Surface reconstruction through mean curvature flow in the sub-Riemannian geometry of primary visual cortex model

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Mean curvature flow is well known in Riemannian setting and it presents new phenomena when it is studied in sub-Riemannian setting, which can be considered as a degenerate limit of the Riemannian case. Short time existence result for the flow has been established via different techniques. However even smooth surfaces present special points, called characteristic points, at which the normal vanishes. For this reason the uniqueness problem is challenging and we face this problem in the first part of the talk presenting uniqueness of the viscosity solution to sub-Riemannian mean curvature flow. Primary visual cortex models and in particular Citti-Sarti model mimick rather orientation selectivity of simple cells, which are sensitive also to other image properties. In the second part we will present our early results related to an extension of Citti-Sarti model for image reconstruction, which exploits also spatial frequency and phase selectivity of simple cells. In the final part, we discuss the convergence of a diffusion driven motion, inspired by Bence-Merriman-Osher algorithm. The algorithm has concrete applications in a cortical inspired model of image completion due to Citti-Sarti.