On the smoothness of Navier-Stokes equation

Wan-Chung Hu

Abstract

The existence and smoothness of Navier-Stokes equation is still a puzzle. I propose that space and time has smallest unit. The unit of space is called new plank volume. The unit of time is called new plank time. Due to Zeno paradox, the spacetime cannot be differentiable infinitely. Thus, space and time has smallest unit. This causes a smoothness problem of Navier-Stokes equation. Because atoms and molecules in the fluid cannot be differentiable infinitely. This implies that there is no smoothness in the Navier-Stokes equation.

The millennian questions include the existence and smoothness of Navier-Stokes equation. Because continuity equation is the basis of Navier-Stokes equation, this equation should be continuous. This also implies the existence of Navier-Stokes equation. However, we still don't know if there is smoothness of Navier-Stokes equation. That is to say if the vectors such as velocity and pressure can be differentiable infinitely.

Space or time has smallest units. The unit of space is called new plank volume. The unit of time is called new plank time. The space or time has smallest unit is due to Zeno paradox. Because fluid is also composite of atoms or molecules, the fluid cannot be differentiable infinitely. The unit: new plank volume and new plank time also suggests that the spacetime cannot be differentiable infinitely. This will disprove the smoothness of Navier-Stokes equation.

Vortex with singularity can also rise due to the Euler equation or Navier-Stokes equation. The singularity inside vortex also suggests that smoothness is not likely in the Navier-Stokes equation. These results suggest the presence of smoothness of Navier-Stokes equation.