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# TASK 11: Analysis and Control of iCub joint elasticity

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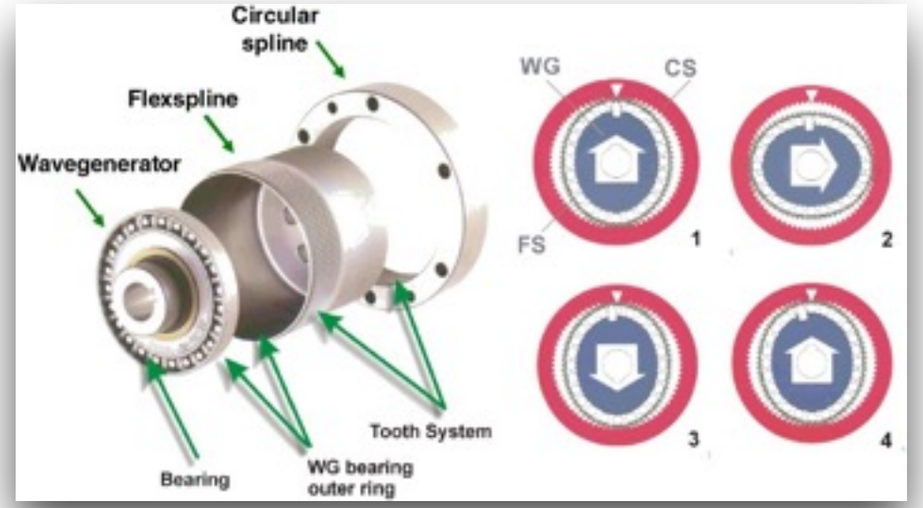
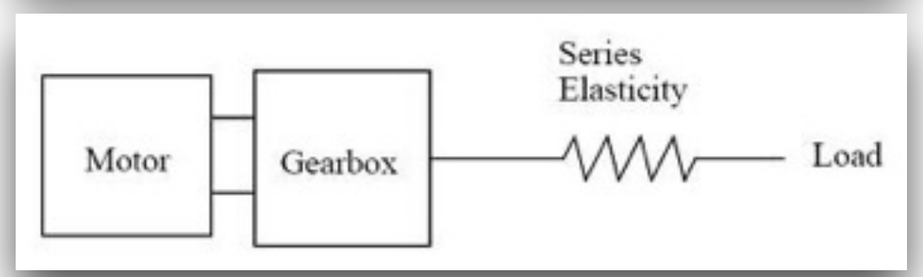
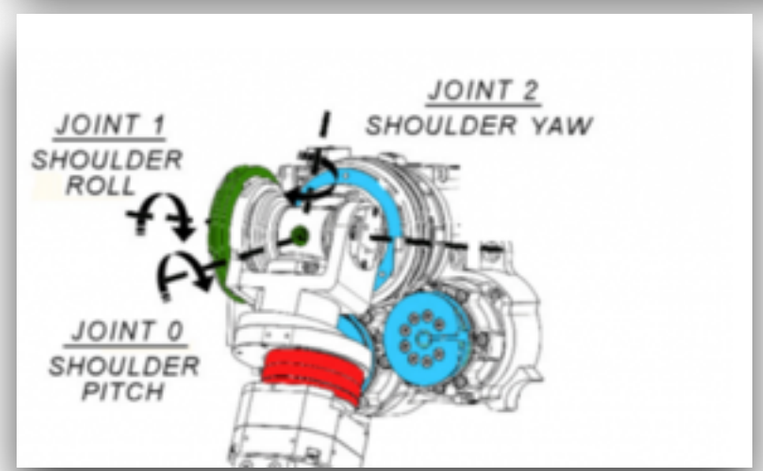
# Joint flexibility. Several examples:




- harmonic drives. elasticity of the Flexspline
- passive Series Elastic joints —> mechanical compliance (purple iCub)
- transmission belts for coupled joints

# GOAL: Dealing with joint elasticity

- Simple test task: generating a trajectory from position, speed and acceleration profiles
- Flexibility can significantly impair the performance of the controller
- Joint elasticity parameters identification and use in the controller model
- iCub hardware with high sensing capabilities:

  16 bits fast encoders

  2 encoders / joint

  - on motor axle of parent link
  - on child link (after harmonic drive)

# Subtasks

Single joint modelling: knee joint (left leg joint 3).
Controller performance criteria: accuracy and no overshoot.

1. Test and evaluate the accuracy of a position controlled trajectory

2. Evaluate the impact of Series elastic joints on the controller performance

3. Identify the joint flexibility parameters (harmonic drives & Serial Elastic feature)

4. Integrate the joint flexibility model in the controller

5. Verify the new controller performance with Series Elastic feature locked

6. Verify the new controller performance with Series Elastic feature unlocked