# Spatially moving boundary conditions for FlowFit using the Augmented Lagrangian method

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## Abstract

In order to support Aeroelastics and Fluid-Structure Interaction studies we intend to improve on how the data assimilation method FlowFit deals with possibly moving boundaries such as walls and other objects. FlowFit takes scattered velocity and acceleration estimates from a particle tracking method such as the STB and estimates the full velocity and pressure fields. Internally, FlowFit represents the flow fields using a uniform rectangular grid of base splines. This type of grid has several benefits which include a fast FFT-based Poisson solver for pressure and fast computation of several quantities due to the separability of the filter kernels. But it also complicates the introduction of possibly curved walls. Until now, we have converted wall constraints into a set of "wall particles" covering the wall's surface with vanishing velocities for the no-slip condition. These constraints were not enforced exactly but only approximately by minimizing the squared error as part of the cost function (penalty method). In this work we present some preliminary results of an investigation on the use of the Augmented Lagrangian method for enforcing the no-slip constraints more accurately within the FlowFit data assimilation method. A 2D implementation of FlowFit was adapted for the purpose of testing different surface sampling strategies with respect to its effect on the velocity field reconstruction. Figure 1 shows an example of a curved surface immersed in a runiform rectangular grid. The curve is sampled for each of the grid's x-coordinates to create the velocity constraint points (red).

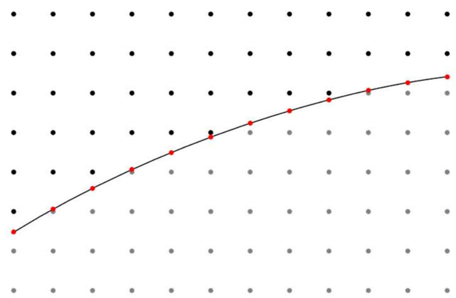

*Figure 1 : Sketch of an example surface immersed into a uniform rectangular grid*

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## References

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