

# Initial Guess For Dynamic Optimization In OpenModelica

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March 16, 2016

## 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");
```