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Development of numerical program for rigid body rotation

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We developed a numerical calculation program for rigid body rotation. Tombstone is widely distributed object and becomes a good recorder of earthquake, since it slips, rotates, falls down, and jumps, affected by the earthquake motion. Therefore, it is important to investigate the motion of tombstone or rigid body rotation, numerically.

When we develop the numerical program for rigid body rotation, we have to be careful about the orthogonality and the unity of the unit vector along the principal axis of inertia. Conservation of energy and the angular momentum is also important. A simple numerical program does not ensure these properties.

Our program represents the time evolution as the summation of rotations. Since the exact rotation does not break the orthogonality and the unity of the unit vector, the summation of these rotations also does not break these properties. Rotation can be represented by quaternion. To ensure the conservation properties, we consider the time evolution of the unit angular momentum vector on the rigid body frame. On this frame, the unit angular momentum vector moves along the closed curve, which is determined by the given energy.

The comparison between our program and the other simple program will be presented.

Keywords: simulation, rigid body