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SINGULARITY EXPANSION FOR A CLASS OF NEUTRAL EQUATIONS

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ABSTRACT. The main purpose of the paper is to study the structure of the solutions for a class of singular neutral equations arising from an aerofoil model problem. We demonstrate that the solution of the neutral equation may be decomposed into two parts, with one part being a linear combination of known singular functions and the other part being a function with continuous higher order derivatives. The result is then used to construct a numerical algorithm with optimal order of convergence.

1. Introduction. In [**6, 7**] a complete dynamic model for the elastic motions of a three-degree-of-freedom typical airfoil section, with flap, in a two-dimensional incompressible flow was formulated. An evolution equation for the circulation on the airfoil was derived and coupled to the rigid body dynamics to obtain a functional differential equation that provided a mathematical model for the composite system. The finite delay approximation for the mathematical model with delay r, $0 < r < \infty$, for the aeroelastic system including a forcing term F (which could be considered as a control) has the form

$$\frac{d}{dt}\left[Ay(t) + \int_{-r}^{0} A(s)y(t+s)\,ds\right] = By(t) + \int_{-r}^{0} B(s)y(t+s)\,ds + F(t) \tag{1.1}$$

for $t > 0$, where

$$y(t) = (h(t), \theta(t), \beta(t), \dot{h}(t), \dot{\theta}(t), \dot{\beta}(t), \Gamma(t), \dot{\Gamma}_t)^T.$$

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