APPROACHING PHYSICS FROM IT PERSPECTIVE

Margareta GALAJU, Eugenia GARCIU, Tatiana TSYGULEOVA, Carina CONSTANTINOVA

Technical University of Moldova

Abstract: *Have you ever thought about why you really need Physics in your life? Moreover, if you are willing to become a programmer, you will need to know Physics. Today, the most common question among the IT students is – 'Why does an IT student need to study Physics?' We will help you to clarify everything! In this work, we trigger the most fundamental scientific discipline as physics, because its main purpose is to study Universe's behavior, to predict it on different scales - from massive groups of galaxies attracted to each other by gravitation to tiny subatomic particles that behave weirdly according to our real life.*

Keywords: P*hysics, developers, programmer, quantum computers, technology, computers.*

Introduction

Physics is crucial to understanding the world around us, the world inside us, and the world beyond us. It is the most basic and fundamental science. Physics encompasses the study of the universe from the largest galaxies to the smallest subatomic particles. Moreover, it is the basis of many other sciences, including computer science, oceanography, seismology, and astronomy, medicine. The physical observations and the theories are consistent in nature. This is the theory, which makes the prediction of the results. Physics starts with the simple structures and then analyze the phenomenon. Now these days the physics has become indispensable.

Physics gets involved in your daily life right from you wake up in the morning. The buzzing sound of an alarm clock helps you wake up in the morning as per your schedule. The sound is something that you can't see, but hear or experience. Physics studies the origin, propagation, and properties of sound. It works on the concept of Quantum Mechanics.

Right after you wake up in the morning and start preparing for your school/office, you need an ironed cloth, and that is where Physics comes into play. The steam iron is such a machine that uses a lot of Physics to make it go. The foremost principle of Physics used in the steam iron is "Heat." Heat, in Thermodynamics, is a type of energy transfer from a warmer substance to a colder one. Ironing works by having a heated metal base- the soleplate.

Now, when you get ready for your office/school, whatever medium of commutation is, you certainly have to walk up to a certain distance. You can easily walk is just because of the Physics. While you have a walk in a park or on a tar road, you have a good grip without slipping because of a sort of roughness or resistance between the soles of your shoes and the surface of the road. This resistance, which is responsible for the grip, is called "Friction" or "Traction." However, when a banana peel comes under your foot, you suddenly fall. Now, what makes you fall? Well, it's due to the reduced friction between your shoes and the surface of the road because of the slippery banana peel.

Figure 1.Walking

When you get tired of work or studies, listening to music comes handy. Have you ever thought how does your headphone/earphone work? Well, again because of the Physics. The concept of magnetism and sound waves are involved in the science of your headphone/earphone. When you plug your headphone/earphone into an electrical source, the magnet in your headphone/earphone creates an electromagnetic field, which ultimately results in sound waves

Figure 2.Boxes

Have you ever noticed that on which principle does your car seat-belt work? Well, it's again Physics. When you tighten your car seat-belt, it works on the concept of "Inertia." Inertia is unwillingness or laziness of a body to change its state of rest or motion. In case of a car collision, your seat-belt helps prevent your body moving in a forward direction; as your body

resists being stopped because of inertia of motion.

The phenomenon of “Selfie” has engulfed people of every age groups. You entertain yourself by clicking photos. The Lens used in a camera works on the principle of Optics. The set of convex lenses provide the camera an image outside of the camera.

Figure 3. Lens

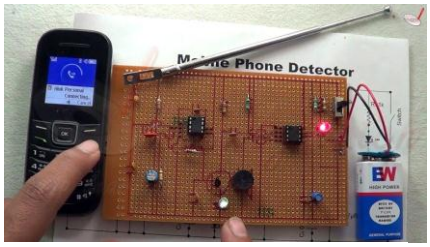

Figure 4. Cell phone

Cell phones have become like the Oxygen gas in the modern social life. Hardly, anyone would have been untouched by the effects of a cell phone. Whether conveying any urgent message or doing incessant gossips, cellphones are everywhere. But do you know how does a cell phone work? It works on the principle of electricity and the electromagnetic spectrum, undulating patterns of electricity and magnetism.

Whether in cellphones, cars, torches, toys, or any other appliance, batteries act as saviors of electricity. Batteries work on the principle of capacitance. Since the late 18th century, capacitors have been used to store electrical energy. Benjamin Franklin was the first to coin the phrase “battery” for a series of capacitors in an energy store application.

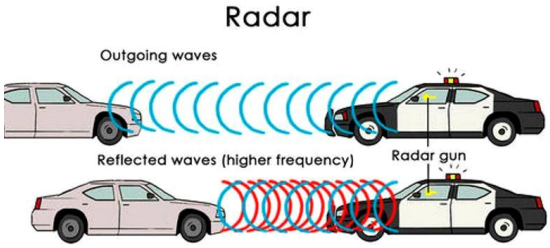

Figure 5.Machines

To check the overspeeding vehicles, police often use Doppler Radars. Doppler Radars work on the principle of Doppler Effect. The Doppler Effect is nothing but a change in the pitch of a sound when the source of the sound is moving relative to the listener. It is because the frequency of the sound wave changes as the source of sound moves closer to or farther from the listener.

Students' attitudes and approaches to problem solving in physics can greatly impact their actual problem solving practices and also influence their motivation to learn and ultimately the development of expertise.

1. The Beauty of Physics

Physics is the most fundamental of the sciences. It is concerned with the most basic building blocks of all things - from ants to antennas, from quarks to quasars. The study of physics means trying to find out what the universe is made of, and how these things move and interact with each other. So in one sense, all the other sciences are built on the knowledge gained through the study of physics.

Physics is beautiful. Physicists love simplicity. They are constantly striving to find the most fundamental ideas that can be used to describe even the most complex of phenomena. For example Newton found that only a very small number of concepts could be used to describe just about all of the mechanical world - from steam engines to the motion of the planets. Not only is this beautiful, it's downright amazing!

Physics teaches you to think. This might seem like a strange statement. The study of all subjects teach you to think. But because physics deals with the most basic concepts, the application of such techniques as "Separation of Variables" and "The Scientific Method" are never more clear than they are in the study of physics. Once mastered you will find that these methods can be applied to all subjects, including the business world and just coping with everyday life.

Physics is a creative subject. The concepts of physics don't come easily. Someone has to come up with a theory to begin with. This is just as much a creative process as composing music. But where physics, and science in general, differ from the Arts is that no one will accept your theory unless you have some way of testing its validity. Experimental physicists sometimes have to be enormously creative in coming up with methods of testing theories and measuring things in the world around them. For example, how do you tell that there is a planet orbiting a star that is so far away that it appears as nothing more than a spec of light in even the most powerful telescopes?

Physics gives you a new appreciation of the world around you. You can look a rainbow and say "Wow, pretty colors!", or you can marvel at the amazing interactions between photons and electrons that come together in that particular way when light from the sun strikes spherical water droplets in the sky, and that you perceive as a multicolored arc suspended in the air. Now that's awe!

Physics is fun. Lastly, studying physics gives you the opportunity of playing with a lot of really cool

toys!

2. Physics for Programmers

Many people studying the profession of a programmer do not truly understand why they need to study such disciplines as physics and mathematics. We found out why we need physics in general. Now let's discuss why people of technical specialties are studying physics.

Work related to physics

The future work of the programmer can be directly related to physics. Suppose your task is to create a ship simulator, interpret data from medical equipment, or develop realistic computer games.

If we take the latter direction, then a huge amount of applications of physics can be found:

- understanding the laws of propagation and reflection of light to create photorealistic graphics;
- the realization of a physicorealistic interaction of objects with the game world - a believable behavior of the car depending on the weather, a destructible game world, realistic ballistics, etc.
- modeling the behavior of complex environments such as water, smoke, fire.

The first paragraph is more or less clear.

Ability to build models

If in mathematics everything is always extremely strict (try to throw the equation out of the system!), Then in physics a person often works with a certain simplification - a model of a real system. In some cases, an object can be considered ideally elastic (in a real macrocosm there are no such objects), somewhere it is possible to neglect the friction force, in another situation the Coriolis force will be insignificant.

It is physics that teaches the construction of models of objects of the real world, recording them in a strict mathematical language, teaches to single out the most important and discard the insignificant.

For the profession of a programmer, such a skill is vital, because it is necessary to work with models in almost any field of activity, starting with search engines and ending with the banking sector.

Overall development

To know why and at what temperature water boils, why skis glide over the snow and why a cork shoots out of a bottle of champagne, should any educated person. But if you are a representative of a technical profession, you can be sure that others will expect from you more profound knowledge in the field of physics.

In some life situations, a person who knows, and most importantly understands physics, can find simple solutions to seemingly complex at first glance problems. And such situations the life of an active person throws a great many.

3. Physics in IT; interesting facts

Studying subatomic particles with their own reality that does not surrender to any logical rules led humanity to creating quantum computers that are based on quantum mechanics. Quantum computers will be super powerful, awesome and the fastest computers someday, and all due to the properties of quantum physics.

In a quantum computer, the information is represented by physical states that are sufficiently microscopic and isolated so that they obey the laws of quantum mechanics. The spin of a single electron is one among many possible ways for storing such a quantum bit (or **qubit**) of information. Imagine a computer in which the information is stored in the form of coins placed on a tabletop, with heads "1" and tails "0" being the two possible states of each bit. Then convert the tabletop into a quantum computer by substituting quantum coins for which heads and tails are quantum mechanical states. A normal coin would show either heads or tails, reflecting the fact that the bit it represents must be valued at either 1 or 0.

In contrast, quantum mechanics allows our quantum coins to show both heads and tails at once (just as Schrödinger's famous cat could be both dead and alive at the same time inside a sealed box), to whatever degree we choose. This ability comes with fact when we actually measure the orientation of a coin; it makes the choice between the two states. It is not determinate. For instance, it is possible to prepare a coin in a state that is 75 percent heads and 25 percent tails. The coin would remain in this state until someone measures it, which makes the coin randomly choose between heads and tails. This randomness is because by the fact that the coin really chooses a definite state only when it is **being watched**, and, until that happens, its state is completely described by a single number: the degree to which it is showing heads, or 75 percent.

If we expand our view to two quantum coins, there are clearly four possible results of measuring their state: both heads (1, 1), both tails (0, 0), and two combinations of one heads and one tails – called superposition (0,1 and 1,0). Quantum mechanics allows us to assign any weight we want to each

combination, as long as the total adds up to 100 percent. It follows that three numbers are needed to completely describe the two coins (the fourth is constrained because the total must add up to 100 percent). Similarly, we need seven numbers for 3 coins, 15 numbers for four, 31 for five, and so on. The complexity of the quantum state quickly becomes incredibly large: to describe only 100 quantum coins requires 1,267,650,600,228,229,401,496,703,205,375 different numbers – many trillion times the storage capacity of all computers ever made.

That is why quantum computers are the fastest. For instance, a central problem in modern cryptography is the search for the factors of very large integers. In a normal computer, the most efficient approach essentially consists of dividing the integer by every number smaller than its square-root to see which ones will factor it. The larger is the integer, the more time is required for this test. With a quantum computer, however, factorization is a snap, because we can perform the test on all numbers simultaneously and thus we need only a single test to find the right answer.

Conclusions

Designing efficient quantum algorithms turns out to be very challenging. Constructing a working, full-scale quantum computer is the most difficult problem of our century. This makes quantum computing be one of the great intellectual challenges of our time, and this fascinating subject is likely to remain at the forefront of research for many years to come. We want to inspire our peers and colleagues to study all the branches of physics, because this knowledge and understanding how the things around us work only makes our lives better and more intricate.

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