Review of: "A direct calculation in the newtonian gravity framework"

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The article is most probably a pedagogical piece since the good old Gauss theorem is by far the best tool to quickly prove the well-known statement, Theorem 1.1, of the article. With this assumption, I would like to recommend the following "improvements" to make the article more accessible to students:

1- The left hand side of (2.1) is minus the gravitational potential, say $-\phi(u)$, and that of (2.2) is the magnitude of the gravitational force, say $F(u)$ (or minus the force itself, as a vector $-\vec{F}(\vec{u})$ at the point $\vec{u} \in \mathrm{R}^3$). By definition, a conservative force follows from the relevant potential via $\vec{F}(u) = -\vec{\nabla}\phi(u)$ for a physicist. Moreover, the gravitational potential satisfies Poisson's equation $\nabla^2\phi(u) = -4\pi\mu(u)$ in Gaussian units.

[The sign choices above should be obvious since gravitational force is always attractive and mass is always a non-negative quantity. In passing, the source coordinates are typically denoted by $\vec{r}\,'$ rather than x and that of the observer by $\vec{r}$ rather than u in the physics literature. Similarly, U is r and the mass density μ is denoted by ρ. In the physics literature, when using spherical polar coordinates, the polar angle θ is measured from the positive z-axis, whereas the azimuthal angle φ is measured from the positive x-axis; so the vector x in the second unnumbered equation corresponds to (z, x, y) in Cartesian coordinates. These and other relevant formulas can be found, e.g., in the textbook

John David Jackson, Classical Electrodynamics, 3rd ed., John Wiley & Sons, Inc., 1999

2- As already pointed out by the author in Remark 2.2, since

$$\vec{\nabla}\frac{1}{\left|\vec{r}-\vec{r}\,'\right|} = -\frac{\vec{r}-\vec{r}\,'}{\left|\vec{r}-\vec{r}\,'\right|^3},$$

the left hand side of (2.2) can alternatively be written as

$$-\int_{B_R}\mu(\|x\|)\,\vec{\nabla}\frac{1}{\|u-x\|}\,dx = -\vec{\nabla}\int_{B_R}\frac{\mu(\|x\|)}{\|u-x\|}\,dx$$

with $\vec{\nabla}$ living in the *u*-space, the right hand side of (2.2) already follows from that of (2.1).

3- It would be helpful to add a hyperlink to the Wikipedia entry mentioned in Remark 4.2.

Here are a few typos/misnomers that need to be taken care of:

1- It is definitely better to use "massive point particle" instead of the "punctual massive body". Who is late and who is on time? :)

2- At the third line of Remark 2.2, the typo "dermines" should be corrected to "determines".