Mechanics and Machines, HW CAE DYN 2

Motion Analysis

INNOPOLIS UNIVERSITY

Short Task Description

Description: Solve 5 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

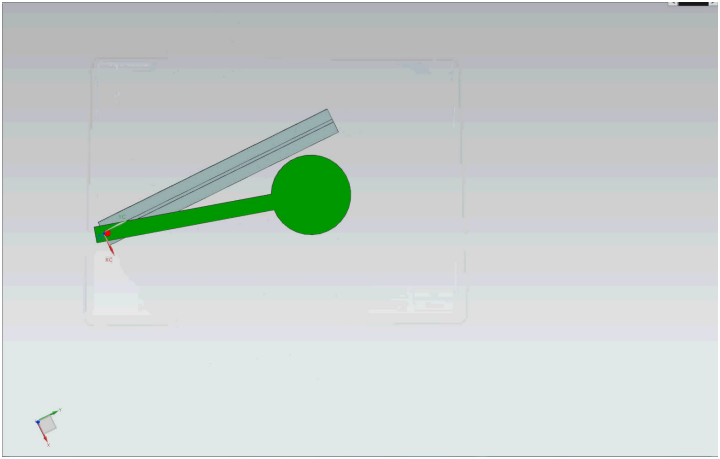
Goal:

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

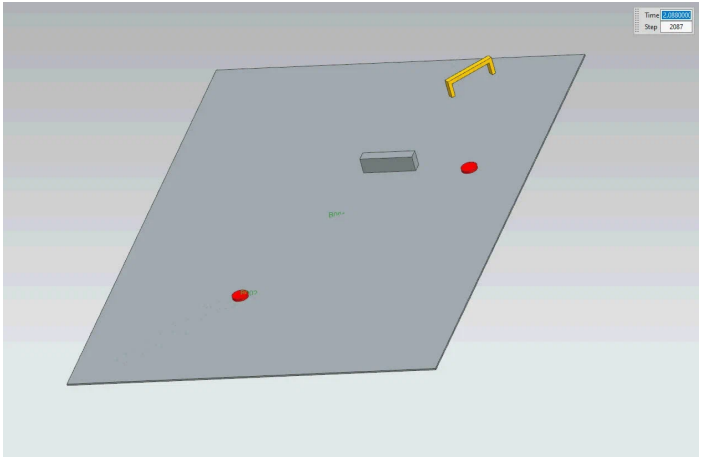
Extended Task Description

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.

Task 2

Video



Task 3

Extended Task Description

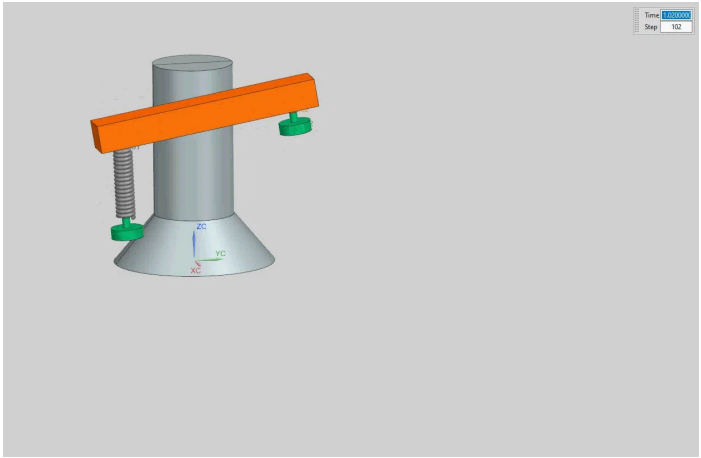
Goal:

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. Try to find a static equilibrium solution. If you cannot, explain why and fix it. Draw a 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:

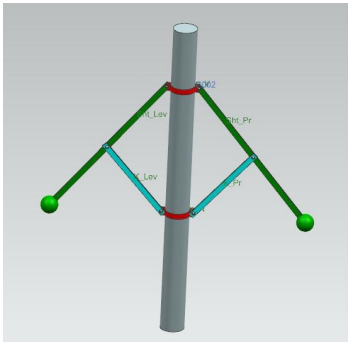
1. Plot the vertical displacement of the bottom clamp (fig. 1c);
2. Determine the maximum height to which the bottom collar will rise in 10 seconds;
3. Determine the maximum angular velocity of the regulator that will occur at 10 seconds.

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.

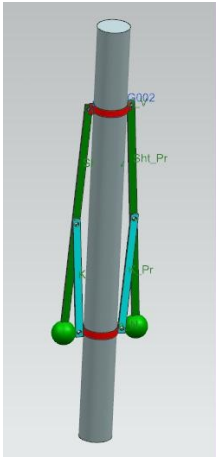
Naturally, under the action of the weight, the weights of the regulator should take a vertical position at the initial moment of time (fig. 1b). But during rotation, the weights of the regulator will lift and take a certain position at an angle to the vertical (fig. 1a).
Set the masses of spherical weights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

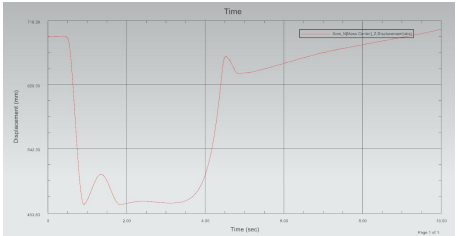
Video



(a) Some particular position



(b) Lowest Position



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

Deserve “A” grade!

– Oleg Bulichev

o.bulichev@innopolis.ru

@Lupasic

Room 105 (Underground robotics lab)