Adjoint equations of DAEs and optimal control problems

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Recently, a somewhat more precise formulation of DAEs has been discussed, namely

$$A(x(t),t)(d(x(t),t))' + b(x(t),t) = 0$$

and, in the linear case,

$$A(t)(D(t)x(t))' + B(t)x(t) = q(t).$$

The coefficients of the leading term are supposed to be well matched. One of the advantages of this formulation is that an original DAE and its adjoint equation

$$D(t)^*(A(t)^*y(t))' - B(t)^*y(t) = r(t)$$

have the same structure.
Optimal control problems for those lower index DAEs with properly stated leading terms will be discussed. In particular, solvability conditions will be presented. It will be shown how the gradient may be computed via the adjoint equation.

References:

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