1 Parameter Optimization

After completing our own model, we focus on the second task, the identification of parameters for the excavator.

1.1 Parameters

Examples

- Friction coefficients in the engine and in the cable reels
- Mass and mass distribution of the arm
- Inertia of the arm and in the engine

Why?

Parameters are often hard to measure in reality. Control and motion are known on a real excavator. Thus, we identify the parameters this way.

Parameters can change in a long time usage, due to frequent temperature changes, abrasion and dirt. Then, one can measure the actual parameters only this way.

1.2 Black Box

For this purpose, we have received a real excavator model from Siemens. Since the content is confidential and complex, the model is a black box, implemented in MatLab.

Input:

- Control: Actual handling of the operator in the mine
- Parameters

Output:

- Motion: Position and torques of the excavator shovel over time

For given trajectories of control and motion, we have to identify the parameters.

1.3 Parameter Optimization

We are optimizing the parameters for the black box model and our own model.

- Own model: all information, including derivatives, available
- Black box model: no information about the black box model
  $\Rightarrow$ Derivative-free optimization methods

For given trajectories of control and motion, we define penalty terms for the deviation from the desired motion

$\Rightarrow$ minimizing penalty terms in order to achieve solutions for parameters.