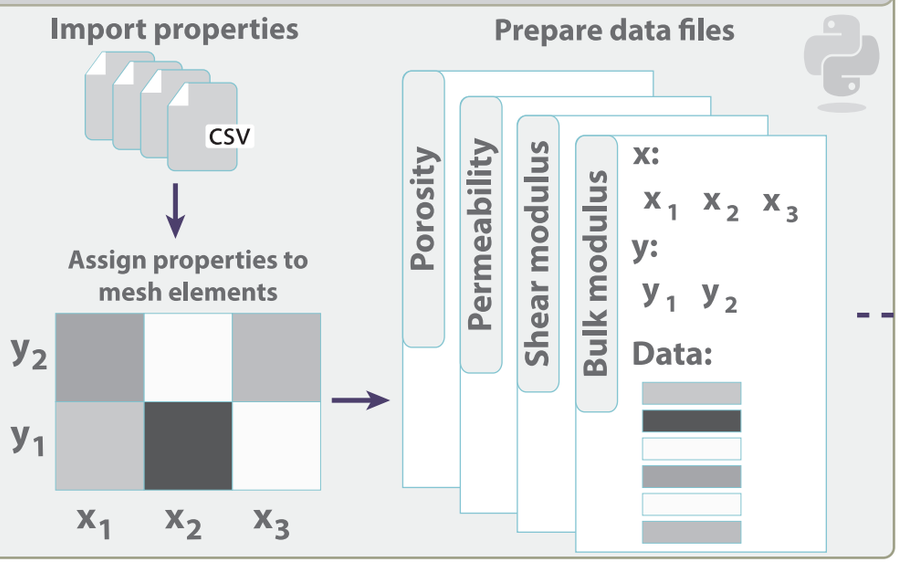
Define, retrieve and store coupled variable

Build RHEA

```
>>
cd ~/projects/RHEA
make -j4
```

RHEA

Step 2 - Preparation of material properties



Step 3 - Simulation setup and control

Create a RHEA simulation

Export material property in MOOSE compatible file format

System	Input file

Mesh
Mesh dimensions and refinement
- MOOSE mesh generator system
- Import mesh from file
	`>>`
	`[Mesh]`
	`type = GeneratedMesh`
	`dim = 1`
	`xmin = 0`
	`xmax = 10`
	`nx = 10`
	`[]`

Functions
Load spatially distributed material properties into RHEA
	`[Functions]`
	`[ShearModulusFcn]`
	`type = PiecewiseMulticonstant`
	`direction = 'right left'`
	`data_file = ShearModulus.data`
	`[]`
	`[]`

Variables
Unknowns of PDE system used by the "Kernels" block
	`[Variables]`
	`[diffused]`
	`order = FIRST`
	`family = LAGRANGE`
	`[]`
	`[]`

AuxVariables
Variable where the imported material properties is stored
	`[AuxVariables]`
	`[ShearModulus]`
	`order = CONSTANT`
	`family = MONOMIAL`
	`[]`
	`[]`

Kernels
Physics of the governing equations. Defined in the weak form of PDEs
	`[Kernels]`
	`[./diff]`
	`type = Diffusion`
	`variable = diffused`
	`[]`
	`[]`

AuxKernels
Assign the spatial distribuited data to the AuxVariables
	`[AuxKernels]`
	`[ShearModulus]`
	`type = FunctionAux`
	`function = ShearModulusFcn`
	`Variable = ShearModulus`
	`execute_on = initial`
	`[]`
	`[]`

Boundary conditions
System's contraints. Adaptable to system's physics
	`[BCs]`
	`[bottom]`
	`type = DirichletBC`
	`variable = diffused`
	`boundary = 'top bottom'`
	`value = 0`
	`[]`
	`[]`

Materials
System properties
Spatially varying and nonlinear behavior
	`[Materials]`
	`[VariableIsotropicTensor]`
	`shear_modulus = ShearModulus`
	`bulk_modulus = BulkModulus`
	`[]`
	`[]`

Executioner
Control solver behavior and time stepping
	`[Executioner]`
	`type = Steady`
	`solve_type = Newton`
	`[]`

Outputs
Define the simulation's output file
	`[Outputs]`
	`exodus = true`
	`[]`

Run simulation and visualize results

```
>>
./RHEA-opt -i YourRHEAFile.i
```

ParaView