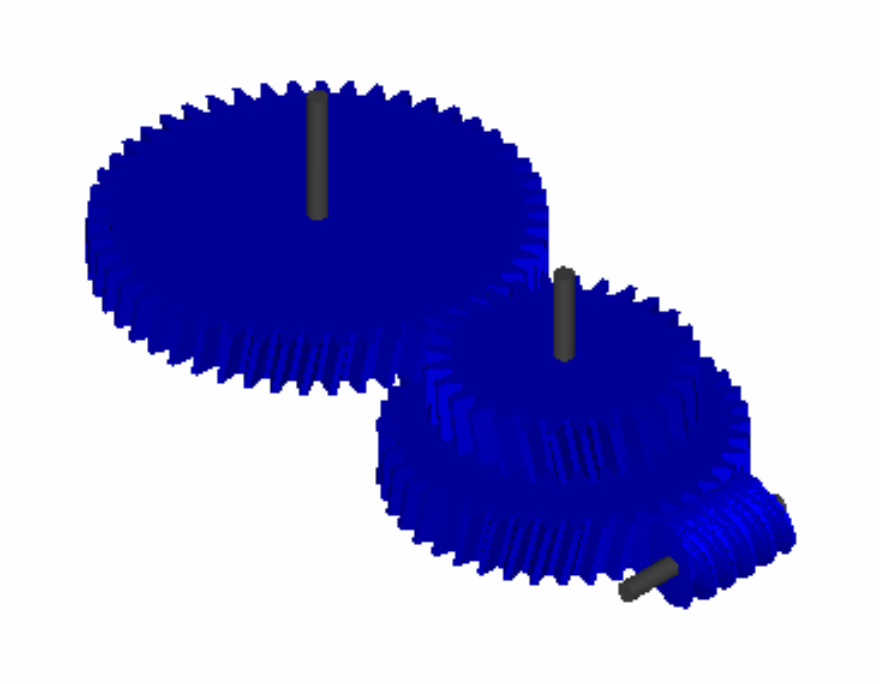


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KISSsys instruction for Worm gear modeling and efficiency calculation



1. Explanation

1.1 Worm gear modeling

Worm gear can be modelled to KISSsys similarly as any gear connection. To do that we anyway need to use special components created for that and also calculation is needed to be done with worm gear module. All necessary components can be found from default template file “templates.ks”. Worm gears have quite low efficiency compared to helical, epicyclical or bevel gears and that is why it is also explained how to get calculated efficiency from KISSsoft calculation back to KISSsys kinematics calculation.

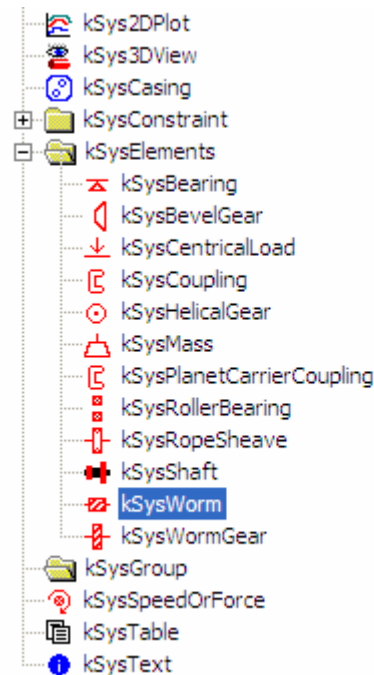


Figure 1.1-1 Standard templates used for the modeling

User may refer also related model “018-Worm-gears.ks”

2. Building up a model

1.2 Components

Use worm gear components from templates. “kSysWorm” for worm and “kSysWormGear” for mating gear. Connection will be “kSysWormGearConstraint” and Calculation module “WormGear”.

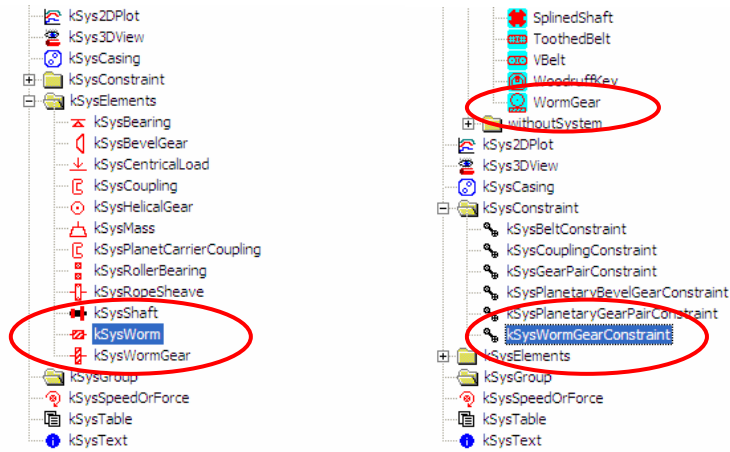


Figure 1.2-1 Components, connection and calculation module

Correctly selected components will look like figure below. Connection (g1) for worm looks similar to helical gears (g2) in tree structure, but then calculation module looks different.

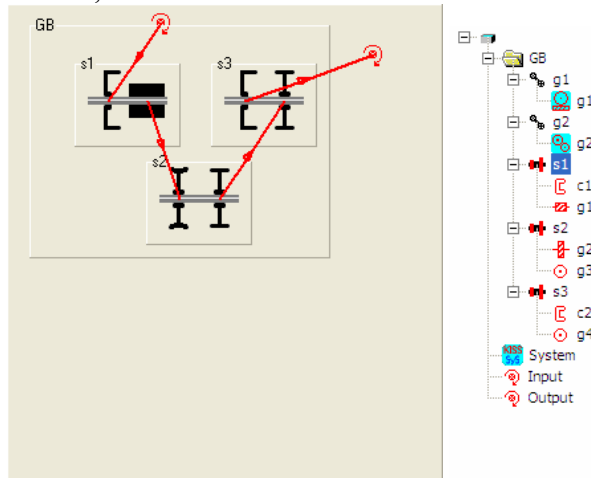


Figure 1.2-2 Schematic and tree structure of the example model

3. Model setup

1.3 Efficiency

Because efficiency of worm gear depends a lot about the load values, therefore we can use calculated value for efficiency taken from KISSsoft calculation instead of a fixed value. That value is not anyway translated directly from KISSsoft calculation so we need to first translate it to be able to use it.

1.4 New variables

Create a new variable for worm calculation element in KISSsys. Array "TranslationTable" and Real value where to put new information in this example "etaz" and flag translation from KISSsoft -> KISSsys, to really transfer the value from calculation. Variable "TranslationTable" presents the values in array that shall be translated from the calculations. In this case we will take the value from KISSsoft variable "ZS.etaz" to KISSsys variable "etaz". More information how to use "TranslationTable" see instructions "ins-007-02-TranslationTable.pdf"

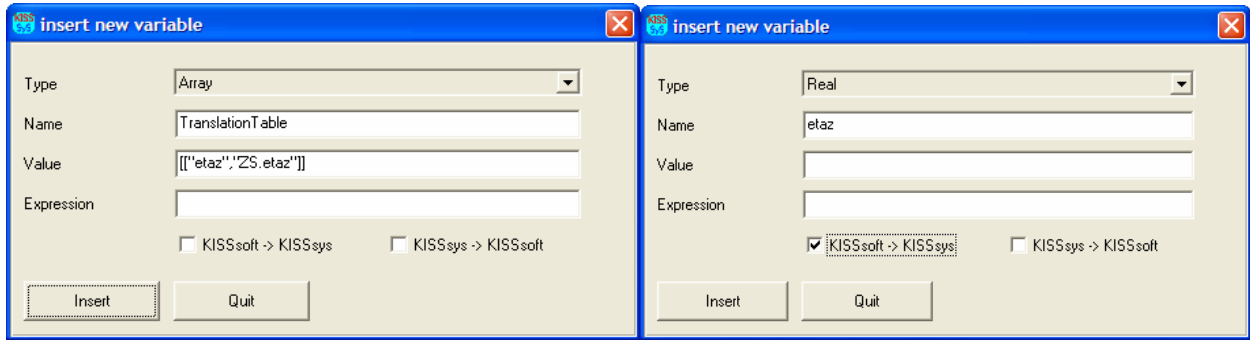


Figure 1.4-1 New variables needed for efficiency calculation

1.5 Creating an expression

This new value “etaz” must be then put as an expression into the worm gear connection “eta”. Instead of using now fixed value, efficiency is taken from the calculation and used in the kinematic calculation. Similarly we can also transfer efficiency values from helical gear calculation.

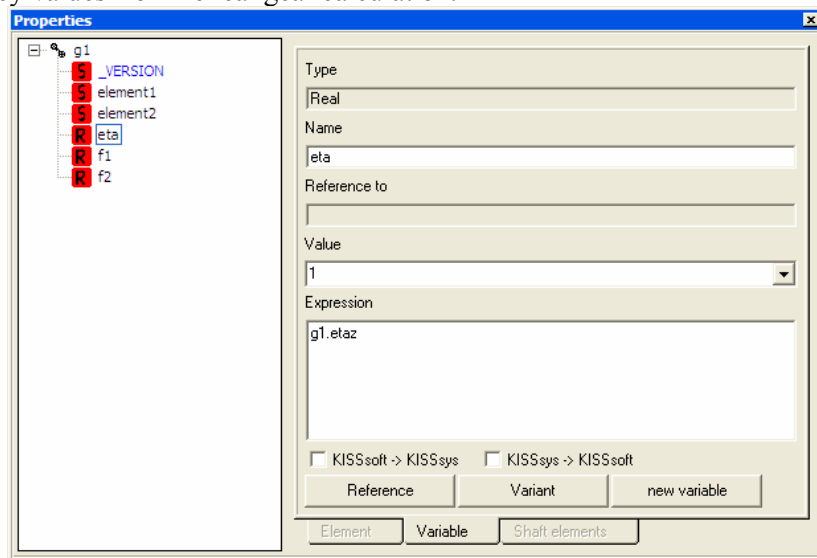


Figure 1.5-1 Efficiency linked to the calculated value

Now to be sure that new efficiency values are used into Kinematics calculation we need to repeat “calcKinematic” and “ksoftCalculate” functions as many times as we have transferred efficiencies for calculations. This is because first we need to do kinematics calculation to get correct forces for calculations, but then after this calculation we can see what are efficiency values with given load. These values are transferred back to KISSsys. Now we need to do new kinematics calculation again with those new efficiency values, to get right power values for next calculation. This must be then repeated as many times as needed to get all transferred efficiencies correctly. For this we can create function e.g. to “UserInterface” to repeat these two procedures several times.

```

-----
System.calcKinematic();
System.kSoftCalculate();
kSys_Refresh();
//repeat
System.calcKinematic();
System.kSoftCalculate();
kSys_Refresh();
//repeat as many times as necessary...
-----

```