Statik2d\KMat-Package for TI89/92(+)

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Purpose:	Generation of stiffness matrix for displacement method in civil engineering (plain systems)
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Installation Guide

By using your link-Software (e.g. the TI-GRAPHLINK-Software) the groupfile kmat.89g should be transmitted to the calculator. Note: all files need to get in a folder “statik2d” (check box “Retain folder”).
Firstly this software was developed on my TI89, but it’s also tested on my girl friends TI92 an it should do its task on the TI92+.

First

While learning the displacement method for solving complex static systems (plain systems) I was told to think about bars with inconsistences between the end of the bar and a node. Stiffness matrixes for various inconsistences should be generated by using the four general matrixes for bars, stable fixed at the node.
The reason for implementing a algorithm for this: I’m lacy, to lacy to generate it by myself.

Technical details

I trust at your knowledge about the displacement method in the following details, reffering to the lecture of Prof. Möller, institute of statics in civil engineering (http://rcswww.urz.tu-dresden.de/~statik) at the Dresden Technical University (http://www.tu-dresden.de).

Used Signs:

i,k	node at beginning of a bar/ end of a bar
ik,ki	beginning/ end of a bar
$\underline{K(ik,ki)}$	Stiffness matrix at start of a bar (ik), caused by a displacement of the end of the bar (ki)
$\underline{K(ik,i)}$	similar to the last, caused by the displacement of the node at the beginning of the bar
$\underline{v(i)}$	Displacement of the beginning of a bar
$\underline{P(k)}$	Forces at the node k

$\underline{F(ki)}$	Forces at end of the bar
$\underline{F_0(ki)}$	Forces at end of the bar, caused by extern forces, should be calculated outside the displacement method
$X_1\ X_2\ X_3$	local coordinates
$\underline{\tilde{x}}$	global vectors
$\underline{T}$	Transformation matrix to convert local to global coordinates

A static system will be solved by solving by the follwing linear Equations:

$$\underline{\tilde{K}} * \underline{\tilde{v}} = \underline{\tilde{P}} - \underline{\tilde{F}_0}$$

Users Guide

My Intention by developing the kmat-package was the generation of stiffness matrixes with any inconsistences. There were three forms possible, in each coordinate one (three coordinates: x1, x2, angle3). So there were 8^2=64 combinations of inconsistences? Some of them are nonsens, e.g. x1 at beginning and end of a bar, others ar possible, e.g. a link.

function kmat

kmat(bar, displaced-node, inconsistence-at-start, angle-at-start, inconsistence-at-end, angle-at-end)

This function generates the stiffness matrix, e.g. $\underline{K(ik,i)}$ with your given values.

kmat – parameters

bar	At which end of the bar? ik (beginning)=0, ki (end)=1
displaces-node	Which node will be displaced? i=0, k=1
inconsistence-at-start	Inconsistences are coded as octal numbers, the summary of numbers will be the combination of incostistences between bar and node: 1=x1 (force along the bar), 2=x2 (force across the bar), 3=x3 (Momentum) d.h. 0=fixed at the node
angle-at-start	Which angle has the inconsistence to the local coordinates? default=0
inconsistence-at-end	similar to ~at-start
angle-at-end	similar to ~at-start

Example

kmat(0,0,0,0,0,0) returns the K(ik,i) stiffness matrix of a fixed bar
kmat(0,1,0,0,7,0) no fixing at the end of the bar => matrix = 0
kmat(0,0,4,0,4,0) => ideal framework bar

buglist

My software is very slowly. The TI89 works hard and takes some time (up to 10sec) for calculating.

Versions History

This Version is the first public one, all the fomer versions were to gracy to make it public here.

Thanks to

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