# Review

**Title**: Fast Algorithms for Intersection of Non-matching Grids Using Plücker Coordinates

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**Review**: The paper presents a new algorithm for intersections between 1D and 2D unstructured multi-component meshes and their intersections with a background unstructured 3D mesh. A common algorithm based on the advancing front technique is used for the efficient selection of candidate pairs among simplicial elements. This technique can be used, e.g., for the numerical of groundwater processes including the transport processes.

The paper describes into details the whole algorithm including the basic subroutines for intersection of simple geometrical elements. Then authors compare the effectivity of the proposed algorithm with two others from the theoretical point of view. Finally, an application of the algorithm to a real-world example is presented.

The subject of the paper is undoubtedly interesting and demanding for many practical application. I suppose that the paper **can be accepted** for publication. There are several remarks concerning the manuscript which should be taken into account.

- It is not quite clear what is the main motivation for this work. Why to use FE computation on non-matching grids? It is clear that the mesh generation is easier but on the other hand the FE solution is much more complicated. There exist mesh generation codes allowing to generate matching grids for complicated geometries. This item should be discussed.

- The authors should outline how the algorithm is sensitive to the computer arithmetic. Namely, how to set parameter $\epsilon$ in the algorithm in page 5? Is it necessary to choose it empirically or is there a more sophisticated approach?

- I suppose that it would be also nice to add some FE solution of the considered problem on meshes from Figure 8.

- bottom of page 3: what is $\mathbf{u}_p$ and $\mathbf{v}_p$? What is their relation to $\mathbf{v}$?

- I do not understand too much to Figure 1. There is stated that "the sign of the permuted inner product gives us the relative position of the two lines". But in Figure 1, there is more lines. Which two of them are considered?

- Section 4.2: Table 1 shows that the algorithms based on the Plücker coordinates is less effective. Are there some another advantages of this algorithm?