

How to set up the Problem

September 24, 2019

To solve an optimal control problem with the stand-alone version of MUSCOD-II, two files have to be prepared by the user: a C++ file which defines the model equations (objective, differential equations, constraints), and an ASCII file which contains the corresponding problem data (e.g., starting guesses-values, scaling factor, bound, library, etc).

1. *Model Source File.* Here, the model equations are defined either as ANSI C++ functions.
2. *Data File.* The contents of this ASCII keyword file and its syntax are described below.

Setting up a new problem

We recommend to add a new problems to the existing **MUSCOD_SUITE/Apps/TEST/Src/SRC** directory. The user has to provide the model source file and the data file, say **problem_name.cpp** and **problem_name.dat**. The files have to be treated as follows:

- The model source file **problem_name.cpp** has to be added to the **TEST/Src/SRC** directory. Then, edit the **CmakeLists.txt** in this library. Add the name of your source file (i.e. **problem_name** to the list. Take care that you must to skip the file extension **.cpp**. Save your changes to **CMakeLists.txt**.
- The data file **problem_name.dat** has to be added to the **TEST/Src/DAT** directory.

In the desired binary directory, say **MUSCOD_SUITE/Apps/TEST/Debug**, run **make**. The make process deals automatically with the changes in **CMakeLists.txt** by calling CMake before starting the build. After a successful build, one may execute the problem as described above. **Running an existing problem from the test set** The directories **MUSCOD_SUITE/Apps/TEST** and **MUSCOD_SUITE/Apps/MIP** contain sample problems which lend themselves to being used as reference and templates. To launch one of these problems, change to a binary directory (e.g., **Debug**) and inspect the files in the **DAT** subdirectory. Each of these files describes a combination of a dynamic optimization problem and the variant of the multiple shooting SQP algorithm to be used for the solution. To launch one of these, e.g.,

DAT/problem_name.dat, create a symbolic link in **MUSCOD_SUITE/Apps/TEST/Debug** by entering
user@machine~/.../TEST/Debug\$ ln -s ~/MUSCOD_SUITE/MC2/Debug/bin/muscod
and call
user@machine~/.../TEST/Debug\$ muscod_debug problem_name
to run the problem: **problem_name**.