Newton's Three Laws of Motion and their role in the World

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Abstract

The information on gravity, force, and acceleration is contained within Newton's three laws of motion discussed in this paper. Each law describes a distinct mechanism or explanation for how gravity operates. The first law explains why things move in the same direction or remain at rest unless an unbalanced force is applied to the item. The second law illustrates how force is equivalent to acceleration. The third law of thermodynamics states that there is always an accompanying reaction equal and opposite for every action. Each of these principles contributes to a greater understanding among scientists of how the World operates and the kinds of effects that can be brought about by moving objects. The World was fundamentally altered for the better as a direct result of every one of Newton's laws. The paper will also discuss ten research articles based on Newton's laws of motion application in a real-world situation.

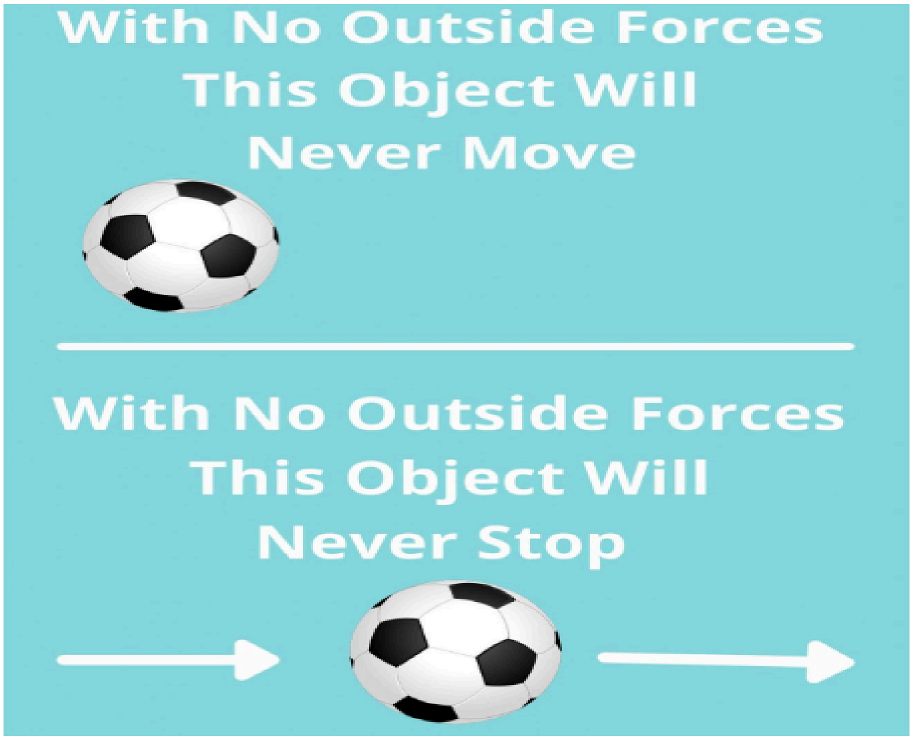
Introduction

Newton's Three Laws of Motion are the fundamental physics rules people use daily. This law states that an object's movement is proportional to the applied force operating on it. In these three laws, Newton outlined what occurs to a body and its effects when it is either at rest or in motion or when it is pressed by an exterior force to bring it into motion. This research paper aims to understand better Newton's law of motion and its practical applications in everyday life. The inclusion criteria for the articles will be Newton's law of motion role in daily activities among related terminologies.

Literature Review

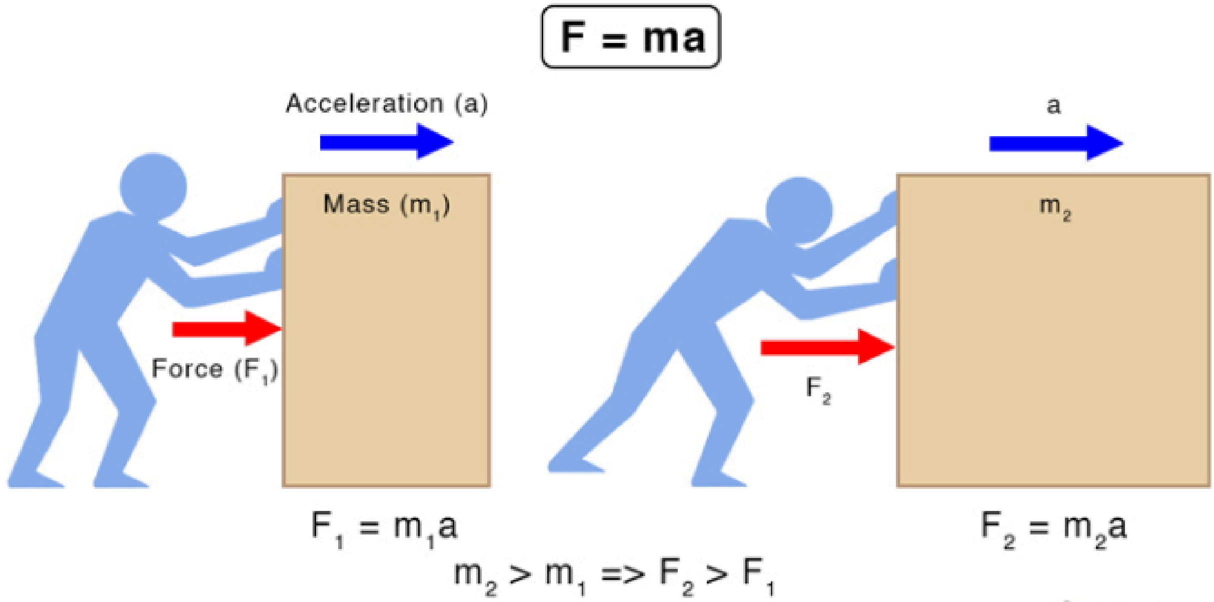
According to Bloomfield (2015), kinematics is a branch of the physical sciences founded on three physical laws of Newton's laws of motion. These rules explain the connection between the speed at which an object moves and the force being applied to it. The first law of motion states that if no net external force is acting on an object, the object will continue moving, and an object already at rest will remain at rest (Newton, 2017). This can be illustrated by using a ball; when it is in motion, it will continue being in motion unless an external force acts upon it. Similarly, if a ball is at rest, it will continue to be in that position unless disturbed by another force, as shown in the figure below.

Figure 1:



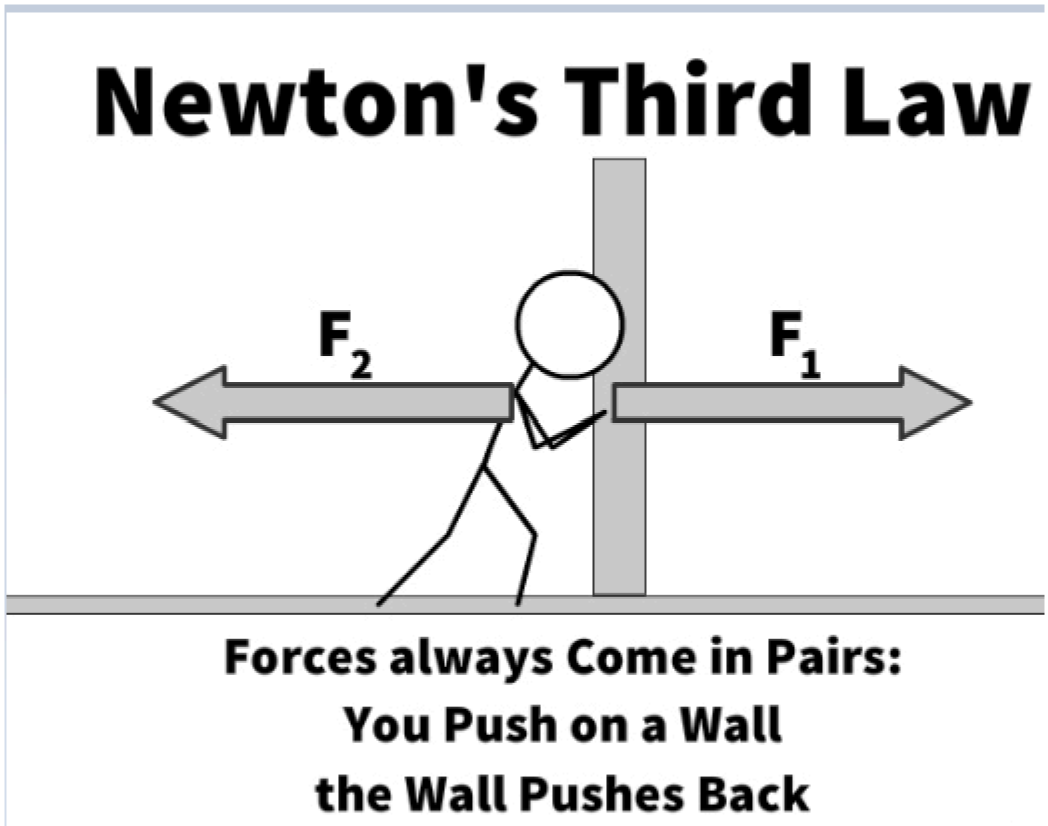
According to Newton (2017), the second law investigates what happens to the motion of an object when it is affected by forces from the outside. When a constant force acts on a large item, the force will cause the object to accelerate, which means that its speed will change at a rate that is also constant. A force operating on an object that is already moving causes that object to speed up in the direction that the force is acting (Sun et al., 2018). This is the simplest possible scenario. Nevertheless, suppose the object is in motion. In that case, it may appear to be accelerating, decelerating, or transforming its direction based on the direction of the force acting on it, the paths taken by the object, and the frame of reference in which it is heading (Lemmer, 2018, p. 27; Primanda, Distrik, and Abdurrahman, 2019)). This is because the direction of force acts on the object in the same way that it acts on the frame of reference in connection with one another. The second law is shown in figure 2 below.

Figure 2:



An object will experience accelerated motion if it is acted upon by force greater than zero. Suppose no force is operating on a body, either because there are no forces or because counterforces perfectly balance all forces. In that case, the body cannot advance and be in equilibrium (Shute, Ventura, and Kim, 2013). If there are no forces at all, there is no gravitational pull acting on the body. On the other hand, if a body is not perceived to be accelerating, then one can infer that there is no overall force operating on the body. The third law affirms that every force in the universe can exist in pairs, each with the same magnitude but in a different direction (Newton, 2012). There is no such thing as a secluded force; for every exterior force that exerts itself on an object, there is an equal and opposite force that reacts opposite on the object that is exerting the external force. Baran, Maskan, and Yasar (2018) state that because an isolated system is unable to in any way impose a resultant force on the system as a whole due to the interaction of internal forces, a force that is applied to one component of a system will be balanced by a response force that is applied to another component of the system. According to Budiarti and Tanta (2021), an object cannot bounce itself into motion by using only its internal forces; instead, it must interact with something external to generate a resultant force and acceleration. As shown in figure 3

Figure 3



Broader Impact

The link between a physical item and the forces that act upon it can be understood with the help of Newton's laws of motion. By understanding this knowledge, people can construct the foundation for modern physics. Newton's laws are particularly significant because they are connected to virtually everything people encounter daily (Baran, Maskan, and Yasar, 2018, p.225). These laws explain in great detail how things move or remain still; for example, they explain why people do not float out of bed or drop through the floor of their house. Newton's laws are responsible for the operation of cars, water flow, buildings' stability, and virtually anything else that moves or remains intact in our environment.

Techniques

Working with Newton's second law requires calculating the placement, x(t), and the velocity, v(t), as functions of time, t. This is done when a force is given to work with. When an issue can be solved, it is, of course, to one's advantage to obtain an analytical solution to that problem. Nevertheless, a numerical solution is a typical way too tough problems, and some methods can be used. In this context, the Monte Carlo (MC) method and the self-consistent (SC) method are important numerical approaches (Shute, Ventura, and Kim, 2013). In the instance of MC, the plan is to generate a wild guess for the acceleration, denoted by a (t), and then apply the trapezoid approach to calculate the velocity versus time, denoted by v (t). After performing a typical numerical integration of v, one arrives at the time-dependent position denoted by x (t).

Project Goals

Both force and motion play significant roles in our day-to-day lives. This paper enables examining how life and work are affected by physical variables. Through the lessons and activities, people will be more aware of friction, gravitational force, and magnetic force. Force and motion are prerequisites for participating in any form of physical activity. To execute any work, a person must have a solid understanding of the methods and mechanics behind exerting force (Sun et al., 2018). The combination of force and motion causes motion in an object or causes an item to remain motionless. Knowledge of force and motion is essential to comprehend daily life's happenings.

Body

Newton's laws of motion explain the occurrence of things in our immediate environment. For instance, people apply Newton's first law daily to achieve their dreams. As soon as a person commits to pursuing their dream, they put that dream into motion and bring themself one step closer to realizing it with each passing day. Their dream is no longer at a standstill but is in motion. The only thing that can stop the forward momentum of the dream is the intervention of some external force. An external force may manifest itself in various ways, including a pessimistic frame of mind, physical harm, or even setbacks. However, if the dream is not interrupted but maintained with positivity, it will grow and achieve its target. Additionally, another application of the law is that in the event of a collision, the airbag is designed to deploy and cushion the blow to the driver's head that the windshield would otherwise receive. When a vehicle equipped with airbags is involved in an accident, the unexpected pullback in its speed causes an electrical switch to be activated (Sun et al., 2018). This, in turn, initiates a chemical reaction, producing a gas molecule that tends to fill the airbag and safeguard the driver's head from injury.

When people make an effort to move an object, such as by trying to stop a moving ball from rolling on the ground or by pushing a ball to get it to move, they are putting Newton's second rule of motion into practice and seeing its implications in everyday life (Bortz, 2013). For example, when people play soccer, they apply force in a particular direction, which determines the path the ball will take due to that force. Additionally, the more strongly the ball is hit, the more force we put into it, and the further the ball moves. When individuals jump, their feet transmit force to the ground, and the earth generates an opposite and equal reaction force that propels them into the air, which is an illustration of the use of Newton's third law of motion in everyday life. In addition, as a person swims, the water pulls them forward while at the same time they are pushing the water back, so the two are mutually affecting each other.

Conclusion

In conclusion, Newton's laws of motion are extremely significant due to their widespread application in modern life. People are said to have implemented any laws deliberately or unknowingly whenever they drop something or even when they walk. Although most people do not pay much attention to the laws, simply being aware of them can help alleviate a great deal of stress. This is because the laws of motion encapsulate life, given that everything living moves, and this is why the laws are so significant.

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