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MINIMAL SURFACE PARTITIONING FOR PARTICLE-BASED MODELS

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Large computational mechanic problems often require to be executed in parallel environments either to run faster or simply due to the fact that stand alone computers have not enough memory nor computational power to execute them. One of the requirements to be able to run in these environments is the ability to split our problems in as many parts as different processes we want to spawn.

Existing partitioning algorithms generally focus on solving mesh partitioning and few of them exploit particle based characteristics that can result in resource usage, quality of solution and scalability improvements. The aim this method is to create a new partitioning strategy that is both suitable for run and benefit from parallel environments and generate solutions suitable for these computer platforms.

The algorithm presented, developed under the Kratos MultiPhysics [1] framework and has been specifically designed for the DEM problem, but can be easily adapted to any method that uses particles. A variation of Lloyd's algorithm [2] over an initial arbitrary partition scheme is used to achieve the results. This approach is mainly focused on the reduction of the communication between processes using minimal surface tessellation of the space defined by the model particles. The algorithm also introduces the possibility of integrate model parameters such as velocity or particle density in order to increase the performance adapting to different instances and stages of the problem.

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