August 10, 2019

—"*What I tell my niece.*"

The mutual attraction between two or more objects does not guarantees that they "end up" – which means after a sufficiently long time during which all transients of the initial encounter equilibrated – in a stable, localized state. Their paths through the world may still diverge and never overlap despite affectionate meetings for some finite intervals.

Now, can *you* predict whether or not this behaviour pertains to any number of objects of this kind? To give you some examples, although two planets attract each other gravitationally, they might pass each other and end up in different corners of our universe. Is that scenario possible also for the entirety of all planets, stars, point-like-on-astronomical-scales masses, *i.e.* , is Newtonian gravity consistent with an ever expanding universe, or does it demand its eventual collapse? Secondly, a man and a women meet late at night in the swimming pool of a hotel in Manchester, the rain knocks steadily against the glass roof, the blue tiles reflect only few rays of light, and the atmosphere conveys a feeling of security in light of a harsh nature. The two talk, they experienced similar things up to this point, they were both not born in England and communicate with each other not in their mother tongue.

What I tell a machine.

$$m_i \ddot{\boldsymbol{x}}_i = \tag{1}$$

Question 1.
Does an unbounded trajectory exist for any number of particles whose mutual interaction does allow for such an unstable state?

a) Put the system in a "Fermi" box.

b) Put that box into a gravitational background field whose centre is identical with that of the box.

c) Let the particles be connected to each other via springs,*i.e.* , assume a harmonic-oscillator interaction.