MOOSE: Model Based Optimal Input Design Toolbox
Christian Larsson and Mariette Annergren

Moose is a model based optimal input design toolbox developed for Matlab. The toolbox has been made to simplify implementation of the optimization problems found in input design. It provides an extra layer between the user and a convex optimization environment.

Features
- Design input spectrum, $\Phi_u$.
- Easy to use text interface.
- Compatible with the Matlab Control System Toolbox.
- Applications oriented design.
- Classical input design, such as D-optimal.

The Math
- Handles problems of the form
  \[
  \begin{align*}
  & \text{minimize} \quad \Phi_u \\
  & \text{subject to} \quad \mathcal{E}_S(\alpha) \subseteq \Theta_{app}(\gamma) \quad \beta(\omega) \leq \Phi_u(\omega) \leq \delta(\omega), \quad \forall \omega.
  \end{align*}
  \]
- Confidence ellipsoid inside application set.
- Relaxed to convex problem.

Implementation
- Matlab toolbox.
- Object oriented implementation.

```
% Setup system and model
theta0 = [10 -9];
G = tf([0;theta0],1,1,'variable','z^-1');
H = 1;
Re = 1;

% MOOSE declaration block
beginMoose
  objective minimize(inputPower)
  model G H Re
  identification constraints
    spectrum phiU = FIR(20)
    probability 0.95
    numSamples 100
  application constraints
    ellipsoid(@Vapp,100)
endMoose

optimalFilter = mooseProblem.spectralFactor;
```

www.ee.kth.se/moose