Addendum for End Cost Capability

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SPOCv1.3 addresses the following problem:

Problem P: For a parameter space $\Omega = [\omega_{0,1}, \omega_{f,1}] \times [\omega_{0,2}, \omega_{f,2}] \cdots \times [\omega_{0,N_\omega}, \omega_{f,N_\omega}] \subset \mathbb{R}^{N_\omega}$, determine the state-control pair, $t \to (x, u) \in \mathbb{R}^{N_x} \times \mathbb{R}^{N_u}$ that minimizes the cost function:

$$J[x(\cdot), u(\cdot)] = \int_\Omega \left[F(x(T), u(T), \omega) + G\left(\int_0^T r(x(t), u(t), t, \omega) dt \right) \right] \phi(\omega) d\omega \tag{1}$$

subject to the dynamics:

$$\dot{x}(t) = f(x(t), u(t))$$

with initial condition $x(0) = x_0$, control constraint $K_1 \leq u(t) \leq K_2, \forall t \in [0, T]$. The function $\phi : \Omega \to \mathbb{R}$ is a continuous single-valued function, as are $G : \mathbb{R} \to \mathbb{R}$ and $r : \mathbb{R}^{N_x} \times \mathbb{R}^{N_u} \times [0, T] \times \Omega \to \mathbb{R}$.

In this problem, an end cost is now included as an option. The choice to include an end cost is specified in the problem definitions file by setting the following variable:

CONSTANTS.End_Cost = 'yes' or CONSTANTS.End_Cost = 'no'.

A 'yes' commits to entry of end time cost information.

If gradient options are set to automatic, this information is merely the file defining the end cost function F. This file is specified along with all other files which define the problem as

My_Problem.End_Cost = 'end cost function file'.

If gradients are user entered, additional required files are:

My_Problem.End_Cost_Gradient = 'My_Problem_Cost_Gradient_file';

My_Problem.End_Cost_Sparsity = 'My_Problem_Cost_Sparsity_file';

The formatting of these files is similar to those required for the inner function files. For details, see the included example End_Cost_Targeting_user_gradient.