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Approximate mean curvature flows for general data, and their limits

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The classical mean curvature flow of regular surfaces may develop singularities in finite time and is not well defined beyond. Various extensions have been proposed which are meaningful for all positive times. However, they are generally not well defined or inconvenient for more general "surface-type" objects such as point clouds. In this talk, I will present a new notion of approximate mean curvature flow which is valid for very general objects. It is based on Brakke's construction of weak mean curvature flows and the adaptation due to Kim & Tonegawa. We first construct, for general varifolds and by iterated push-forwards, an approximate time-discrete mean curvature flow depending on both a given time step and an approximation parameter. This time-discrete flow converges, as the time step tends to 0, to a unique limit flow, that we call an approximate mean curvature flow. Our approach is fairly general: it provides an approximate notion of mean curvature flow for very general structures of any dimension and codimension, whether continuous surfaces in the classical sense or point clouds. I will discuss the properties of this approximate mean curvature flow, and the existence of a limit spacetime Brakke flow when the approximation parameter tends to 0. These results were obtained as part of Abdelmouksit Sagueni's PhD work cosupervised with Blanche Buet and Gian Paolo Leonardi.

Presenter: MASNOU, Simon (Université Claude Bernard Lyon 1)