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The Formula for Calculating the Moment of Inertia and the Law of Conservation of Angular Momentum Are Wrong.

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Abstract
The moment of inertia about an axis is a classic concept in physics. This concept has existed for several centuries. Until now, the calculation of this moment value based on existing knowledge is still considered correct, and the results are still widely applied in many fields. The goal of this article is to point out the mistakes in formulating the calculation of the moment of inertia value. To clarify the problem, the author uses an approach involving physics and mathematics. The correctness of this knowledge is indisputable. The results of this article will open up huge applications and profoundly impact the fields of engineering, life and society. It helps to bring a more correct view of physical phenomena in nature. From there, it brings practical values about costs and prices when applying this phenomenon to produce and manufacture machinery and equipment. Like other studies, this study needs further experiments to clarify and confirm the correctness of the problem.

Keywords: moment of inertia, wrong, angular momentum, physics, solution.

1. Introduction

Moment of inertia I of a solid, about an axis Δ:

$$I = \sum m_i r_i^2$$

m_i : mass, r_i : Radius.

This formula is widely accepted, and so far, no published experiment or theoretical study confirms that this formula is wrong. However, this does not mean this formula correctly reflects the physical nature. This study points out the misconceptions arising when establishing the formula. These misconceptions include: the construction of torque in rotational motion and the process of establishing the moment of inertia.

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2. Method

2.1 Angular momentum.

Let us consider the figure below:

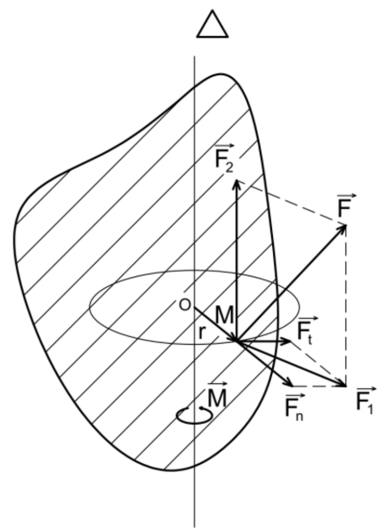

Figure 1 – Effects of force in rotational motion.

Suppose an external force F is acting on a solid rotating around the Δ axis. We have:

$$\vec{F} = \vec{F_1} + \vec{F_2}$$

With $\vec{F_1} \perp \Delta$, $\vec{F_2} \parallel \Delta$

$\vec{F_1}$ lies in a plane perpendicular to Δ

$$\vec{F_1} = \vec{F_t} + \vec{F_n}$$

With: $\vec{F_t} \perp OM$, OM is the circle's radius with centre O, $\vec{F_t}$ lying on the tangent direction of the circle (0), $\vec{F_n}$: lies along the radius.

Therefore, we have the following result:

$$\vec{F} = \vec{F_t} + \vec{F_n} + \vec{F_2}$$

In physics textbooks, the argument is as follows:

$F_2 \parallel \Delta$ So it only causes translational motion.

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Component F does not cause rotational motion; it only acts to make the solid object leave the axis of rotation.

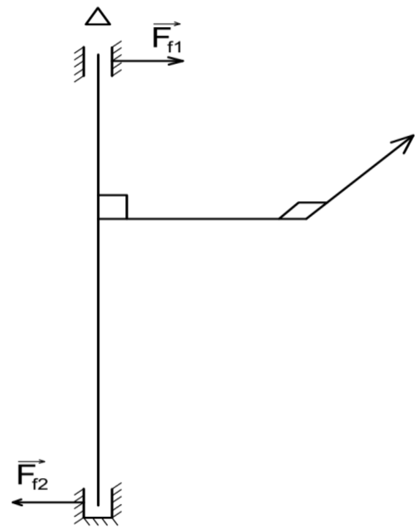

Figure 2 – Frictional force appears in rotational motion.

Frictional forces F_{f1} *and* F_{f2} propagate in the solid, leading to the appearance of dynamic forces. Therefore, they will change the moment. In the case of a rotating shaft with only one fixed end, F causes the rotating shaft to tilt.

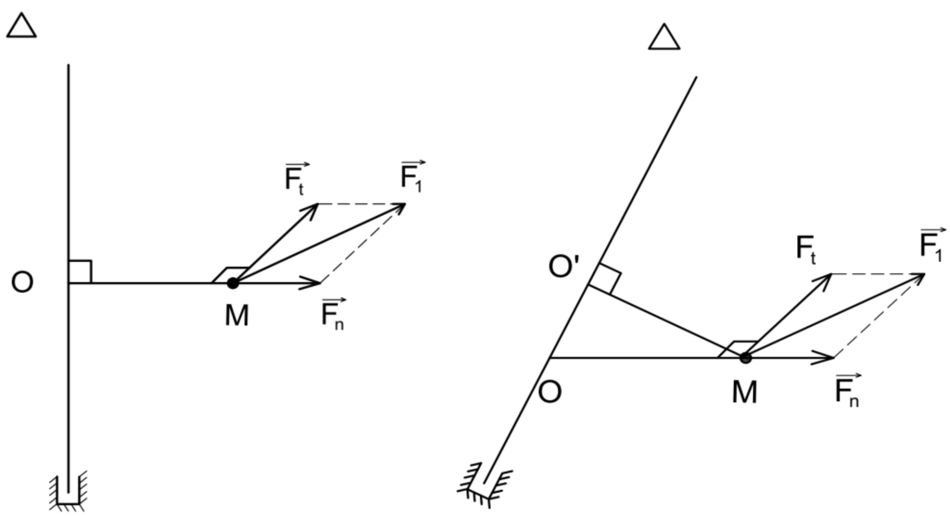

Figure 3 – Diagram describing the force acting in rotational motion, with one end of the shaft fixed and one end free.

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Meanwhile, F still maintains the same direction and orientation. Thus, the force component F_t tangent to the trajectory of the point of application M will change, and the moment will change accordingly.

$$\mathrm{M} = O'M.F_t$$

Let us consider the case of a spinning top. No matter how precisely one makes a spinning top, its axis will tilt as it rotates. This phenomenon is evident when the top rotates at a low enough speed.
Description of the Giucovsky chair experiment illustrating the law of conservation of angular momentum.

Equipment: The Giucovsky chair can rotate around a vertical axis. The person experimenting stands on the chair, holding two dumbbells in their hands.

Implementation:

- When the person extends their arms, the distance from the dumbbells to the axis of rotation increases → the moment of inertia increases → the rotational speed decreases.
- When the person contracts their arms, the distance from the dumbbells to the axis of rotation decreases → the moment of inertia decreases → the rotational speed increases.

Because the experiment was conducted with the chair still, and the person standing on the chair did not move, it led to a misunderstanding. We can see this in the following example:
For the ball in soccer, this is especially clear. When the player spins the ball horizontally relative to the ground, the ball's trajectory will be a curve relative to the horizontal. If we rely only on the law of conservation of angular momentum, we cannot explain the origin of the curved trajectory of the ball.

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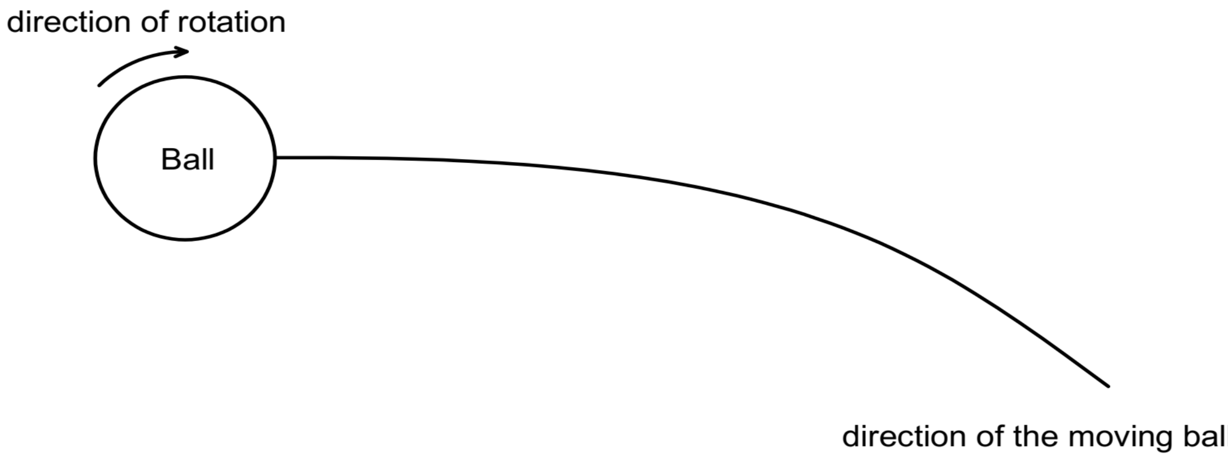

Figure 4 – The curved trajectory of the ball experiences angular momentum.

Thus, when applied to the above phenomena, the law of conservation of angular momentum will no longer be correct.

2.2 Error in setting the moment of inertia.

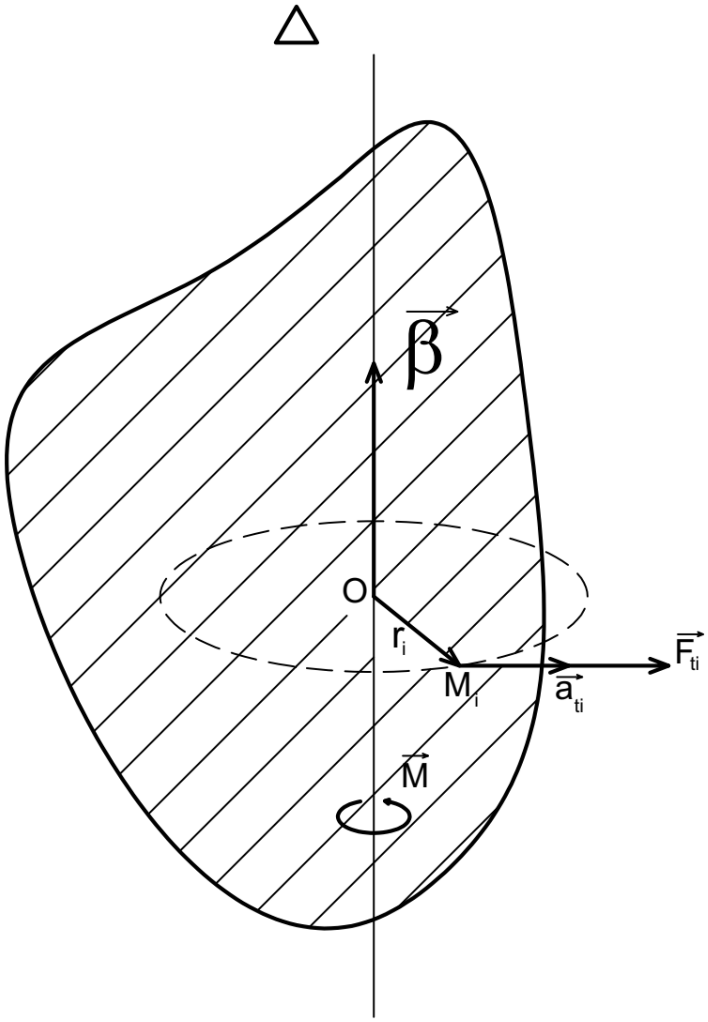

Figure 5 – Set up the fundamental equation of rotational motion.

M_i Is any point of the solid.

Δ: is the axis of rotation at a distance r from M_i. We have $\overrightarrow{OM_i} = \vec{r_i}\ M_i$, has mass m_i and is affected by the tangential external force $\overrightarrow{F_{t_i}}$. We have: $m\overrightarrow{a_{t_i}} = \overrightarrow{F_{t_i}}$ Multiply both sides of the equation by the vector radius $\vec{r_i} = \overrightarrow{OM_i}$

$$m\vec{r_i} \wedge \overrightarrow{a_{t_i}} = \vec{r_i} \wedge \overrightarrow{F_{t_i}} \quad (1)$$

$$\vec{r_i} \wedge \overrightarrow{F_{t_i}} = \overrightarrow{\mathrm{M}_i} \quad (2)$$

$$\vec{r_i} \wedge \overrightarrow{a_{t_i}} = \vec{r_i} \wedge \left(\vec{\beta} \wedge \vec{r_i}\right) = \left(\vec{r_i}.\vec{r_i}\right)\vec{\beta} - \left(\vec{r_i}.\vec{\beta}\right)\vec{r_i} = \overrightarrow{r_i^2}.\vec{\beta} - 0 \quad (3)$$

In which we have applied the following mathematical formula:

$$\vec{a} \wedge \left(\vec{b} \wedge \vec{c}\right) = \vec{b}\left(\vec{a}.\vec{c}\right) - \vec{c}\left(\vec{a}.\vec{b}\right) \quad (4)$$

In the above formula:

$\vec{r_i}\left(\vec{r_i}.\vec{\beta}\right) = 0$ because $\left(\vec{r_i}.\vec{\beta}\right) = 0$

So from (1) (3) (4) we have:

$$m_i r_i^2 \vec{\beta} = \overrightarrow{\mathrm{M}_i} \quad (5)$$

$$\sum m_i r_i^2 \vec{\beta} = \sum \overrightarrow{\mathrm{M}_i} = \mathrm{M} \quad (6)$$

M: sum of the moments of the external forces acting on the solid.

$$\sum m_i r_i^2 = I \quad (7)$$

I Is called the moment of inertia of the solid with respect to the Δ axis.
So (6) can be rewritten as:

$$I\vec{\beta} = \overrightarrow{\mathrm{M}_i} \quad (8)$$

The above are the arguments given to calculate the moment of inertia I. In (3) and (4), there is a fundamental mistake: $\left(\vec{r_i}.\vec{\beta}\right) = 0$

$\vec{\beta}$ is a vector quantity representing the moment, but this is not a real quantity. To clarify, we consider the following figure:

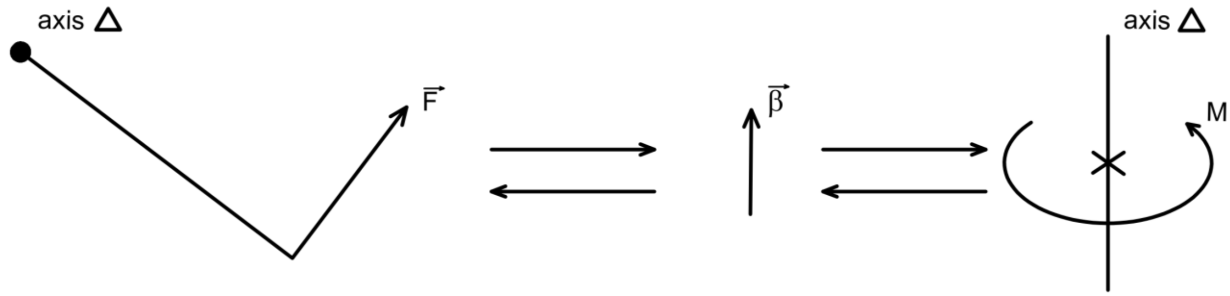

Figure 6 - Illustration proving that B is an unreal quantity in classical physics.

The value of the moment = force × lever arm

Meanwhile, $\vec{\beta}$ is a vector with direction and length as shown in the figure. $\vec{\beta}$ has a direction and a point of application corresponding to the magnitude of the moment. However, $\vec{\beta}$ does not exist in nature; it is only a quantity introduced by theorists to make calculating the moment easier. Therefore, when taking $\left(\vec{r_i}.\vec{\beta}\right)$, in terms of physics, this is a meaningless quantity. Therefore, in physics, there is no basis to affirm that $\left(\vec{r_i}.\vec{\beta}\right)=0$. Thus, all arguments to derive the equation $\sum m_i r_i^2 = I$ are wrong.

This equation is fundamental, so it is necessary to review all the consequences of using the equation. These include the law of conservation of angular momentum.

3. Results

The arguments in this article point out the theoretical and experimental errors in formulating the moment of inertia calculation and the fundamental errors in the Giukovsky experiment (the experiment proving the conservation of angular momentum). At the same time, this article also provides knowledge for potential further research.

4. Discussion

The proven errors raise the following issues:

+ The law of conservation of angular momentum is wrong. So what is correct?
+ The formula for calculating I is wrong, and the huge applications that apply this formula are also wrong—leading to other huge effects.

The article contributes to our understanding in the field of physics. Brings practical values to social life

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