## On the Loss of regularity for a Class of Weakly Hyperbolic Operators

Marcelo R. Ebert Universidade de São Paulo, Brazil

Abstract. In this work we consider the Cauchy problem

$$Pu = \partial_t^2 u - \sum_{i,j=1}^n a_{ij}(t) \partial_{x_i} \partial_{x_j} u + \sum_{i=1}^n c_i(t) \partial_{x_i} \partial_t u + \sum_{i=1}^n b_i(t) \partial_{x_i} u + c(t) \partial_t u + d(x,t) u = f(x,t)$$

$$(1)$$

$$u(x,0) = u_0(x), \ \partial_t u(x,0) = u_1(x)$$
 (2)

where P is weakly hyperbolic with respect to  $\{t = 0\}$ , that is,

the roots of 
$$p(x, t, \xi, \tau)$$
 in  $\tau$  are real; (3)

here  $p = p(x, t, \xi, \tau)$  is the principal symbol of P. Examples show that, differently of the hyperbolic case, under (1), (2) and (3) the solution might not exists. In addition to condition (3), various authors presented sufficient conditions, usually called Levi conditions, for the Cauchy problem to be well posed in Sobolev spaces. Those type of conditions relate p with lower order terms of P. In this work, we narrowed the bounds for the optimal Sobolevs loss of regularity under some sharp Levi conditions.

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