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Moving finite elements; from shallow water equations to aggregation of microglia in alzheimer's disease

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Moving finite element methods are numerical methods designed for tracking moving shocks and complex structures with a fixed number of nodes. In my talk I will discuss the general idea of the adaptive mesh technique called "String Gradient Weighted Moving Finite Elements" and I will present results to several systems of non-linear Partial Differential Equations (PDEs). The second half of the talk will focus on the application of SGWMFE to a model of aggregation of microglia found in Alzheimer's disease. Pattern formation, such as in chemotactic cell (microglia) aggregation, is an important phenomenon within Biology and Chemistry. I will discuss a model for aggregation of microglia in two spatial dimensions, where for the appropriate parameters, cells aggregate into sharp peaks. I will show some of the details involved in the extension of SGWMFE for such chemotaxis models, and will conclude with the presentation with some numerical results.