New approach to laws of physics based on a Law of Approximations

Law of approximations

To understand the laws of physics we need to consider all the possible equal events that can potentially happen.

In this work, we will try to show that the rule above is true and also we will show an approach based on this rule to some of the aspects in physics.

To understand the rule we can think of it as the opposite of machine learning. In machine learning to be able to perform any action, there is a need for a large dataset. Here there is only one action but we can easily approximate the physical situation into more advanced explanations of physical events.

Examples that showcase the rule of approximations.

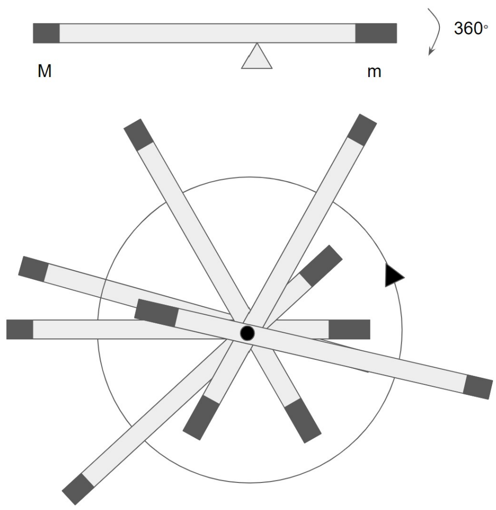


Figure 1: A swing rotated in the horizontal plane by 360deg

$$m_1 = \rho ds H \tag{1}$$

$$m_2 = \rho ds h \tag{2}$$

$$H = \frac{m_1}{\rho ds} \tag{3}$$

$$h = \frac{m_2}{\rho ds} \tag{4}$$

If $m = M$:

$$\rho V_1 = \rho V_2 \tag{5}$$

$$\rho 2\pi R H s = \rho 2\pi r h s \tag{6}$$

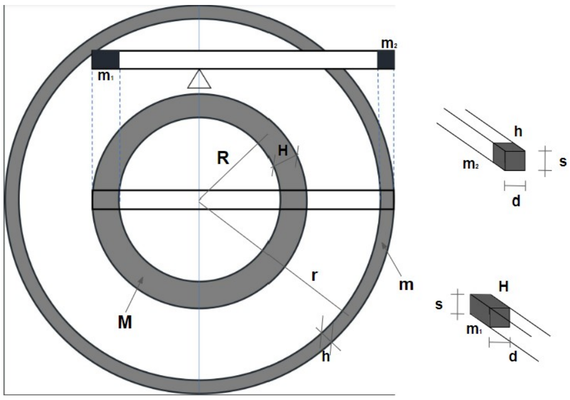


Figure 2: Performing full rotation of the swing in the horizontal plane we obtain two discs.

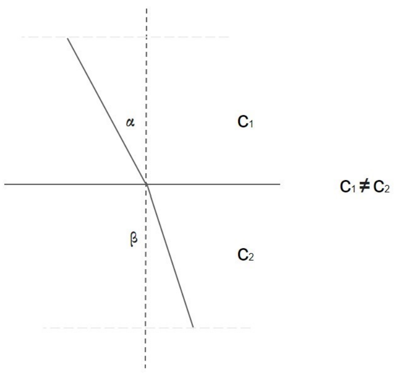
$$HR = rh \tag{7}$$

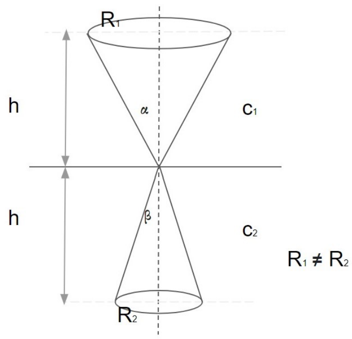
Combining both:

$$R\frac{m_1}{\rho ds} = r\frac{m_2}{\rho ds} \tag{8}$$

$$Rm_1 = rm_2 \tag{9}$$

Refraction



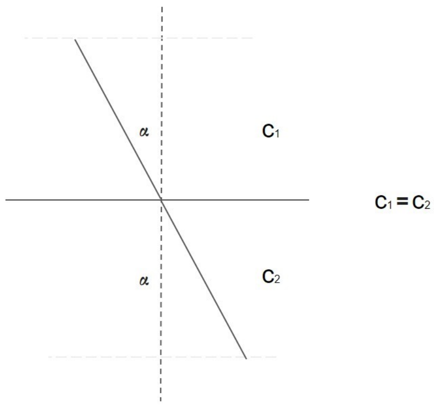


(a) Refraction of a single ray

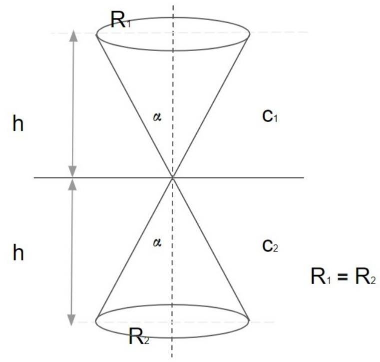
(b) Refraction if we consider all possible versions of the single ray

Figure 3: We can consider refraction using the rule of approximations.

When a light ray travels to a medium of a different refractive index than the initial medium the light refracts. The radii of the circles drawn by considering all the rays therefore also need to change when traveling to a different medium: $R_1 \neq R_2$



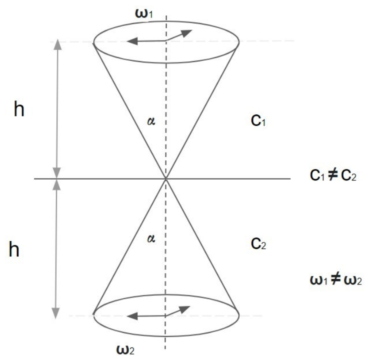
(a) A single ray



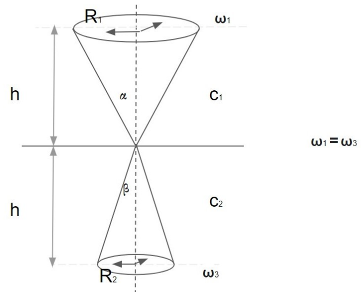
(b) We consider all possible versions of the single ray

Figure 4: We can consider refraction using the rule of approximations.

If we replace the top circle with a clock whose arms move with a constant angular frequency $\omega = \text{const}$.



(a) Angular frequency will change.



(b) Correct rotation, angular frequency is conserved. With differing speeds of light between media the refraction angle changed $\alpha \neq \beta$

Figure 5: We can consider refraction using the law of approximations.

Refraction of light can be a necessary condition to conserve a constant angular frequency ω, or in other words necessary to show us the correct image of reality.

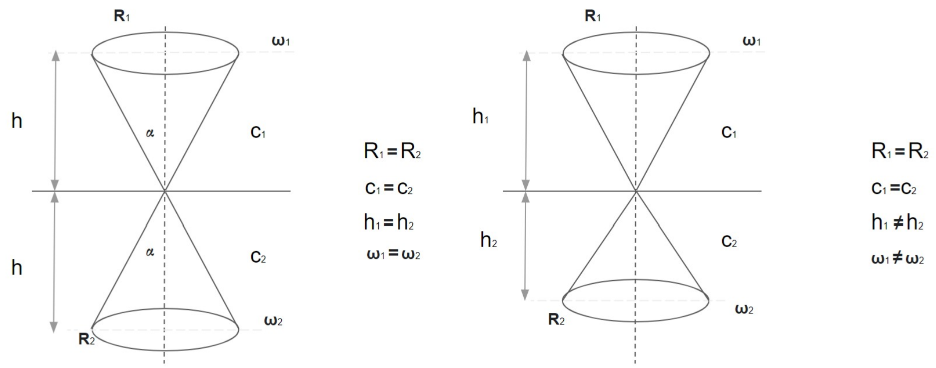


Figure 6: Similar situation happens when $c_1 = c_2$ and $R_1 = R_2$ but $h_1 \neq h_2$ then $\omega_1 \neq \omega_2$

Other considerations

Examples of equivalent systems

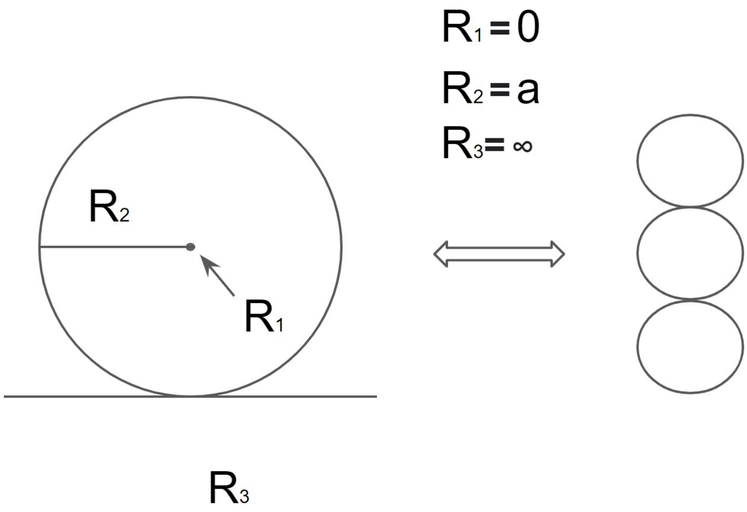


Figure 7

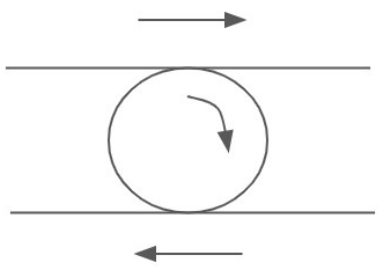


Figure 8

Time dilation in the reflection of the mirror

We have a moving watch 1, with an angular velocity of the watch arms ω_1. The reflection of the watch in the mirror (2) has the angular velocity of the watch arms ω_2. We can note that for the $\omega_1 = \omega_2$, or for the readings of the watch be the same in reality and in the reflection, time for watch 1 has to slow down. That agrees with the Theory of Relativity.

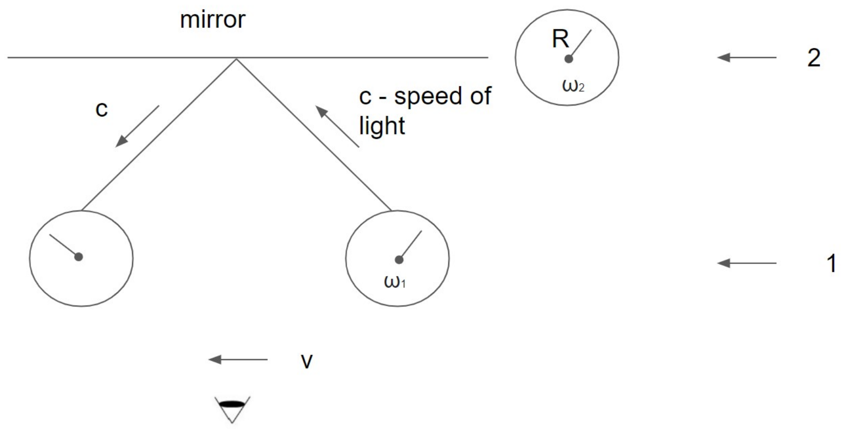
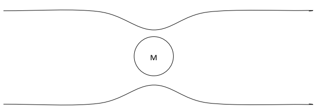


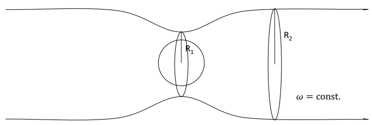
Figure 9: Moving watch, reflected in the mirror

Time In the case of the gravitational lensing the gravitation around a mass changes the speed of light around said mass. If we consider a circle placed in the matter around said mass that has a rotation and the rotation has an angular velocity ω, when the speed of light is slowed around the body the radius has to decrease to keep the angular velocity the same (Figure 10).

From these examples we can see that to describe the causes of the refraction and reflection of light we have to assume, in keeping with the law of approximations, that all directions of light travel are taken into account.



(a) Mass



(b) Mass considered with the law of approximations

Figure 10

Camera obscura The same consideration is taken when thinking about camera obscura. The image needs to be reversed when passing through the hole to keep the angular velocity, ω constant.

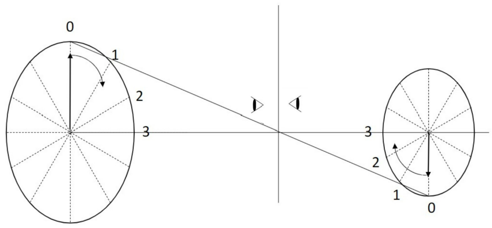


Figure 11: Camera obscura and the need to reverse the image to keep the angular velocity.

Thinking about movement

We discern a few types of movement

- rectilinear with a constant acceleration
- rectilinear with a varying acceleration
- movement on a curve
- circular movement

The Law of Approximations assumes that any movement is approached as the simplest version of the event. To understand the approach we will consider a potential path of a body in motion shown in Figure 12.

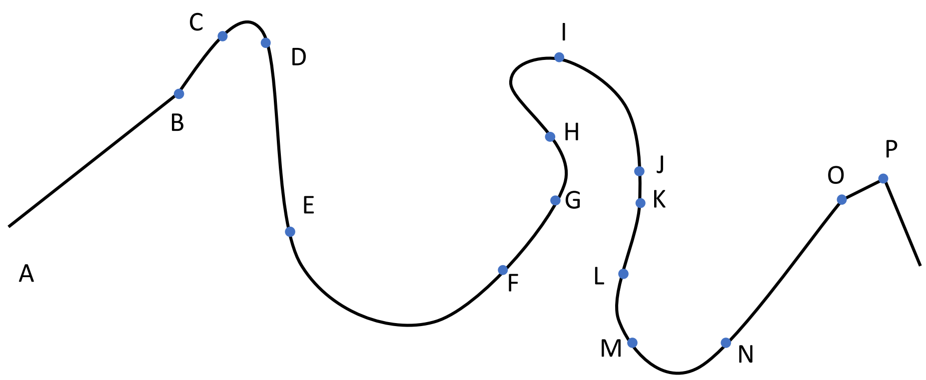


Figure 12: Path of the body in motion. Fragments of the path are denoted with letters.

The path can be divided into fragments with length l, each circular, with radii ranging from 0 to inf. This is presented in Figure 13.

We postulate that the primary type of motion is a circular motion, with which we can effectively describe all other types of motion. All the laws of dynamics can be therefore postulated based on this assumption with the circular motion being a base of the consideration.

Acceleration

Acceleration 1

Let's picture a situation where a body moves with acceleration a. It changes its speed from v_1 to v_2 with a constant force F. Considering two paths shown in Figures 14b and Figure 14a for an observer looking from the point T they are equivalent. The acceleration a can therefore be thought of as a function of a radius R.

A change in the force results in a change in the radius.

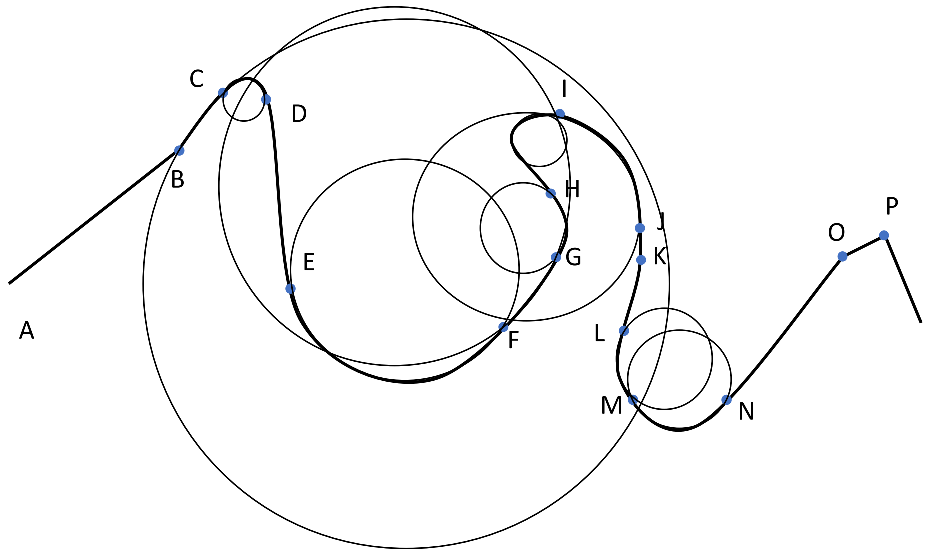
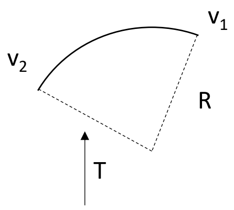
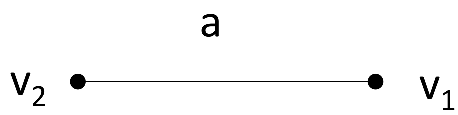


Figure 13: Path of the body in motion, divided into fragments that can be described by circles.



(a) The side observation



(b) Rectilinear

Figure 14: A circular movement viewed by the observer from the side is equivalent to observation of the rectilinear motion.

Laws

With this, we can reformulate the three laws of dynamics.

1st Law of Dynamics If no force is acting on a body or the forces that are acting on a body are in equilibrium the body moves on a circle with a radius 0 or inf. (Tho understand that one has to assume that for an observer of a rectilinear motion that looks in the direction of movement the radius of the observed circle is also equal to 0).

2nd Law of Dynamics The second law states that the rate of change of momentum of a body over time is directly proportional to the force applied, and occurs in the same direction as the applied force. Considering a body with constant mass m and undergoing a circular motion with a radius R

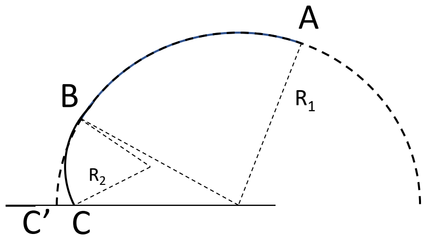


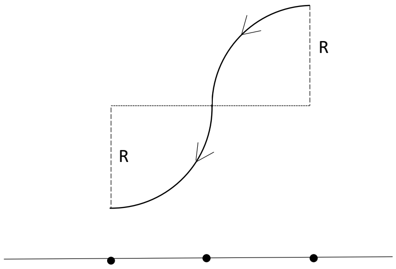
Figure 15: The change in force results in acceleration thus changing the radius of the circle

the law can be written as

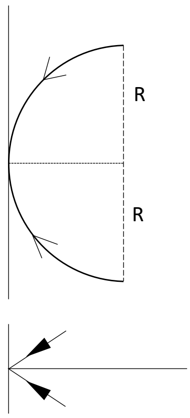
$$F = m\mathbf{a}(\mathbf{R}), \tag{10}$$

where $\mathbf{a}$ is the body’s acceleration.

3rd Law of Dynamics The third law states that a force F applied to a body results in a change of the circular motion. The radius of said motion can either change or remain the same, as demonstrated in cases of a collision (Figure 16a) and a bounce (Figure 16b).



(a) Collision. The radius stays the same.



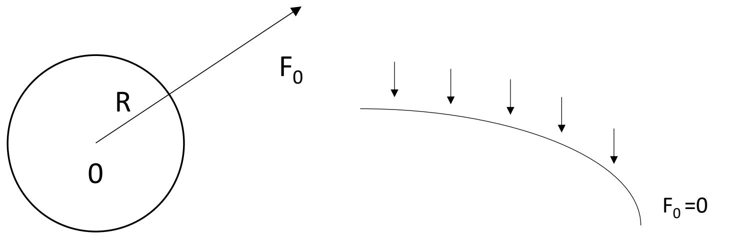
(b) A body bouncing off a wall. Radius stays the same.

Figure 16: Action of the force F

Inertia

In this section, we will explore the connection between circular motion, centripetal force, and inertia.

Centripetal force exits when there is a point about which rotation is undergoing. Not every motion on a curve generates centripetal force. We can think for example about the wind acting on a sail or a gravitational force, pictured on 17



(a) The gravitational force (b) The force of the wind on a sail

Figure 17: Examples of the movements where the centripetal force is not generated.

The value of the centripetal force Looking at the example shown in Figure **??**.

Knowing the kinetic energy in the point A

$$\frac{mv^2}{2}, \tag{11}$$

the work of the force F_0 on the distance R is

$$\frac{mv^2}{2} = \frac{1}{2}R\frac{mv^2}{R} \tag{12}$$

$$F_0 = \frac{mv^2}{R}. \tag{13}$$

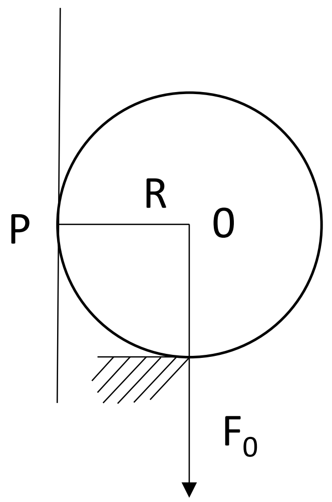


Figure 18: Example that illustrates the centripetal force

Inertia Assuming that there is an equivalence of movement in a circle of a radius R with the change in acceleration we can declare inertia to be a composite of the centripetal force, demonstrated in Figure 19.

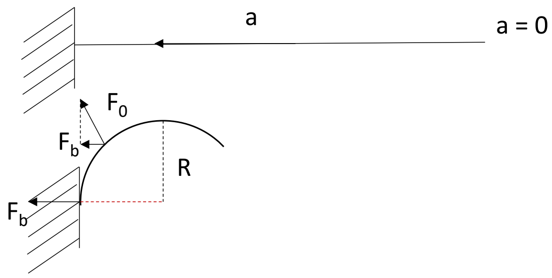
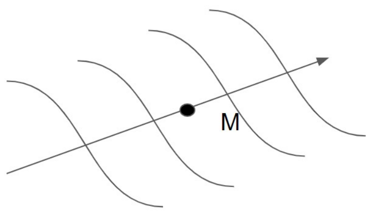


Figure 19: Force of inertia resulting from the centripetal force

Inertia and a gravitational force If we assume that the gravitational force is a form of spacetime warp by an object that has mass we can wonder how the deformation would behave if the body would be in motion. The rule of approximations would allow us to note that the spacetime warp would not need to depend precisely on the position of the body in motion. It could take the form of a deformation that has an axis along the direction of the movement of the body. A change in the



direction of motion would cause a need to act with a force to change the spacetime deformation. This way of considering would allow us to connect gravitational spacetime deformation with inertia and centripetal force.

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