CalculiX Simulation

For

Static Displacement of a non-linear spring

Version 1.0

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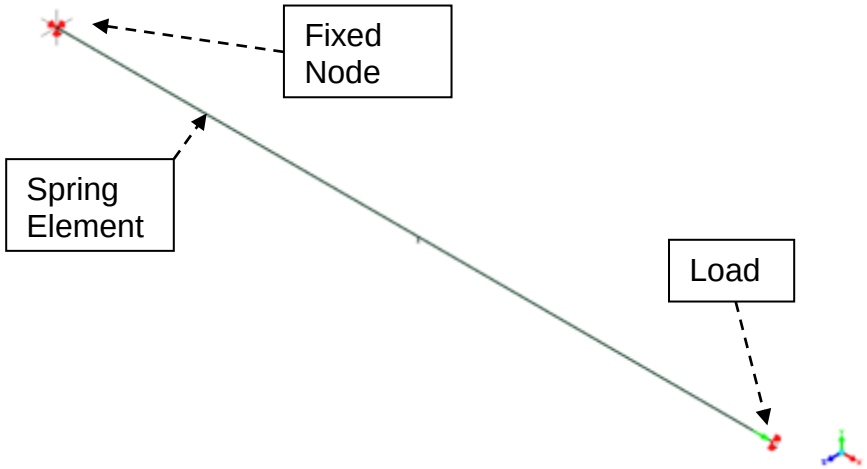
Revision history

Version Number	Comments
1.0	Original Publication

1. Project Description

The project deals with the static displacement of a non-linear spring. The non-linear behavior of the spring is expressed using a force and corresponding displacement values in the input file. The simulation was performed for three different concentrated forces that were applied to node #2 and the resulting displacements were computed. The force vs displacement plot shows the comparison.

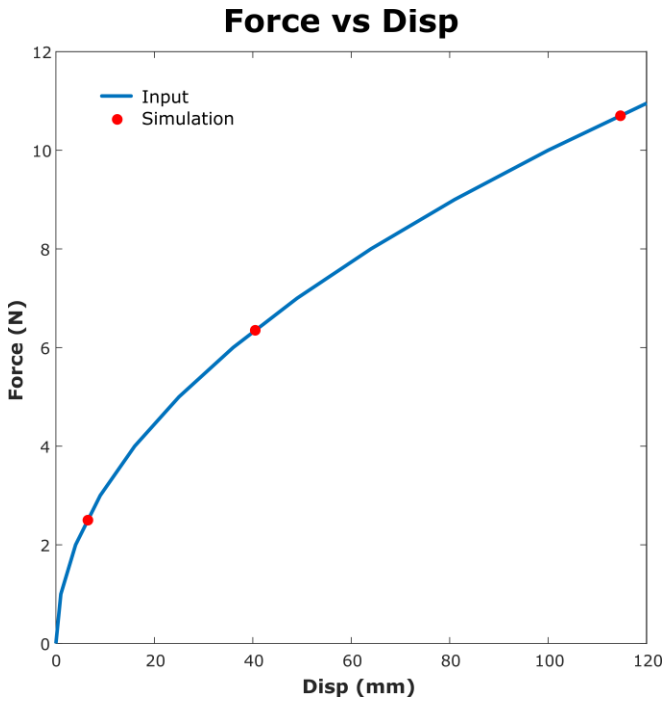


2. Material Data

Force (N)	Displacement (m)
0	0
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100
11	121

3. Results

The following plot shows the resulting displacement which falls in the provided force-displacement curve which is expected.



4. Conclusion

A non-linear spring can be modeled using this technique. The inputs have to be a force and corresponding displacement.

5. Appendix - Input file

```
** Node Definitions
* -----------------
*NODE,NSET=NALL
1,0.,0.,0.
2,1.,0.,0.
** Element Definitions
** -------------------
*ELEMENT,TYPE=SPRINGA,ELSET=EALL
1,1,2
*SPRING,ELSET=EALL,NONLINEAR
**Force,Displacement
0.0,0.0
1.0,1.0
2.0,4.0
3.0,9.0
4.0,16.0
5.0,25.0
6.0,36.0
7.0,49.0
8.0,64.0
9.0,81.0
10.0,100.0
11.0,121.0
** Boundary Conditions
** -------------------
*BOUNDARY
1,1,3
2,2,3
** Step - Apply load
** -----------------
*STEP,NLGEOM
*STATIC
** Apply load
** ----------
*CLOAD
**2,1,2.50
**2,1,6.35
2,1,10.7
** Output request
** --------------
*NODE PRINT,NSET=NALL
U
*END STEP
```

Defining spring behavior