Infinite time singularity formation for the Keller-Segel system in $\mathbb{R}^2$

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Abstract: The classical model for chemotaxis is the planar Keller-Segel system

$$u_t = \Delta u - \nabla \cdot (u \nabla v), \quad v(\cdot, t) = \frac{1}{2\pi} \log \frac{1}{|\cdot|} * u(\cdot, t).$$

in $\mathbb{R}^2 \times (0, \infty)$. Blow-up of finite mass solution is expected to take place by aggregation, which is a concentration of bubbling type, common to many geometric flows. We build with precise profiles solutions in the critical-mass case 8π, in which blow-up in infinite time takes place. We establish stability of the phenomenon detected under arbitrary mass-preserving small perturbations.