

# Research plan

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In the previous research, we obtained the results which suggest a possibility of naked singularity formation by the spindle gravitational collapse in the frame-work of five-dimensional Einstein gravity. It is obtained by researching apparent horizon formation in the initial spacelike hypersurface in which a spheroidal mass exist. The singularity which is covered by an apparent horizon cannot be seen from far, namely it is not naked. In the infinitely thin limit of the spheroid, the poles at the both ends of this thin spheroid are the space-time singularities. Further, in the case that the singular spheroid is sufficiently long, no apparent horizon appears. This result is a bit surprising, because a singular line source with uniform line energy density is always enclosed by an apparent horizon in spite of its length.

The difference between a singular spheroid and an uniform line source is whether the line energy density vanishes continuously or discontinuously at the poles. In general, if an infinitely thin line object forms by the gravitational collapse, it might have a line energy density which continuously vanishes at the end of matter distribution. Therefore, the naked singularity formation seems to be generic in axisymmetric gravitational collapse of highly elongated matter distribution in five-dimensional space-time. However, since we have obtained the sugesstion from only initial data and not followed the time evolution, we did not get definite conclusion on the formation of naked singularities at present.

In order to obtain the definite result, we will perform the following numerical simulations.

1. The simulation of Newtonian gravitational collapses of ellipsoidal dust in five-dimensional space-time.
2. The simulation of full general relativistic gravitational collapses of ellipsoidal dust in five-dimensional space-time.

Through these simulations, we can discuss the stability of the collapses against the strain, namely whether the ellipticity is amplify or not, and we will obtain the more definite suggestions about the naked singularity formation in five-dimensional spacetime.