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WINGS TO YOUR THOUGHTS…..

IMPLEMENTATION OF A LIGHT SABER USING ARTIFICAL INTELLIGENCE

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Abstract— *From the ancient bow and arrow to the latest rifles and guns, humanity has experienced several devastating and powerful weapons. However a weapon that you might have seen only in the science fiction movies and not in reality is a light saber. A light saber can be described as a 3 foot long weapon which consists of a blade of a light source. That light emitting blade should not only be attractive but also powerful. It is to be as powerful so that it can slice through anything whether metal or not so easily as it was a piece of butter. In this paper we will try to find out how to build such a light saber. There will be a tough competition between a laser and plasma for the place of the blade. We will be finding out which material is the strongest one to bear a huge amount of temperature that these heat weapons can generate. Moreover can we able to find out a battery system that could generate such power that can light up an entire city.*

Keywords—*laser, optical communication*

1. INTRODUCTION

Since the time the humanity took its first step on the planet to the time of modern science and technology, the human beings have continuously used weapons and armors during the fight to survive. From the early swords and arrows to the young guns and tanks the thing that keeps on increasing in all these weapons is the power absence of effort that the user have to put on. We have encountered many times during a science fiction movies, a weapon that consist of a handle out of which a three foot solid light energy emerges out of nowhere that have an enormous power to slice through anything just as it is butter. They named it light saber and we are going to discover how to build one.

2. BASIC REQUIRMENT FOR A LIGHT SABER

The basic model for a light saber can be recalled as a few inch handle with a control button which when pushed, emerge a light beam of high intensity that could be solidified into a three foot blade that can slice through almost anything except another light saber. The most basic requirement in the design of our light saber is the blade. It can cut and slice through anything that comes in its way. The most basic answer to this question is using a laser. Light Emission by Stimulated Emission of Radiation, or simply a laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation.[1] A Laser works on a very simple principle that is explained as:

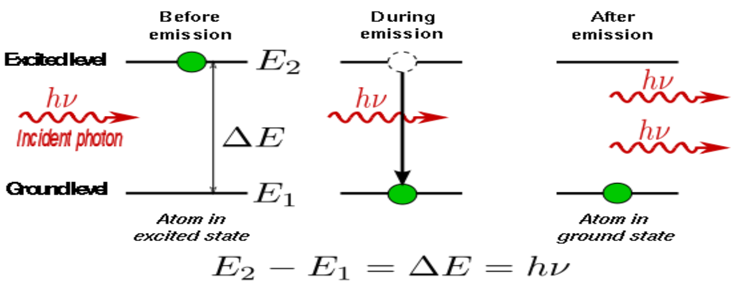

Figure 1: Phenomena of light radiation through energy levels

- When a beam of photons is incident on an unstable atom, it starts to jump from a lower state energy level to high state level and returning back. While returning from the high state to low state it emits the exact copy

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of the original photon in the form of electromagnetic radiation.[2]

- The laser works on the same principle despite the fact that it consist of a series of those atoms and two mirrors covering the atoms. Depending the amount of slant the mirrors provide the laser is accurate and in a single beam. Well this is pretty interesting and quite practical, but we might encounter some problems. First of all a laser in only a beam of light, so it will pass through any other identical beam of laser, secondly it will not be visible in the visible spectrum of the electromagnetic waves. But that's not all the biggest threat in building one is that the laser will go infinitely long in space devastating any building or even our satellites.
- The solution to this huge gigantic problem is already generated, almost. Dr. Ron Walsworth in Harvard-Smith Soman centre has found a way that has not been executed before and that could shake the laws of Einstein. He simply put a beam of infrared light into a chamber containing gas molecules in it. The twist in this experiment is that the gas molecules hold the photon between their pair for a fraction of seconds and then let it go. In some intense experiment, the scientist has been able to stop the light for more than one second.[4] This is the great innovation in modern science but again we encounter a problem.
- We are trying to build a revolutionary light saber whose blade is made of laser which can be stopped for a moment till now. But the issue is for the phenomenon to happen we require a temperature of about 12,000 Fahrenheit. At this temperature the gas molecules will heat down to form something called Plasma. Plasma not a solid, liquid or gas but is known to be the fourth state of matter. This substance is formed when a bunch of gas molecules is heated and ionized at a very high temperature of about 10,000 Fahrenheit.[5] The basic application of the plasma in now-a-day life can be seen in plasma torches which are used to cut one inch thick sheet of steel.

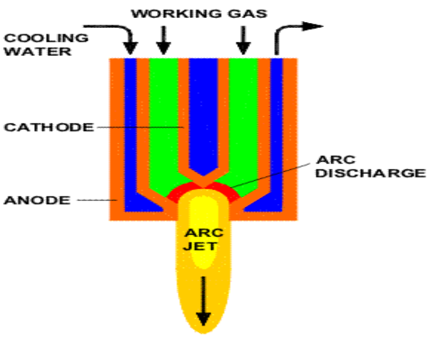

Figure 2: Plasma torch diagram and applications

The plasma torch usually used oxygen in the atmosphere as a fuel and the electricity along with a pump that superheat and ionize the oxygen to produce an arc jet of plasma. The power that the plasma torches uses to cut through steel so easily is approximately 2,700 Watts that is equal to the power generated by two household. Imagine a huge amount of power of about 50 MW that could be equal to a power of city can generate the ideal condition for the light saber similar to fictional movies. [6] But still the major flaw in the design is the least amount of control that one can have over the plasma. The answer lies in the depth of physics. The latest invention till the discovery of plasma is the neon gas plasma tube. It is having much less temperature as the real plasma and it is made up of neon gas. But the thing to notice is that this plasma layer can be altered or controlled by a phenomenon called magnetism. If we put a magnet inside a plasma container it will bend according to our will. So it might be possible in the distant future that we will be able to control the real plasma through magnetic properties.

Well our design for a perfect light saber is half complete. We will be having a blade of plasma that can be stopped or even bend at our own will by using the concept of magnetism. A real light saber can be able to slice anything as well as be useful in a fight. Using our plasma technology i.e. an ionized cloud of plasma can easily pass through another identical plasma layer. We have to have found a way by which the plasma layer can be solidified. Or we can find a material that is solid and can bear the plasma around its body. But is there any material on our earth that can bear the outstanding temperature of 12,000 degrees itself. Well there is a one named as Ceramic. [8]

It is widely found in MIT, department of Aeronautics and Astronautics. Experiments have found that this material known as ceramic can bear a temperature of about 3,000 degrees and remain untouched. However a lot of work has to be done by the scientist to enhance the properties of ceramic to make it bear a temperature of above 10,000 degrees. This ceramic material is often used in the spaceships, which helps the spaceships to remain untouched even in the blistering

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temperature when it reaches the earth's atmosphere. So the idea until now is we used a handle of high melting point under which is a ceramic layer whose outer coating is affected by magnetic properties. When the button is pushed the ceramic layer will pop out of the handle and start a process known as ionization of gas molecules to derive the fourth state of matter known as plasma. The plasma will emerge out of the holes and spread across the surface area of the ceramic ready to fight and slice. But there is one last big issue remaining. How on this planet are we able to generate and conduct a power of about 50 MW inside a few inches big handle? Where there is a problem, resides a solution.[10] And in this case the solution is very small, as small as an atom. Welcome to the Nano-world.

Carbon nano-tubes or the allotropes of carbon with a cylindrical nano-structure are going to be the biggest revolution in the history of nano-science. Nano-tubes have been constructed with length-to-diameter ratio of up to 132,000,000:1, significantly larger than for any other material.

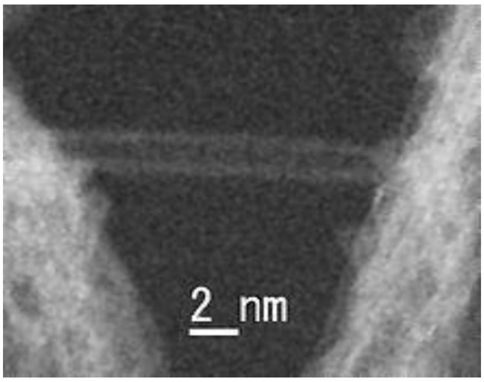

Figure 3: Carbon nano-tubes explained

3. SIMULATION USING FUZZY LOGIC

The structure of a SWNT can be conceptualized by wrapping a one-atom-thick layer of graphite called graphene into a seamless cylinder. The way the graphene sheet is wrapped is represented by a pair of indices (n,m). The integer n and m denote the number of unit vectors along two directions in the honeycomb crystal lattice of graphene. If m = 0, the nano-tubes are called zigzag nano-tubes, and if $n = m$, the nano-tubes are called armchair nano-tubes. Otherwise, they are called chiral. The diameter of an ideal nano-tube can be calculated from its (n, m) indices as follows:

$$d = \frac{a}{\pi}\sqrt{(n^2+nm+m^2)} = 78.3\sqrt{((n+m)^2-nm)}\text{pm}.$$

Where a =0.246 nm.

Figure 4: Input Functions

The two inputs n and m are shown as Gaussian membership function.

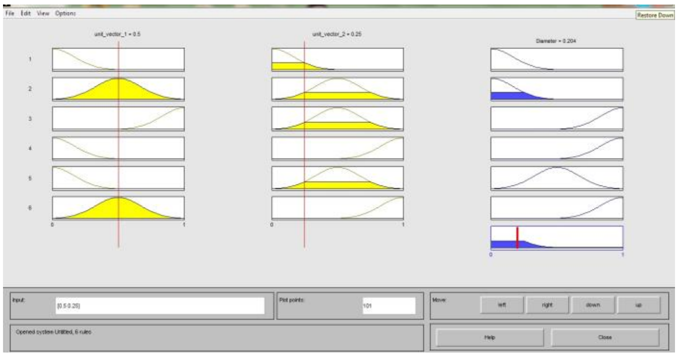

Figure 5: Rule view of Inputs and output

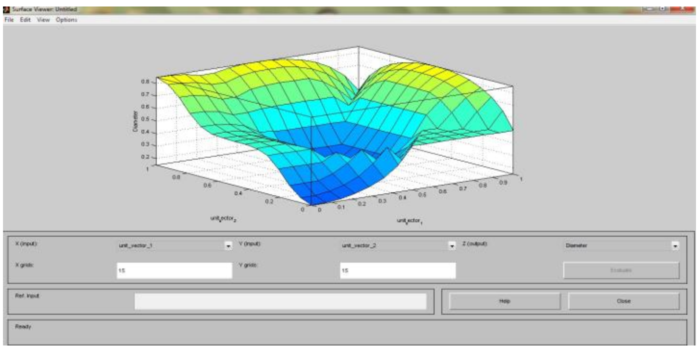

Figure 6: Surface view

These nano-tubes are completely different from carbon having unusual properties such as extreme strength and electrical properties. In 2000, a multi-walled carbon nano-tube was tested to have a tensile strength of 63 Giga-Pascal (G Pa). (This translates into the ability to

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endure tension of a weight equivalent to 6422 kg (14,158 lbs) on a cable with cross-section of 1 mm^2). Because of the symmetry and unique electronic structure of graphene, the structure of a nano-tube strongly affects its electrical properties. For a given (n, m) nano-tube, if $n = m$, the nano-tube is metallic; if $n - m$ is a multiple of 3, then the nano-tube is semiconducting with a very small band gap, otherwise the nano-tube is a moderate semiconductor. Thus we can have trillion of these tiny carbon nano-tubes fit into a few inch handle of our light saber conducting a huge amount of power and electricity. Finally our design for a light saber is ready.

Figure 7: A real light saber

4. CONCLUSION

All science fiction movies that consist of fight scenes have one thing in common, a devastating weapon that looks like a beam of laser and can slice through any metal known as light saber. Our model for an ideal light saber starts with a handle of few inches which is made up of a material of low thermal conductivity and high melting point. Inside it is a layer of ceramic material which is cylindrical in shape and had holes drilled on its surface. Inside the ceramic layer is a group of gaseous atoms which when superheated and ionized at a temperature of 12,000 degrees will produce plasma that will emerge out of the holes in the ceramic layer. Magnetization is used to control the plasma material that will bend and shape as we instruct it to do. Last but not the least the handle will be comprised of trillions of nano-tubes containing enormous amount of power that would be equal to the power generated by an entire city.

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