Predicting Space Debris' Trajectory through the Atmosphere

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Originally an idea to plot the course of meteorites through the Earth's atmosphere, fragmentation of meteors proved too difficult to include. The project was modified into a way to lessen the risk of further collisions between space debris and other objects in orbit around the Earth, as the debris is in an arbitrary way pushed or pulled down towards the atmosphere. The first iteration of the model only applies to spherical objects. It receives a series of "base"-data, consisting of information regarding the piece of space debris being analysed, including size and mass of the object, the density of the material it is made of, its distance from the Earth and its current velocity in all three dimensions. A force is the applied to the debris in an arbitrary direction, and the model simulates the change in acceleration, converting these into both velocity and positional vectors. In doing so, it accounts for the gravity of the Earth, as well as friction against the atmosphere. The density of the atmosphere is found through the MSIS-E-90 atmosphere model. The relative speed to the atmosphere takes the rotation of the Earth into account. The loss of kinetic energy through friction is assumed to be converted completely into thermal energy, heating the debris until it reaches its melting point. An arbitrary constant determines how much thermal energy is transferred to the debris, and how much is transferred to the air around it. An arbitrarily deep layer is assumed to be the sole recipient of the thermal energy, and as it melts, is assumed to slide off the debris. While heated, the loss in thermal energy is assumed to progress as black-body radiation. The intial iteration of the model ultimately failed due to using the Euler Method to predict the trajectory of the debris.