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## On the difficulties of calculating gravity

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The calculation of gravitational interactions scales with the number of particles squared. This creates enormous computational demands with large number of particles. To mitigate this issue multiple algorithms, such as tree or grid approaches, have been used in the past to reduce the computational costs and to allow for larger simulations with larger numbers of particles. While these algorithms work well on CPU, they are difficult to port on the GPU and are usually resulting in significant overhead.

In OpenGADGET3, a N-body/SPH code for massive cosmological simulations and part of the SPACE CoE, we try to implement a new approach combining the strength of a gravitational tree and the computational power of the GPU.

**Primary author:** KARADEMIR, Geray (USM, LMU)

**Presenter:** KARADEMIR, Geray (USM, LMU)

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