International Journal of Differential Equations and Applications

Volume 9 No. 2 2004, 153-154

CORRIGENDUM AND ADDENDUM TO THE PAPER: EXPLICIT DECAY BOUNDS IN SOME QUASI-LINEAR N-DIMENSIONAL PARABOLIC PROBLEMS, IJDEA, VOLUME 7, No 3 (2003), 349-367

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AMS Subject Classification: 35B05, 35B50, 35J25, 35J60
Key Words: parabolic problems, maximum principles, initial and boundary value problem

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In (18), the second inequality is achieved by using the fact that f' is assumed to be negative, and g' is assumed to be non-positive in Ω. Then, the remaining proof is to show the positivity of the following expression:

$$u_t + \alpha a g(u) F(u) \text{ in } \Omega, \quad \text{for} \quad t > 0$$

(we proved this result by means of maximum principles).

Received: December 29, 2004

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The condition (19) follows as:

$$af(\tilde g)g(\tilde g)\Delta\,\tilde g\,+\alpha a g(\tilde g)F(\tilde g) >\,0 \text{ in } \,\Omega. \qquad (1)$$

The conditions assumed on $\tilde g$ appearing in (24) – (25) correspond to negative solution of (2), which contradict the fact that $\tilde g$ is positive. For this reason, (24) – (25) in Lemma 2.2 must be replaced by:

$$\Delta\,\tilde g + \alpha\frac{F}{f}(\tilde g) - \frac{g'}{g}(\tilde g)|\nabla\,\tilde g|^2 \,\geq\, 0 \quad \text{in } \Omega, \qquad (2)$$

and

$$[2\nabla\,\tilde g\nabla(\Delta\,\tilde g)g^2 - ((\alpha\frac{F}{f})^2 g)](\tilde g) \,\geq\, 0 \quad \text{in } \Omega. \qquad (3)$$

For the proof of Lemma 2.2, the only changed expression is (32):

$$\begin{aligned} g\Delta\,\Phi - \frac{\Phi_{,k}[\Phi_{,k} - 4(\alpha\frac{F}{f} + \frac{g'}{g})\tilde g_{,k}]}{2|\nabla\,\tilde g|^2} \quad &\geq \quad 2(\nabla\,\tilde g\nabla\,(\Delta\,\tilde g)g^2 - (\alpha\frac{F}{f})^2 g) \\ &+ \quad \alpha g\frac{F}{f}(\Delta\,\tilde g + \alpha\frac{F}{f} - \frac{g'}{g}|\nabla\,\tilde g|^2) \\ &+ \quad \alpha g|\nabla\,\tilde g|^2(\frac{1-f'F}{f^2}) \,\geq\, 0. \qquad (4) \end{aligned}$$

Analogously, in Lemma 4.1 we must assume that

$$af(\tilde g)(G(\tilde g))_{,kk} - \frac{\alpha a}{fg'} \,<\, 0, \quad x\in\Omega, \qquad (5)$$

instead of (66). Since otherwise (with the first supposition), we obtain $\tilde g$ negative which is a contradiction. In Theorem 4.2, we have the new condition (66) instead (24) – (25).

To this end, we mention that the exponential term $k_\alpha(t)$ must appear in (12), and (18) meanwhile $m_\alpha(t)$ must appear in (64) and (65).