Introduction to Mechanical Engineering, HW CAE DYN 2

Motion Analysis

Short Task Description

Description: Solve 4 tasks, using Motion Analysis NX application

Zip archive, which contains all needed data: *HWs/HW_CAE_DYN2/task_data*

Artifacts:

- Zip archive with NX detail files (.prt) and simulation (.sim) for each task in separate folder.
- Plots and answers (if particular task requires) in pdf format (.pdf). It should be put in the task folder.

Task 1

Extended Task Description

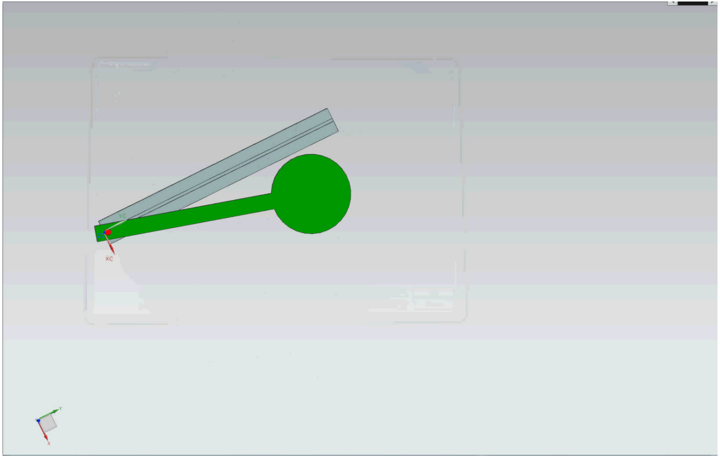
Goal:

1. Make a simulation, which repeats the video from the next slide.
2. Draw 2 plots $x(t)$, $y(t)$ for the center of a green disk in absolute coordinate frame. It can be done, adding a marker into the center of the disk.
3. Make a plot $R_z(t)$ for a center of disk relative to a right bottom corner of *OSNOVA_DLIN*. It can be done by sensor and marker.

Description: You don't need to add any drivers.

Task 1

Video



Task 2

Extended Task Description

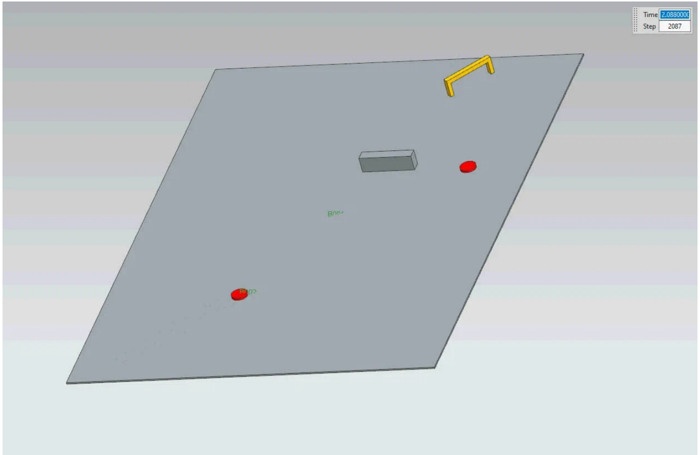
Goal: Make a simulation, which repeats the video from the next slide.

Description: To do this, it is recommended that two, time-differentiated forces of 0.5 *N* and 1 *N* be applied to the puck. The puck must hit the goal.

Hint: I used trace for choosing direction of the second force (second puck in the video).

Task 2

Video



Task 3

Extended Task Description

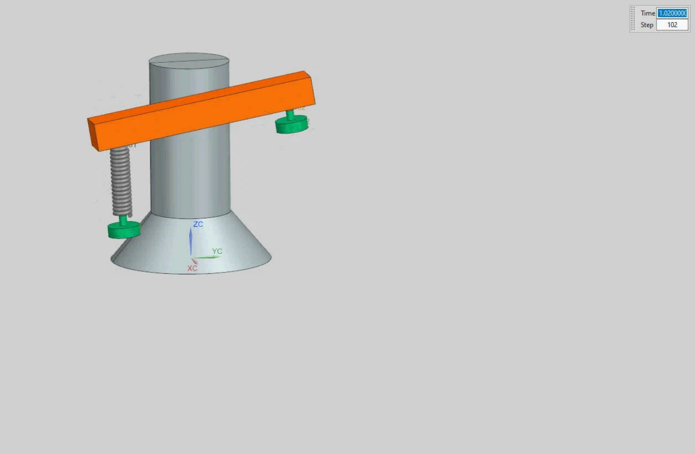
Goal:

1. Make a simulation, which almost repeats the video from the next slide.
2. Firstly, determine only a stiffness for a spring. Make a plot $Z(t)$ for a corner of a crank.
3. Add a damper to a string. Make a plot $Z(t)$ for a corner of a crank.
4. Find a static equilibrium solution (using static analysis solver). If it doesn't work, change the stiffness or damping until it does.
5. Draw plots of needed (your own thoughts) reaction forces and torques, using "Load Transfer" function.

Description: same weight of loads, one part of the scale should be connected by spherical joint, another one — using spring.

Task 3

Video



Task 4

Extended Task Description

Goals:

1. Plot the vertical displacement of the bottom clamp (fig. 1c);
2. Determine the maximum height to which the bottom collar will rise in 10 seconds;
3. Determine the maximum angular velocity of the regulator that will occur at 10 seconds.

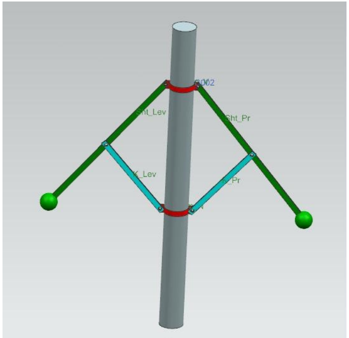
Description: Construct a geometric model of the centrifugal regulator (fig. 1a). The upper red collar rotates around a center pin, but is fixed at a certain height. The lower collar both rotates and moves at a certain height. All joints of the mechanism should be described by rotational and cylindrical joints.

Naturally, under the action of the weight, the weights of the regulator should take a vertical position at the initial moment of time (fig. 1b). But during rotation, the weights of the regulator will lift and take a certain position at an angle to the vertical (fig. 1a).

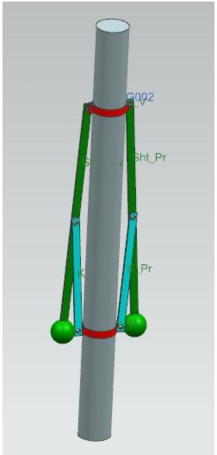
Set the masses of spherical weights on the order of $5 - 6\ kg$. Initial distance between collars — 150 mm.
Upper red collar should rotates with angular acceleration 50 $°/s^2$. Analysis time — 10 sec.

Task 4

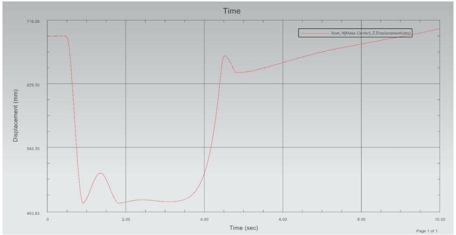
Video



(a) Some particular position



(b) Lowest Position



(c) Expected displacement plot (can be not the same)

Deserve "A" grade!

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