1048-35-75 **Martin Juras*** (martinj@qu.edu.qu), Department of Mathematics and Physics, College of Arts and Sciences, Qatar University, P. O. Box 2713, Doha, Qatar. *A fresh look at Darboux integrability for hyperbolic second-order differential equation in the plane.*

A classical result of E. Goursat states that a linear equation

$$u_{xy} + a(x,y)u_x + b(x,y)u_y + c(x,y)u = 0$$

is integrable by the method of Darboux (the general solution can be written explicitly as a function of the coefficients) if and only if the two sequences of the classical Laplace invariants is finite. Anderson and Kamran (1997) generalized Laplace invariants to nonlinear equations and proved that if a hyperbolic second-order equation in the plane

$$F(x,y,u,u_x,u_y,u_{xx},u_{xy},u_{yy}) = 0$$

is Darboux integrable, then the two sequences of it's *generalized Laplace invariants* are finite. Conversely, Juráš and Anderson (1997), proved that the finiteness of the sequences of generalized Laplace invariants for $F = 0$ insures that this equation is integrable by the Darboux method. The proofs of the central results in this last paper are rather lengthy and on several instances the authors avoid exhibiting the tedious computational arguments, which makes the paper difficult to follow.

In this paper, we present a much shorter and more elegant proof of the result above. The reader will see that the original proof can be significantly shortened and "cleaned up" by examining certain relative invariant forms associated with the equation. (Received January 25, 2009)