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The problem of Inverse Square Law and Inverse Square Root

Matej Babič

Faculty of Information Studies, Novo mesto, Slovenia
E-mail: babicster@gmail.com

Abstract. The inverse-square law is the holy grail of understanding the laws of light, and man is a being of light. Some things are used inversely as the square of something (usually divided) and some things are not. For example, if a point light source sends light uniformly in all directions, the amount of light energy per second falling on a small area is inversely proportional to the square of the distance from the source. Double the distance for the same area and the energy per second will be four times less. Triple the distance and it will be nine times less. (It should really be part of the area of a sphere centered on the point source so that the distance is unambiguous. However, a small planar area perpendicular to the black from the point source approximates this.) Thus, light follows an inverse square law (at least in Euclidean space). In this article, I will present a very old problem of our civilization: the inverse square law and some solutions to this problem. The normalization of a vector is a calculation that frequently takes place in programs like graphics. This calls for two pricey operations—calculating a square root and performing a floating-point division. The approach that computes an inverse square root very quickly utilizing simpler operations is described in the following. In this article, I will present how the problem of inverse square law and inverse square root are connected.

Keywords: inverse square law, speed of light.

Problem inverznega kvadrata razdalje in problem inverznega korena

Zakon inverznih kvadratov je sveti gral razumevanja zakonov svetlobe in človek je bitje svetlobe. Nekatere stvari se uporabljajo obratno kot kvadrat nečesa (običajno razdeljen), nekatere pa ne. Na primer, če točkovni vir svetlobe pošilja svetlobo enakomerno v vse smeri, je količina svetlobne energije na sekundo, ki pade na majhno površino, obratno sorazmerna s kvadratom razdalje od vira. Podvojite razdaljo za isto površino in energija na sekundo bo štirikrat manjša. Potrojite razdaljo in energija na sekundo bo devetkrat manjša. (Resnično bi morala biti del območja krogle s središčem na točkovnem viru, tako da je razdalja nedvoumna, toda majhno ravninsko območje, pravokotno na črno od točkovnega vira, se temu približa.) Torej svetloba sledi inverznemu kvadratnemu zakonu (vsaj v evklidskem prostoru). V tem članku bom predstavil zelo star problem naše civilizacije: zakon inverznega kvadrata in nekaj rešitev tega problema. Normalizacija vektorja je izračun, ki se pogosto izvaja v programih, kot je grafika. To zahteva dve dragi operaciji – izračun kvadratnega korena in izvajanje deljenja s plavajočo vejico. Pristop, ki izračuna inverzni kvadratni koren zelo hitro z uporabo preprostejših operacij, je opisan v nadaljevanju. V tem članku bom predstavil povezavo problema inverznega kvadratnega zakona in inverznega kvadratnega korena.

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1 INTRODUCTION

As energy spreads out from a point, the same energy passes through a larger and larger spherical surface. The area of this surface is given by $S=4\pi r^2$. Thus, the energy per unit area decreases as $1/r^2$.

The one who was the first to extend the paradigm management perfectly is the founder of answer theory, the Jesuit priest Prof. Dr. Ruđer Bošković. Bošković assumes that the earth breathes unobserved [1]. As a result, our body size constantly changes between day and night. During the day, the radiation is greater than at night and we are smaller without being capable of discovering the realization. What applies to the acceleration of light also applies to motion, which is also measured in m/s. This indicates a lower speed on the day side where the meter is correspondingly smaller and a higher hurry on the night side. As ensues, the Earth will circle the sun. The inverse square law is the result of the assumption that the gravitational field, or the effect it produces, propagates around a point source in the form of three-dimensional circles. Since the surface area of a sphere, which is $4\pi r^2$, is also proportional to the square of the radius, the emitted radiation spreads farther from the source to an area that rises proportional to the square of the distance from the point source.

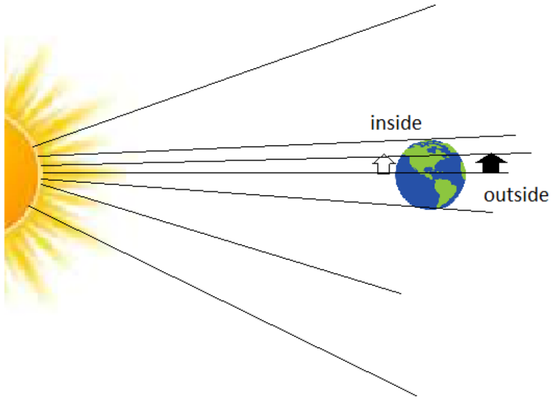

Figure 1. The curvature of the Earth in the gravitational field of the sun

What is another name for inverse square law?

The vigor of attraction or repulsion between two thrillingly charged particles, being directly proportionate to the product of the piezoelectric instruct, is inversely proportional to the exact contrariety between them. This is given as Coulomb's justice [2].

Some things vary inversely as the square of something (usually distance) and some things do not. For example, if a point light source sends light out evenly in all directions, the amount of light energy per second falling on a small area is inversely proportional to the square of the distance from the source. Double the distance for the same area and the energy per second will be four times less. Triple the distance and it will be nine times less. (In fact, the area should be part of a sphere centered on the point source so that the distance is unambiguous, but a small plane area perpendicular to the line from the point source approximates this.) Therefore, light follows an inverse square law (at least in Euclidean space).

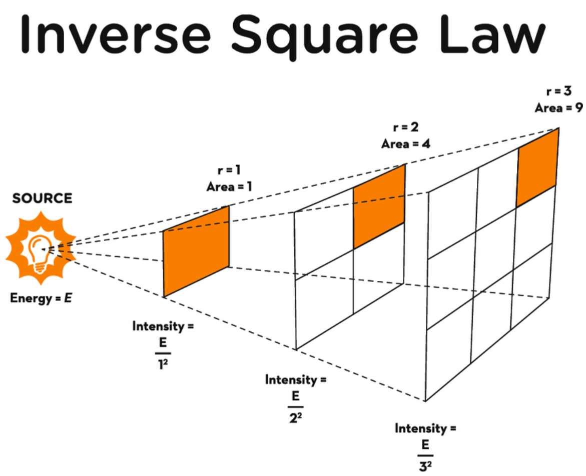

Figure 2. Visual propagation of light following the inverse square law

In Figure 2 Source *S* shows the light spring, while r presents the measured step. The lines represent the unstable emanating from the origin and fuse. The total number of flux lines hinges on the strength of the light source and is constant with an increasing distance where a greater density of inconstant lines (lines per unit range) degraded a stronger spirit room. The density of unstable lines is inversely proportional to the square of the variance from the rise since the exterior area of a sphere was with the true of the line. Thus the address intensity is inversely proportionate to the equality of the alienation from the fountain.

2 THE PROBLEM OF INVERSE SQUARE LAW

Where does the inverse square problem come in?

The inverse square law appears in many places. Thus in the gravitational angle in the electric field (from point sources) the field falls as $\frac{1}{r^2}$. Other things that follow the inverse square law are gravitational and electrical forces. On the other hand, gravitational and electric potential follow the inverse law – e.g. double the distance to halve the potential.

What is the square of the distance problem?

The problem of the square of the distance is the physical measurements that we observe in the same system or within the system but we cannot observe and measure them outside the system. The fish is in a round bowl but it cannot look at itself outside the bowl physically and look at ourselves and make measurements from the outside to the inside.

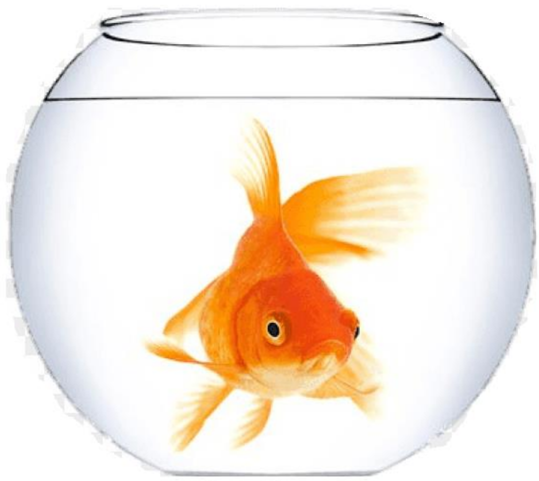

Figure 3. Fish cannot move outside of the bowl space

The energy that the transmitter sends to the receiver is spread both during the transmission of the signal and during the reflected return over the entire space (which geometrically means over the surface of the sphere – the sphere). Therefore, the inverse square for both paths means that the transmitter will receive energy according to the inverse of the fourth power of reach. Therefore, modern physics presents a false theory.

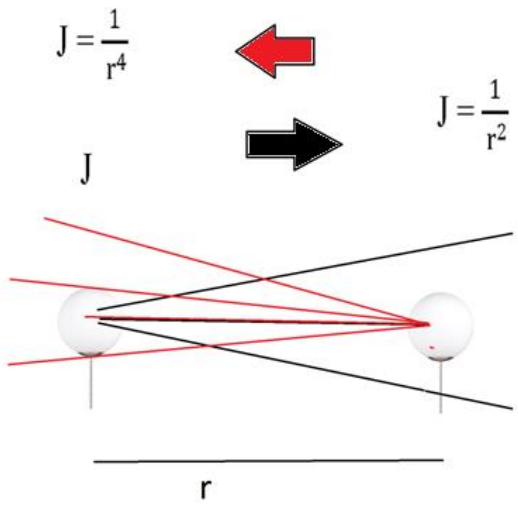

Figure 4. The inverse square for both paths means that the transmitter will receive energy according to the inverse of the fourth power of reach.

Figure 5. Graphical presentation of inverse square law

$$J = \frac{1}{r^2}$$

Proof.

$$J \Leftrightarrow \frac{1}{r^2}$$

$$J \Rightarrow \frac{1}{r^2}$$

With distance, the intensity decays with the square of the distance (this can be measured and calculated). See Figure 2.

and

$$J \Leftarrow \frac{1}{r^2}$$

The problem is that we cannot see our space ($J = \frac{1}{r^2}$) from outside ($J \Leftarrow \frac{1}{r^2}$). We cannot measure physical properties from outside of our space. An example. Even a fish cannot look at itself outside the glass aquarium sphere!

In 1755, Bošković created his epochal discovery. The ancient law was the inverse square division:

$$m \sim \frac{1}{r^2}$$

Assuming a point mass, the gravitational effect occurs with $\frac{1}{r^2}$, which refers to a sphere of radius r.

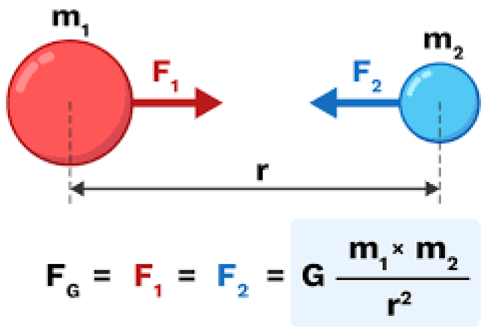

Figure 6. Gravitational effect

An experiment in which a field source, e.g. a point light source, is scanned with radius r. The same applies to the electric field as to the strength of the magnetic field:

$$E \sim \frac{1}{r^2} \text{ and } H \sim \frac{1}{r^2}$$

Earth is affected by the solar wind which follows the electric field strength of the sun. In contrast, the radius is:

$$r \sim \frac{1}{\sqrt{E}} \qquad r \sim \frac{1}{\sqrt{H}}$$

r presents the **inverse square root**.

Prof. Dr. Konstantin Meyl is a German professor of electrical engineering with a doctorate in the three-dimensional non-linear calculation of eddy currents. He developed a new extended field theory (potential vortex1-5 [3-7]) based on the work of Nikola Tesla and Ruđer Bošković. About the speed of light from E, H ~ 1/r and r ~ c follows:

- The field determines the length measures (what is 1 m).
- The field determines the velocities v (in m/s).
- The field determines the speed of light c [m/s].
- The measurement of the speed of light is made with itself.
- A constant of measurement c = km/s is measured $\Rightarrow$ the speed of light c is not a constant of nature!

The biggest mistake of modern quantum physics is to treat the speed of light as a natural constant. This is a violation of the inverse square of distance law.

Why does the inverse square law work?

Because the surface area of a sphere is equal to the square of the radius. If a certain amount of field, whether gravitational, electromagnetic or any other, is to be uniformly distributed over a sphere, the amount per unit area of that sphere will fall in inverse proportion to the area of that surface, i.e. inversely with the square of the radius. It is just another conservation law – twice the surface area, half the stuff, whatever the stuff is – gravity, light, or spaceships running away from the new one.

Why does the inverse square law occur so often?

This is a natural result of living in a three-dimensional universe. Any effect or force that is outward from a central point (such as light, gravity, or sound) spreads outward like an expanding sphere. The "power" of this effect is usually distributed evenly over the area of the expanding circle, following the inverse square law.

Example

The inverse square law of light defines the relationship between the irradiance from a point source and distance. It states that the intensity per unit area varies in inverse proportion to the square of the distance. Distance is measured to the first illuminating surface – the filament of a clear bulb or the glass envelope of a frosted bulb. Get access to our light intensity calculator by downloading it on our website today.

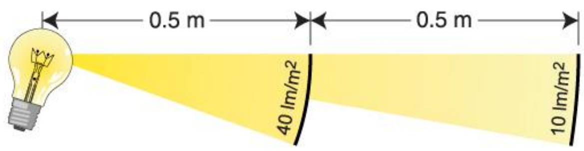

Figure 7. Light Intensity and inverse square law

You measure 10.0 lm/m² from a light bulb at 1.0 meter. What will the flux density be at half the distance?

Solution:
$E1=(r_1/r_2)^2 \times E2$
$E0.5\ m=(1.0/0.5)^2 * 10.0 = 40\ lm/m^2$

3 SOLUTION

The solution (1)

If we want to prevent energy dissipation during signal propagation, we can use a one-dimensional (+ circular dimension) tube which prevents energy dissipation (loss) on the sphere.

Solution (2)

We must observe the laws within the sphere. Therefore, let us make an artificial sphere where all the physical properties are implemented and then take measurements from the outside.

Does the inverse square law affect sound waves?

Things only follow the inverse square law if there is a lot of spherical symmetry in the media. Sound waves are usually affected by the inverse square law but your perception of sound is not. If you double the distance between you and the sound transmitter, the sound pressure that reaches you is not halved but quadrupled. This is because sound radiates just like other waves and is, as the question mentions, an illustration of how the inverse square law works. Therefore, even though sound obeys the inverse square law perfectly, your perception of sound is roughly “twice the distance is half the volume”. This should perhaps give you some insight into why your brain's sound processing works the way it does.

What we perceive as “half volume” is actually the result of an auditory memory of how the volume changes as we move closer and further away from the object. Our brain does not calculate the inverse square but it remembers situations well in the appropriate amount on an unconscious level. It is much more useful for the brain to be able to place an object in space based on "perceived volume = relative distance".

Things to Remember

Light loses brightness or luminosity as it goes away from the source, according to this rule. For example, if you turn on a light in one corner of the room and then move away from the source, the light seems dull or less brilliant owing to the increase in distance (away from the source).

The inverse square law formula can be stated mathematically as $I \propto (1/d2)$.

When a force, energy, or other conserved quantity is equally radiated outward from a point source in three-dimensional space, the inverse-square law often applies.

Because the surface area of a sphere (which is $4r^2$) is proportionate to the square of the radius, the emitted radiation spreads out across an area that grows in proportion to the square of the distance from the given source.

As a result, the intensity of radiation traveling through any unit area (directly confronting the point source) is inversely proportional to the square of the distance. Gauss' law for gravity is also applicable in the same case, and it may be applied to any physical variable that behaves in an inverse-square relationship.

Application of inverse square law

In X-ray methods, the inverse-square law is used to compute source-to-film distances.

It also aids in determining the duration of x-ray exposure, as well as the intensity of the x-ray tube used in the procedure.

When the brightness of the source is known, the traditional candle method may be used to compute the distance from the Earth.

The inverse-square law is used to calculate astronomical distances.

Application of inverse square root

A normalized vector is calculated using a floating point number's inverse square root. Programs can calculate the incidence and reflection angles using normalized vectors. To mimic lighting, 3D graphics algorithms need to make millions of these computations per second.

4 CONCLUSION

The opposite-quarrel law is a principle that expresses the way luminous energy propagates through space. The rule states that the power intensity per unit area from a point source (if the rays strike the surface at a right angle) varies inversely according to the square of the distance from the source.

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Matej Babič received his Ph.D. degree in Computer Science from the Faculty of Electrical Engineering and Computer Science of the University of Maribor, Slovenia. He studied Mathematics at the Faculty of Education in Maribor. He is Assist. Prof. at the Faculty of Information Studies, Novo mesto. His research interest is in fractal geometry, graph theory, network, intelligent systems, hybrid machine learning, topography of materials after hardening, public transport system, and scalar wave.