以C3D8R为例介绍如何在VUMAT中得到单元编号

Taking C3D8R as an example to introduce how to obtain element numbers in VUMAT

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VUMAT不像UMAT直接给出了单元的编号， VUMAT需要借助一个子程序vumatXtrArg 得到，这个方法最早发布在如下链接中

Unlike UMAT, VUMAT does not directly provide the element number. VUMAT needs to use a subroutine called vumatXtrArg to obtain it, and this method was first published in the following link

https://polymerfem.com/community/constitutive-models/nblock-in-vumat/

相信有不少朋友需要，摘录如下 I believe many friends will need it, here is the excerpt

You are using C3D8R elements which means continuum 3D 8 noded reduced integration. A reduced integration of this kind has a single Gauss pt.
Thats why you have matching GP and element numbers.

Regarding the second, apply the following cover,

```
subroutine vumat (
c Read only -
1 jblock, ndir, nshr, nstatev, nfieldv, nprops, lanneal,
2 stepTime, totalTime, dt, cmname, coordMp, charLength,
3 props, density, strainInc, relSpinInc,
4 tempOld, stretchOld, defgradOld, fieldOld,
5 stressOld, stateOld, enerInternOld, enerInelasOld,
6 tempNew, stretchNew, defgradNew, fieldNew,
c Write only -
7 stressNew, stateNew, enerInternNew, enerInelasNew )
c
include vaba_param.inc
c
dimension jblock(*), props(nprops),density(*), coordMp(*),
```

```fortran
      dimension jblock(*), properties(nprops), density(*), coordinateMp(*),
     1 charLength(*), strainInc(*),
     1 characteristic length(*), strain increment(*),
     2 relSpinInc(*), tempOld(*),
     3 stretchOld(*),  3 previous stretch(*),
     4 defgradOld(*),  4 previous deformation gradient(*),
     5 fieldOld(*), stressOld(*),
     6 stateOld(*), enerInternOld(*),
     7 enerInelasOld(*), tempNew(*),
     8 stretchNew(*),
     9 defgradNew(*),
     1 fieldNew(*),
     2 stressNew(*), stateNew(*),
     3 enerInternNew(*), enerInelasNew(*)
c
      character*80 cmname

      parameter (
     1 i_umt_nblock = 1,
     2 i_umt_npt = 2,
     3 i_umt_layer = 3,
     4 i_umt_kspt = 4,
     5 i_umt_noel = 5 )

      call vumatXtrArg ( jblock(i_umt_nblock),
     1 ndir, nshr, nstatev, nfieldv, nprops, lanneal,
     2 stepTime, totalTime, dt, cmname, coordMp, charLength,
     3 props, density, strainInc, relSpinInc,
     4 tempOld, stretchOld, defgradOld, fieldOld,
     5 stressOld, stateOld, enerInternOld, enerInelasOld,
     6 tempNew, stretchNew, defgradNew, fieldNew,
     7 stressNew, stateNew, enerInternNew, enerInelasNew,

      stressNew, stateNew, enerInternNew, enerInelasNew,

     8 jblock(i_umt_noel), jblock(i_umt_npt),

      jblock(i_umt_noel), jblock(i_umt_npt),

     9 jblock(i_umt_layer), jblock(i_umt_kspt))

      jblock(i_umt_layer), jblock(i_umt_kspt))

      return
      end
c -------------------------------------------------------------------------------
      subroutine vumatXtrArg (
c read only -
     1 nblock, ndir, nshr, nstatev, nfieldv, nprops, lanneal,
```

```
2 stepTime, totalTime, timeinc, cmname, coordMp, charLength,
3 props, density, strainInc, relSpinInc,
4 tempOld, stretchOld, defgradOld, fieldOld,
3 stressOld, stateOld, enerInternOld, enerInelasOld,
6 tempNew, stretchNew, defgradNew, fieldNew,
c write only -
5 stressNew, stateNew, enerInternNew, enerInelasNew,
c read only extra arguments -
6 nElement, nMatPoint, nLayer, nSecPoint)
c
include vaba_param.inc
c
c all arrays dimensioned by (*) are not used in this algorithm
dimension props(nprops), density(nblock),
1 strainInc(nblock,ndir+nshr),
2 relSpinInc(nblock,nshr), defgradOld(nblock,9),
4 stressOld(nblock,ndir+nshr),
5 stateOld(nblock,nstatev), enerInternOld(nblock),
6 enerInelasOld(nblock),
7 stretchNew(nblock,ndir+nshr), defgradNew(nblock,9),
8 stressNew(nblock,ndir+nshr)

8 stressNew(nblock, ndir+nshr)

dimension enerInelasNew(nblock),stateNew(nblock,nstatev),

dimension enerInelasNew(nblock), stateNew(nblock,nstatev),

1 enerInternNew(nblock)

dimension nElement(nblock),nMatPoint(nblock),nLayer(nblock),

dimension nElement(nblock), nMatPoint(nblock), nLayer(nblock),

1 nSecPoint(nblock)

character*80 cmname

c make computations for every material point
c -----------------------------------------------------------------------

do 1000 nblck = 1,nblock

Nelem=nElement(nblck) ! here we go 😐
blah blah blah

enddo

return
end
```

推荐阅读 Recommended Reading

采用S-ALE方法的实现静水漂浮, 远场边界以及渗漏控制…

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