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Lecture 1.
“Numerical methods for the simulation of the astrophysical flows”

In the lecture the modern numerical methods used in the simulations of the astrophysical flows are discussed.
The basic approaches are described for gravitational gas dynamics, magnetohydrodynamics.

Lecture 2.
“Magnetorotational supernova exlosions. 2D MHD simulations”

We present 2D results of simulations of the magnetorotational core collapsed supernova. For the first time we obtain strong explosion for the core collapsed supernova. In 2D approximation we show that amplification of the toroidal magnetic field due to the differential rotation leads to the formation of MHD shockwave, which produces supernova explosion. The amounts of the ejected mass and energy can explain the energy output for supernova type II or type Ib/c explosions. The shape of the explosion is qualitatively depends on the initial configuration of the magnetic field, and may form strong ejection neat the equatorial plane, or produce mildly collimated jets. We discuss the violation of the mirror symmetry of the supernova explosion in magnetorotational mechanism and possible explanation for the origin of the observed rapidly moving neutron stars.