1147-35-143 **Arunima Bhattacharya*** (arunimab@uoregon.edu), Eugene, OR , and **Micah Warren**.
Interior Schauder estimates for the fourth order Hamiltonian stationary equation in two dimensions.

In this paper, we study the regularity of the Lagrangian Hamiltonian stationary equation, which is a fourth order nonlinear PDE. Consider the function $u : B_1 \to \mathbb{R}$ where B_1 is the unit ball in $\mathbb{R}^2$. The gradient graph of u, given by $\{(x, Du(x))|x \in B_1\}$ is a Lagrangian submanifold of the complex Euclidean space. The function θ is called the Lagrangian phase for the gradient graph and is defined by

$$\theta = F(D^2u) = Im \log \det(I + iD^2u).$$

The non homogeneous special Lagrangian equation is given by the following second order nonlinear equation

$$F(D^2u) = f(x). \tag{1}$$

The Hamiltonian stationary equation is given by the following fourth order nonlinear PDE

$$\Delta_g \theta = 0 \tag{2}$$

where g is the induced Riemannian metric from the Euclidean metric on $\mathbb{R}^4$, which can be written as

$$g = I + (D^2u)^2.$$

We consider the Hamiltonian stationary equation for all phases in dimension two and show that solutions that are $C^{1,1}$ will be smooth and we also derive a $C^{2,\alpha}$ estimate for it. (Received January 02, 2019)