STABILIZATION FOR SMALL MASS IN A QUASILINEAR PARABOLIC–ELLIPTIC–ELLIPTIC ATTRACTION-REPULSION CHEMOTAXIS SYSTEM WITH DENSITY-DEPENDENT SENSITIVITY: REPULSION-DOMINANT CASE

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Abstract. The quasilinear attraction-repulsion chemotaxis system
\[
\begin{align*}
    u_t &= \nabla \cdot ((u+1)^{m-1}\nabla u - \chi u(u+1)^p - 2\nabla v + \xi u(u+1)^q - 2\nabla w), \\
    0 &= \Delta v - \alpha u - \beta v, \\
    0 &= \Delta w - \gamma u - \delta w
\end{align*}
\]

is considered in a bounded domain \( \Omega \subset \mathbb{R}^n \) (\( n \in \mathbb{N} \)) with smooth boundary \( \partial \Omega \), where \( m, p, q \in \mathbb{R}, \chi, \xi, \alpha, \beta, \gamma, \delta > 0 \). In the case that \( m = 1 \) and \( p = q = 2 \), when \( \chi \alpha - \xi \gamma < 0 \) and \( \beta = \delta \), Tao–Wang (Math. Models Methods Appl. Sci.; 2013; 23; 1–36) proved that global bounded classical solutions toward \( (\overline{u}_0, \frac{\alpha}{\beta} \overline{u}_0, \frac{\gamma}{\delta} \overline{u}_0) \) via the reduction to the Keller–Segel system by the transformation \( z := \chi v - \xi w \), where \( \overline{u}_0 := \frac{1}{|\Omega|} \int_{\Omega} u_0 \). However, since the above system involves nonlinearities, the method is no longer valid. The purpose of this paper is to establish that global bounded classical solutions converge to \( (\overline{u}_0, \frac{\alpha}{\beta} \overline{u}_0, \frac{\gamma}{\delta} \overline{u}_0) \).