

Initial Guess For Dynamic Optimization In OpenModelica

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Abstract

The initial guess is (any other nonlinear problem) important to find the solution. The optimizer need for each time point an initial guess. Currently it's not possible formulate a initial guess/start value for each time point with Modelica. The following notes help to make a initial guess for dyn. optimization with **OpenModelica**.

tip: see <https://build.openmodelica.org/Documentation/OpenModelica.Scripting.html> for **OpenModelica** scripting.

1 prior simulator

OpenModelica automaticly done a prior simulatn and use the simulation as intial guess.

Listing 1: initial guess with simulation

```
optimize(modelxxx, simflags="-ipopt_init SIM");
```

1.1 prior simulator with const inputs

OpenModelica keep the inputs around the prior simulation on the start values.

1.2 prior simulator with external inputs

OpenModelica fetch the inputs around the prior simulation from a file.

Listing 2: external inputs

```
optimize(modelxxx, simflags="-exInputFile xxx.csv -ipopt_init SIM");
```

Listing 3: example xxx.csv

```
time input1 input2 input3
0 -1 2 3
0.2 -0.9 2.3 3.5
0.6 -0.5 2.0 2.9
1.1 0.3 1.6 3.1);
```

2 file

OpenModelica fetch all variables from file.

Listing 4: initial guess with file

```
optimize(modelxxx, simflags="-ipopt_init FILE -iif xxx.mat");
```

2.1 example

Listing 5: model for initial guess

```
model simModel
  Real u;
  ...
equation
  ...
  u = f(time,x,...);
  ...
end simModel;
);
```

Listing 6: model for optimization

```
model optModel
  input Real u;
  ...
equation
  ...
  ...
end optModel;
);
```

Listing 7: initial guess with file

```
simulate(simModel);
optimize(optModel, simflags="-ipopt_init FILE -iif simModel_res.mat
");
```

Note: OpenModelica map the variables between file and optimization via name.

3 start values

OpenModelica keep all variables on the start values.

Listing 8: start values

```
optimize(modelxxx, simflags="-ipopt_init CONST");
```

4 show guess

Listing 9: result with intial guess

```
optimize(modelxxx, simflags="-ipopt_max_iter -1");
```

Listing 10: result with intial guess after preprocessing

```
optimize(modelxxx, simflags="-ipopt_max_iter 0");
```