

Appendix A

Tcl Commands to Create Brick Elements

A.1 The Eight Node Brick Element

```
element Brick8N  eletag? node1? node2? node3? node4? node5? node6? node7?
                 node8? matTag?  bf1? bf2? bf3? massDens?
```

The Brick8N element is the standard eight node three dimensional element implemented based on tensor operation. The arguments to construct the element are its tag, eletag, eight nodes ordered according to Figure A.1, the material tag, matTag, the body forces, bf1, bf2, bf3, and the mass density, massDens. By default, $3 \times 3 \times 3$ integration points are used. Users will be able to specify number of integration points very soon.

The valid queries to a Brick8N element when creating an ElementRecorder are 'force', 'stiffness', 'stress', 'gausspoint', or 'plastic'. For "stress" output, the six stress components from each Gauss point are output by the order: $\sigma_x, \sigma_y, \sigma_z, \tau_{xy}, \tau_{xz}, \tau_{yz}$. For "gausspoint", the coordinates of all Gauss points are printed out. For "plastic", the equivalent deviatoric plastic strain from each Gauss point is output in the same order as the coordinates are printed.

A.2 The Twenty Node Brick Element

```
element Brick20N eletag? node1? node2? node3? node4? node5? node6? node7?
                 node8? node9? node10? node11? node12? node13? node14? node15?
                 node16? node17? node18? node19? node20? matTag? bf1? bf2? bf3?
                 massDens?
```

The Brick8N element is the standard eight node three dimensional element implemented based on tensor operation. The arguments to construct the element are its tag, eletag, twenty nodes ordered according to Figure A.2, the material tag, matTag, the body forces, bf1, bf2, bf3, and the mass density, massDens. By default, $3 \times 3 \times 3$ integration points are used. Users will be able to specify number of integration points very soon.

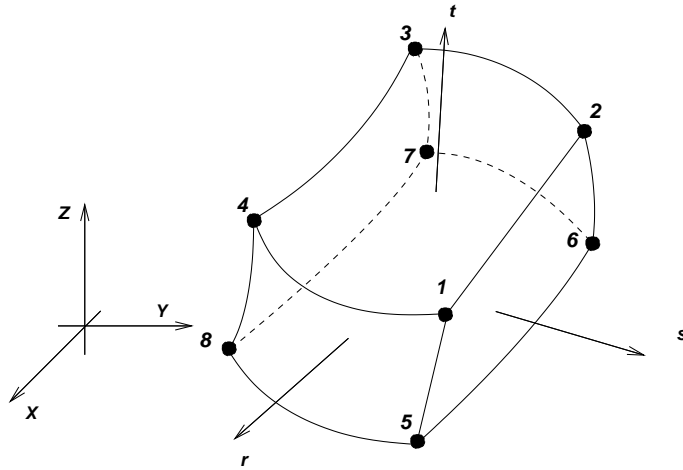


Figure A.1: Node numbering for 8 node three dimensional element.

The valid queries to a Brick20N element when creating an ElementRecorder are 'force', 'stiffness', 'stress', 'gausspoint', or 'plastic'. For "stress" output, the six stress components from each Gauss point are output by the order: $\sigma_x, \sigma_y, \sigma_z, \tau_{xy}, \tau_{xz}, \tau_{yz}$. For "gausspoint", the coordinates of all Gauss points are printed out. For "plastic", the equivalent deviatoric plastic strain from each Gauss point is output in the same order as the coordinates are printed.

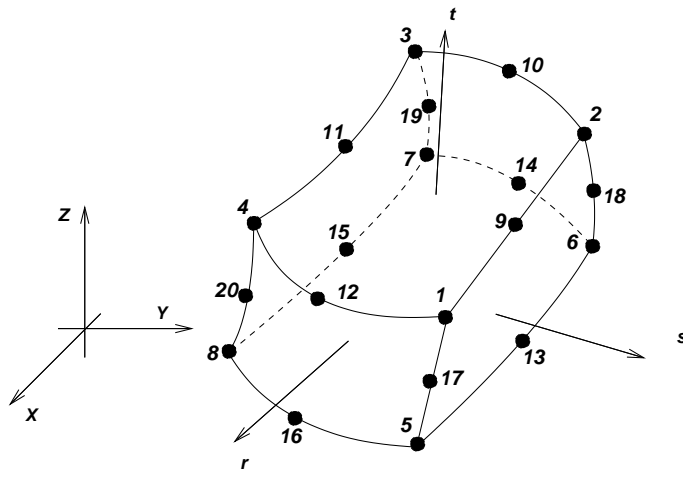


Figure A.2: Node numbering for 20 node three dimensional element.