STATIC AND DYNAMIC PHYSICAL LAWS

Vector derived and transforming a rotating basis in a fixed base (called 'basic Frenet') they provide the mathematical proof of the existence of the centrifugal force? It's to do !…

Some useful information

- A repository is a set of benchmarks against which to measure the characteristics of a mass movement. There are two types of repositories: the general reference to describe a real movement, and the limited reference to describe an apparent motion.

The Earth is the general repository adapted to the description of the movement of cars and all they contain (passengers, luggage) because, as the name implies, land vehicles move relative to the Earth. However, a car can only be a small repository that does not allow other description than that of the movement of passengers and luggage. This distinction was detailed in a folder to play elsewhere (see ADILCA folders).

- A force is any cause capable to change the speed or trajectory of a body. There are two types of forces: the real forces and imaginary forces.

The real forces are remotely or by contact, they are at the origin of the movement observed in a general repository. There are only two forces acting at a distance: the gravitational force and the electromagnetic force. By cons, there are a multitude of contact forces, including those governing the movement of land vehicles. These are exerted on the tires in contact with the ground (driving force, engine brake force, braking force and guiding force).

The imaginary forces (also called apparent strengths, fictitious forces or pseudo-forces), are of a different nature: they are supposed to be exerted on the center of gravity of a mass to explain apparent movement or balance but can only appear in a restricted repository or in a static description. Physics knows only three imaginary forces: inertial force, centrifugal force and the Coriolis force.

From reality to fiction

What is the transformation of a rotating base in a fixed base?

Mathematics and physics are certainly complementary, but we must be careful to align calculations without considering their real meaning. In this case, the passage of a rotating basis to a fixed base is a transformation that ignores the real movement.

So it is a purely imaginary projection. In other words, the rotation base is then considered to be immobile, and it is then necessary to resort to imaginary forces to explain movement or become apparent equilibrium.

This conditional

How to separate reality from fiction? Here is an example:

- Sentence 1: I won the lottery $ 300 and my grandmother left me $ 700, I have $ 1,000.

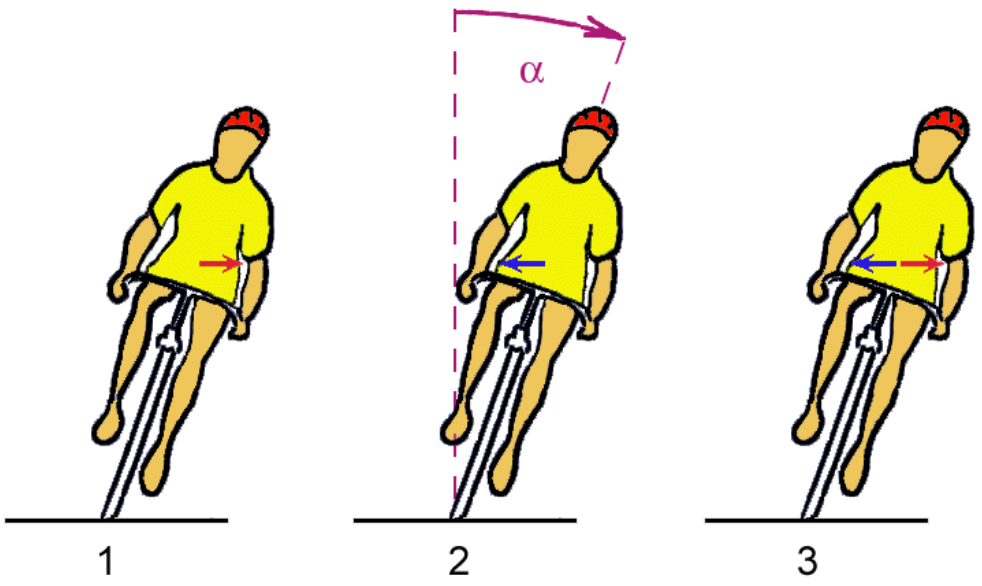
- Sentence 2: if I won the lottery $ 300, and if my grandmother gave me $ 700, I would have $ 1,000.

We see that the two calculations are absolutely accurate in both cases, with the slight difference, however: the money is real only in the first sentence, it is completely fictitious in the second! These are modes that allow conjugation to distinguish, and there is no question of mixing, or the grammatical point of view, it is the rule of tenses nor the accounting point of view!

From dynamic to static

The same transformation is in math and physics! Moving from a rotating basis to a fixed base is like spending this conditional, conditional assuming here that the real movement is frozen. The first description is named 'dynamic', this is the actual description. The second is called 'static', this is an imaginary description. But a thousand words, here is the example of the balance cyclist to illustrate this distinction.

Three drawings better than a long speech



- Drawing 1: This is the actual description, known as 'dynamic'. The rotating base is made of a cyclist on the bicycle. Concrete translation: the rider is moving and in a circle. According to Newton's law, the cyclist was initially deviated from its straight path through a contact force **F**, unique and real, which causes the lateral acceleration of its center of gravity is the guiding force (arrow red on the drawing 1). In reality this force is exerted in contact with the ground but, for better readability of the drawing, we 'transported' it to the rider's center of gravity which is one of the basic rules of vector calculus.

In this description, the proper relationship is:

$$\mathbf{F = M V^2 / R}$$

A numerical example shows that if the mass of the rider is 100 kg (bicycle included, "**g**" = 10 $m.s^{-2}$), the speed 10 meters per second, and the radius of its path 100 meters, the intensity of the guiding force necessary to maintain this path is 100 newtons. Furthermore, an accurate measurement of the angle of the cyclist inclination relative to the vertical (from a photo, for example) show us that, in these conditions, this angle is exactly equal to 5.7 degrees.

- Drawing 2: this is an imaginary description, called 'static'. The rotation base was converted to fixed base. Concrete translation: the cyclist is now still, he did not advance. But it leans to one side! To prevent falls, the equilibrium condition requires the presence of a force **F'**, commonly force called 'centrifugal force' (blue arrow in the drawing 2).

This force is supposed to have on the cyclist's center of gravity (if we neglect the mass of the bicycle). But that famous strength she really exist? Not for who has ever seen a cyclist, both still and looked able to stay balanced in such a position?

This force is called a centrifuge, which means '*which distances from the center*.' This term is it appropriate? Either, because the cyclist is stationary and there is no path, there is no radius or center. The correct name of this force is 'fictitious force', 'imaginary force' or 'pseudo-force'.

Another regrettable error, the relationships between quantities. Indeed, contrary to popular belief, the famous magic formula **F = MV² / R** can never be applied to this description in which the speed is always zero. An attempt to numerical application confirms:

$$\forall\ \mathbf{M},\ \ \forall\ \mathbf{R} \neq \mathbf{0},\ \text{pour}\ \ \mathbf{V = 0},\ \ \mathbf{F = MV^2/R\ =\ 0/R\ =\ 0}\ !...$$

Here it is, this famous mathematical proof! And it's not all ! What value give R? Measuring the trajectory radius of a stationary object? It is clear, clean and definitive: this formula does not work here, it only leads to a dead end!

So how to calculate the intensity of centrifugal force? In truth, the only relationship that fits this description is the following:

F' = **– P . tangent α**

In this relation, P is the weight of the assembly and α its inclination relative to the vertical angle. Here, the [**–**] sign is decisive: it specifies the spatial orientation of this force which, obviously, should exercise the opposite side of the tilt. We will see later why that sign is so important.

The digital implementation of this equation shows that for a stationary cyclist retain mass 100 kilograms (bicycle understood, "**g**" = 10 $m.s^{-2}$) in an inclined position of 5.7 degrees to the vertical, it should have a strength of an absolute value of 100 newtons.

A 100 newtons force? What a curious coincidence! Or rather: what an extraordinary correspondence values, what marvelous precision physics, for chance and coincidences obviously do not have their place here!

These calculations show that, for an identical inclination, the guiding force (dynamic description) and centrifugal force (static description) have the same intensity! Hence the confusion.

Beware ! The accuracy of the calculation does not prove the reality of the concept. One of these two forces only is real, it is the guiding force. The other is purely imaginary, we repeat, this is the centrifugal force.

And now, we will demonstrate that these two forces, and so the two descriptions which they relate, can neither complete nor overlap!

- Drawing 3: it is a mixture of the two previous descriptions, a sort of fusion against nature intended to bring clear and definitive evidence that the two arguments are totally incompatible.

In this description, the two forces coexist, but the vector calculation shows that these two forces of equal intensity and of opposite directions, cancel each other:

F + **F'** = **100 – 100** = **0** !

How to interpret this? A vector sum of zero means that everything happens then as if these two forces not acting: the cyclist now comes to himself!

That is, if we think in dynamics, cycling (which is moving) remains bent but retains a straight path, he cannot describe any circular path! And if we think in static, the cyclist (which is stationary) immediately falls, he cannot stay still and looked even time!

This reasoning by contradiction must convince us that it is imperative to choose one of these two descriptions and forget the other! QED!

From this follows an absolute rule: you never mix a rotating base and a fixed base,

a dynamic description and static description, the present and the conditional, reality and fiction!

Static or dynamic: the true definition!

The above brings us to these two definitions:

Is called a perfectly static description in which a moving base is considered stationary.

We call dynamic real description of the movement and its causes.

Attention danger ! Beware to use! Physical abhors a mix of genres. Insist again on the formal and absolute prohibition to merge the two descriptions, which will ban until the system! And note in passing another common mistake: confusing and restricts static description repository (see ADILCA records " centrifugal force " and " inertia ").

What misunderstandings, as setbacks, blunders than for those, students or teachers do not respect these precautions! ...

Centrifugal force: the true definition!

The distinction between static and dynamic brings us to these two original and unpublished definitions of centrifugal force:

We call centrifugal force transverse force that should be exerted on the center of gravity of a stationary bicycle (we neglect the mass of the bicycle) to keep it in balance with the same taper as that can be observed when describing a circular path. This definition applies only static is void if the bicycle is in motion.

For a car, this definition becomes:

Centrifugal force is called the transverse force that should be exerted on the center of gravity to create a stationary car on tires and suspension an effect comparable to that which can be observed when the car in a circle . This definition, valid only in static, lapses if the car is moving.

A purely imaginary force!

Emphasize the first requirement of this definition: the vehicle must be stationary. Then underline the hypothetical nature of this force, made clear by the use of the conditional '*force should be exercised*'... and finally, the technical impossibility to exercise directly any force to the center of gravity of any mass.

Besides, no one has seen with his own eyes seen such force occur spontaneously.

We therefore deduce that the centrifugal force is an imaginary force. This is an apparent force, a fictitious or pseudo-force, i.e. a force that has no real existence.

The only force that really exists is exercised in contact with the ground, is the guiding force. It was she who initially deflects the straight path of land vehicles, it is what keeps them in circular paths, and it alone. There is no other force into play on this occasion!

Proof by the water bottle

How to distinguish a static description of a dynamic description? The experiment called 'water bottle' may be enough! This experience is to partially fill a plastic water bottle, preferably with syrup (mint, grenadine...) to color the content and then install the bottle flat across the handlebars or tank of a motorcycle.

The experiment called 'water bottle' can reveal the true nature of the description. In dynamics, the liquid surface remains perpendicular to the plane of symmetry motorcycle. Static, the fluid falls on the side where the machine is inclined.

Then just go for a walk and observe the movements of the liquid during variations in trajectories: except brutal driving or shaking caused by the soil, the liquid surface is always perpendicular to the axis of symmetry of the motorcycle. It obviously would not even static!

This experience is very useful: When a teacher struggles to draw strengths to the table, ask him how to behave so a liquid inside a bottle... You'll know right away if the teacher thinks in static, dynamic, or if he is wrong!

What is the use of an imaginary description?

Beyond the controversy as fun as sterile, the real question to ask is rather this: why did physicists felt the need to invent imaginary descriptions? Reality is not enough?

Incidentally, this exercise of intellectual acrobatics, which many teachers use, constitutes a kind of 'bridge donkeys' intended to sort out the pseudo-scientific (those who confuse pseudo forces with the real forces!) and other.

But the real explanation is not there. To the physicist, this intellectual construction is justified in the interests of consistency of all descriptions, both theoretical and fictional they may be.

Thus the natural abhors a vacuum and physicist projects its rigorous logic everywhere, including in the abstract!

The fictitious forces are concepts that serve only to satisfy the need for coherence own theory. The fact remains that these forces are purely imaginary, they have no real existence. To hold otherwise falls within the fraud or incompetence.

Conclusion

The imposture is not the concept of centrifugal force! The only real intellectual imposture, is the confusion between reality and fiction, the present and the conditional, dynamic and static. The real intellectual imposture is to believe or make believe that the centrifugal force does exist!

Indeed, the least scientific and educational precaution is to always clearly specify the nature of the proposed description and added that in the case of a static description, there can be only an imaginary description in which forces have no real existence. Then all description mixture is obviously prohibited.

Finally, the famous magic formula $F = MV^2 / R$ used almost everywhere indiscriminately can be applied to a dynamic description, it can not therefore express only one force: the guiding force. Spread the word !

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