

Modeling and SPH Analysis of Composite Materials

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The number of SPH modelling and analysis examples using medical imaging devices such as CT Scan(CT) and MRI have seen an increase in the industrial field [1]. And the particle modeling technique for micro structure mechanics of a metal using microscopic photographs and its application examples to 2D elastic wave propagation analysis and 2D ECAP elastic plastic analysis have been reported in [2].

In this study, we propose an image processing technique which can quantize the material properties by brightness value and generate 3D SPH particle models from the sliced CT/MRI image data of composite materials.

In the past, to reconstruct 3D model by CT/MRI medical images unstructured grid approach (polygon) was often used to reproduce the complex geometry. However, this could not represent a solid model. In this study we use CT/MRI medical images brightness to arrange for the initial particle coordinates by voxel method instead of polygon approach. The 3D particle data are generated by using threshold selection by the brightness value.

The large computational time will be required for this approach, because of the large amounts of 3D particle models. We have resolved the computer resource problem by the development and use of GPU technology.

Finally using the proposed method described above, we introduce the elastic plastic analysis and fracture analysis of 3-point bending test for carbon fiber reinforced plastic material using SPH method. It is concluded that SPH composite material analysis using image processing such as CT/MRI and microscope photographs is convenient for evaluating composite materials.

REFERENCES

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