Functions and performance of the Basics and Applications of Computer Graphics and Graphic Design

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Article Info	ABSTRACT
	This paper focuses on the basics and applications of computer graphics and why it is important for students to be abreast of the nitty-gritty of this area of study and by extension, knowing why the study of computer graphics is of immense importance. Graphic design generally was also touched on the body of this essay. The important areas of this application consist of blueprint and designs, object simulation, general animations and manipulations. Although computer graphics became prominent during the early stages of the advent of computer monitors, there comes also, a number of other output and input gadgets that are essential for computer graphics; these comprise joysticks, mouse, hi-tech color monitors, flash drives and various models of camera and smart phones. For the purpose of clarity, in this write-up, computer graphics and computer designs would be used interchangeably because the process of computer graphics is in the designs system. Also, the design study used in this essay is the review and studio exploratory methods. The major aim of this essay is to give insights into the working dynamics of computer graphics and designs so that practitioners and graphic students would see it as a ready resource material. At the end, the intention of this writer is to give first-hand informative knowledge to students and non-students who may be interested in taking up computer graphics as a career.

Fonksiyonlar ve Performans Temelleri ve Uygulamaları Bilgisayar Grafikleri ve Grafik Tasarım

Makale Bilgileri	ÖZ
	Bu makale bilgisayar grafiklerinin temelleri ve uygulamaları ve öğrencilerin bu çalışma alanının nitty-gritty'sini takip etmelerinin ve buna bağlı olarak, bilgisayar grafikleri çalışmasının neden çok önemli olduğunu bilmelerinin neden önemli olduğuna odaklanmaktadır. Grafik tasarım genellikle bu makalenin gövdesine de değinilmiştir. Bu uygulamanın önemli alanları plan ve tasarımlar, nesne simülasyonu, genel animasyonlar ve manipülasyonlardan oluşmaktadır. Bilgisayar grafikleri, bilgisayar monitörlerinin ortaya çıkışının ilk aşamalarında öne çıkmış olsa da, bilgisayar grafikleri için gerekli olan bir dizi başka çıkış ve giriş aracı da vardır; bunlar joystickler, fare, yüksek teknoloji renkli monitörler, flash sürücüler ve çeşitli kamera ve akıllı telefon modellerinden oluşur. Netlik amacıyla, bu yazımda, bilgisayar grafikleri ve bilgisayar tasarımları birbirinin yerine kullanılacaktır, çünkü bilgisayar grafikleri süreci tasarım sisteminde yer almaktadır. Ayrıca, bu makalede kullanılan tasarım çalışması gözden geçirme ve stüdyo keşif yöntemleridir. Bu makalenin temel amacı, bilgisayar grafiklerinin ve tasarımlarının çalışma dinamikleri hakkında fikir vermektir, böylece uygulayıcılar ve grafik öğrencileri onu hazır bir kaynak materyali olarak göreceklerdir. Sonunda, bu yazarın amacı, bilgisayar grafiklerini kariyer olarak almakla ilgilenebilecek öğrencilere ve öğrenci olmayanlara ilk elden bilgilendirici bilgi vermektir.

INTRODUCTION

The theory of computer graphics according to Philip (2012) simply connotes the identification of objects on the monitor that needed to be highlighted as well as treated and others that are not supposed to be treated. Several normal plain figures like circles, lines, squares and other polygonal shapes are shown by statistical equations. With such a representation, the initial phase of computer graphics is their translation to a progression of picture elements or pixels and points; that would be highlighted (as it relates to raster realistic presentation) or merely converting them to curves that could be drawn out on the monitor. Given that repeatedly these designs must be very rapid plus well-organized; learners have to be exposed to a number of such algorithms and also their precincts.

Malvik (2020) posits that the concept of transformations is also a part of the process therefore, whenever an existing object will be attached to a fresh position or zoomed-in, the sketch will never be drawn again; at this stage, transformation is what is necessary. A simple alteration matrix for the diverse operation has to be brought in. In most cases one draws pictures that are larger than can be shown on the monitor; in which case, there is a technique to clip it to the preferred size; there are also patterns that fit a particular image into a screen of appropriate dimension and position. Also, because a computer is an accurate gadget and for the fact that it will not always estimate workings; at times it is tricky for humans to key-in precise standards, for example, joining lines accurately or the split ends of a circular object joining flawlessly. To amend such instances, some constraint tricks are to be brought in to make the computer recognize what the input value is, or alternatively, it might not be possible to estimate things that have been altered to make them look perfect. Likewise, there are several additional graphical key-in methods which permit the computer user to creatively key-in information, especially pictures and drawings, without any ambiguities.

Statement of the Problem

Graphic artists have overtime neglected this important and critical aspect of the visual art. Computer literacy in other areas like medicine and engineering appears to have an overriding factor as against graphic production especially in the area of advertising; this thus has a debilitating effect on graphic students and budding artists in the area of graphic conceptualization and composition. Presently, it seems some artists still find it difficult to conceptualize and visualize themes to acceptable global best practices and standards. Furthermore, originality of works produced by these artists appears to have been overshadowed by downloaded works especially from internet sources consequently leading to a dearth of creativity in the designs produced for advertising. Therefore, it is of paramount importance for young graphic artists, graphic students and professionals to concentrate on areas that have a world-wide recognition like the computer graphics and designs.

Aims, Objective and Significance of the study

The general objective of this study is to explore the area of computer graphics as an illustrative tool for advertising graphic design. This study is significant in the area of advertising in the sense that the outcomes of each composition will serve as a novel idea for advertising and promotional purposes. Just as the original objective of graphics was to revolutionize human experience, this study will inadvertently balance a rational vision of life with one that asserts the power of conceptualization and visualization in graphic processes and outcomes. The ultimate aim of this essay is to serve as an eye-opener to those who would like to take computer graphics and designs as a profession. Although there have been several other authors in this area of study, this study will incorporate some end products using the computer as tool to achieve desired design purposes and that is the reason that the writer has fully incorporated graphic design into this essay.

What is computer Graphics?

Peter and Michael (2001) aver that computer graphics is an aspect of computer science that deals with the digital synthesization and manipulation of visual content. Although the word frequently refers to the study of three-dimensional graphic art, it also involves two-dimensional graphic art and illustration processing. The study and research in the domain of computer graphics in most tertiary institutions of the world normally include thumbnail sketching, alternate design methods, texture modeling, and human perception in computer graphics, improving shapes and images, colour corrections, computer 3D and 2D animation, replication and geometrical processes. Computer applications that make this work effective are architectural drawings, documentation of educational legacy and study, the learning of organic models and conventional experiences such as characteristic movies, sports events and other visual content. Computer graphics is the study area in the domain of creativity in the visual arts. Computer graphics are applied comprehensively in a broad variety of specializations from quality films and sports to medical imaging and economic and crime investigation; however remarkable the development of computer graphics application has been over the years, the ultimate target of effortlessly achieving computer graphics input perfection still remain vague. Computer graphics systems need to include substance-look properties just as geometry but regrettably, the systems extensively applied in computer graphics presuppose that the equipment is as perfect and absolute as it can be, even if valid resources are none of these two characteristics. The objective of the study on material and texture samples most times is the invention of a new substance approach, to expand new and original techniques to replicate resources and the processes that influence their form and actually compute the entry necessary for material presentations. The rational, significant proposition becomes a continuing puzzle in the area of computer graphics and to produce creative animations that are both artistically credible and normatively persuasive, our animation study area must scrutinize new methodologies to compute the physics ideology that would underscore accepted phenomena like intensifying smoke-like visualizations, water splash; with the power that shapes those characteristic form of skins and muscles behind organic kinesis and so, as long as practicality is very essential, expressiveness with artistic technical know-how also play a similarly important part and harnessing the precise characteristics that suits an efficient performance remains an open aspect of the study. Hyatt-Major (2012) argues that Computer graphics is an art and science of illustrating lines, charts, pictures, texts, shapes and manipulating figures with computers through programming. Computer graphics comprises numerous pixels while stressing that pixel is the minutest graphical representation or component shown on the computer monitor. Principally, Godse and Godse (2001) forwarded two variants of computer graphics as follows:

Interactive or communicative computer graphics

This is the category of computer graphics where the user interrelates with the illustration on the computer monitor; or in a common language, talk to the computer while the computer talks back to him; in this regard, there is a collaborative interaction between the computer user and the illustration whereby such figure is at the command of the operator; a colorful instance of this scenario is playing of computer game. Here, the users completely control the figure in accordance with his wish while the illustration does the activities as shown on a monitor.

Non-interactive or non-communicative computer graphics

This is one type where the user has no form of command over images. The picture or images are simply the creation of motionless-saved programs that work with commands given by the program in linear functionality most likely using default settings. The images are entirely under the management and command of the program and not managed by such user; such includes screen savers and wall papers.

Areas in Computer Graphics

Computer graphics is practically functional and useful in virtually all facet of life. Osaigbovo (2014) advanced some of the well-known aspects of computer graphics as follows.

Drawings and Designs

In almost all aspects of human endeavour, be it medicine, economics, education, military, engineering, law, agriculture and such like, drawings are of paramount importance. As a matter of truth, illustration has been postulated to be the verbal communication apparatus of engineers; the capacity of computers to save multifarious illustrations, both linear and postscript, and exhibit them when needed is of the foremost reasons for using computers in graphic design approach. Some examples in these areas are enumerated hereunder:

a. Mechanical engineers use the computer graphics in the design of gears, bolts, nuts and other engineering components.

b. Civil engineers construct bridges, buildings, roads, rail lines and other engineering construction initially on the computer that can be viewed from various planes and angles and displayed before actually getting down to work physically. It helps put finishing touches to the plans of these various structures.

c. Textile designers do a different multi-dimensional variety of designs using computer graphics

d. Electrical and Electronics engineers do their design their circuits easily with the use of computer graphics.

e. In medical imaging houses, the main job is medical imaging, diagnosis and prognosis of certain diseases but some go further to administer treatment. The main job of the medical graphic artists is to simulate drawings of organs of the body that requires attention

f. The geographer needs drawings to delineate geo-political areas for effective administration

g. In the areas of crime prevention the special investigation unit of the police force needs skilled draftsmen to make identikit drawings of crime suspects.

h. The graphic artist needs thumbnail sketches as groundwork for some particular design projects.

i. In the industrial sector like the car manufacturing companies, the industrial designers, using appropriate software do the initial model design before the prototype is brought out in 3D and sent to the factory for modeling following the blueprint of the initial designers. The same apply to aerospace technological practices and other household gadgets.

Animation

This is the art of making shapes, texts and figures to be in motion on the computer graphical monitor using specialized software. Animation renders the application of computers in computer graphics very interesting. It brings life and action to web pages and television adverts. Interestingly, present-day motion pictures took their roots from the art of animation. According to Osaigbovo (2019)

It is common knowledge that people enjoy seeing perfectly edited motion pictures with appropriate effects, well balanced colours and adequately tweaked voice-overs, in the same way children enjoy good and interesting animations be them 2D or 3D. Suffice it to say here that these perfectly finished movies are the handiwork of professionals.

Animation is the activity relating to moving pictures that a sequence of related images, when

flashed in adequate synchronization, makes the sequence of images appears to be in motion. In motion picture, progression of such motion picture is done and shown using adequate velocity to an illusion of movement. Computers are used to make various animations of whatever category using related software such as Adobe Premiere Pro, Swish Pro, Adobe Photoshop and others.

Suffice it to state here that these software are being upgraded periodically with slight changes that makes for improvement on earlier versions therefore animators should always keep abreast of these developments. The properties of these images can also be tailored and adjusted at various speed rates to make them appear in motion. The instance of this is, a hand moving from the plate on the table to the mouth, the succeeding arrangement of the hand at several points in time are synchronized and the pictures representing the positions of the hand at various positions are displayed on the monitor at corresponding speeds to give the illusion or impression of movement.

Computers do not only permit us to demonstrate figures but also let us have access to facilities to enable us to manipulate them in a variety of ways; figures could be enlarged, reduced, rotated, twisted or morphed, making one image progressively and systematically transit to a new one; for example, an advert depicting a tiger transmogrifying to a motorcycle and doing many other things; indeed, many of the films makes use of computers to generate photo tricks. In fact, many advert movies and cartoon strips are created without actors but only computer-generated images and voice over.

Animation is the major dynamic power in aviation training and simulations whereby the trainee is in a room with gadgets that has a semblance of the aircraft cockpit; the trainee gets the initial trainings from the simulation which is animation driven yet mechanically, it requires the application of the animated pictures to learn the entire technique of how airplane takes off and manipulating it during flight, getting in touch with and receiving help from the control room, and so on are better explained using computers animation technique.

Animation also plays a very significant and crucial role during training via computer graphics; if one is given a bike simulation via computer animation, it will make it easy to understand and master; this goes for a motor vehicle too.

Multimedia applications

The application of sound or resonance cards to enhance computer producing sound effects is another aspect of graphics. The theories of virtual realism, whereby a person can be taken into an imaginary experience, like going into a yet-to-be-built house (to experience how it would feel indoors, when completed) is very achievable using computer graphics technology. This is particularly made possible with the application of software like Cinema 4D and some 7D virtual motion pictures whereby the viewer feels like a part of the movie cast in the midst of several props. Actually, the capability of computers to translate electronic signals (0s and 1s) to statistical data and to information and images makes it achievable for man to capture photographic details of remote planets like mars to be reproduced on the earth in approximately actual time.

Simulation

Another innovative modification that graphics has made is in the domain of computer simulation. Fundamentally, simulation is the replication of some ambience elsewhere to learn or experience it; the accessibility of easily communicative gadgets like the mouse has made it promising to manufacture simulators. An example is the flight simulator, whereby learners, sitting by the computer, operate on the interactive interfaces as though they were working on the flight control itself. A vivid case in point was the incidence of the 9/11 United States airline hijackers who have never flown an airplane but attended training sessions for a period via simulation practice just to enable them to destabilize the aircraft and direct it to the world trade center on a suicide mission. In the case of aircraft

simulation, the changes the learner is anticipated to see outside his flight window are fashioned to appear on his computer monitor, so the trainee can learn the technicalities of flight operations prior to actually trying his hands on the real flights. The graphic dexterity of computers is applied in an exceptionally large array of situations like a criminal investigation; to reconstructing faces of suspects, assailants, and also in the medical fields for recreating pictures of internal organs and cavities, using signals sent by miniature cameras like the hysteroscopy probe, the recreation of satellite pictures and others.

How pictures are stored and displayed

Every computer operations are in requisites of 0s and 1s consequently figures are also saved in terms of 0s and 1s. Therefore, when a picture folder is viewed in the memory, it cannot be at variance with other files. Nonetheless, when they are to be treated and displayed, there will be no difference. Images are indeed created with the help of frame-buffer show; a frame buffer show consists of a frame buffer, which is a digital storeroom that stores the images in requisites of 0's (zeros) and 1's (ones). It subsequently contains the 0's (zeros) and 1's (ones) in requisites of 8's (eights), or multiple of 8's (eights) in a file. The zeros and ones are interpreted by the display (presentation) manager, one row at a time and then transferred to the monitor after their conversion from digital to analog. The display manager would read the content of the frame buffer one row at a time or the whole digits same time. The digital images will be displayed on the screen after conversion into analog.

Peter and Michael (2001) puts forward that figures could be saved or manipulated in any two ways which are by line drawing or by vector illustration or by raster clear graphic method. For the line diagram method, the information must be shown by graphical equations; for instance, normal perfect line could be shown with this equation: $y = mx + c$ and circle by $x2 + y2 = r$. Then, if (x, y) points are joint points, then these (x, y) worth pairs that satisfy the equations must translate to a fraction of the form even as those that would not conform, would fall exterior of such form. Therefore, to create any figure, clearly the equation of the form has to be identified. Afterward, all the point that matches the equation must be well expressed. Such are the points that would in turn be highlighted on the monitor.

An electric ray in motion illuminates the display screen so each time the ray turns on, electrons would light up the display monitor and show the point. In line sketch patterns, the ray is constrained to pass through the trail of the form that would be traced and the figure needed is established. For instance, in the example given, given that the electron ray is allowed to go from point A to B along the line, a straight line is established. The raster verification method employs a different method and is mostly found suitable to control. In this case, a frame buffer is made to save the pixel value. The monitor can be an idea of as having a ray consisting of a number of parallel columns of picture elements; every pixel stands for a spot on the image. As a matter of fact, the figure of the horizontal and vertical joints indicates a greater resolution and consequently better output. Characteristic resolutions are somehow like 640, 480, 860 x 640, 1024 x 860 dots per inch (dpi), whereas the information shows the quantity of row and quantity of pixels on each line correspondingly on the computer monitor; distinct from basic arithmetic, the left top side spot indicate the source (0, 0) and the distance are calibrated in horizontal and vertical representation as illustrated below.

Assuming a space of 1024 x 1024 dpi screen, if there is any image to be displayed within the space, the frame buffer will save the condition of each of the pixel, for example, 0 shows that the pixels is abnormal hence not a piece of the picture and 1 shows it is a fraction of the image, therefore will be displayed. The illustration is basically how data information is used to show pictures.

Sadly, the theory of graphics displaying images is even more complex than what this writer has previously explained. Evaluating the point by the use of equations, storing information in a particular folder and using the bitmap graphic technique or using plain vector drawing algorithms are all involved

in displaying images.

Values of pixels are constantly in integers of (0, 0), (0, 1), and (0, 2), but algorithm to illustrate or maneuver images may not necessarily constantly amount to integer values, for instance, if the spot at which two lines meet up, let us say at 1.4 or 2.7, then what happens? Here, Wu (2020) submits that we approximate the values, by making use of any of the normal algorithms; that is 1.4 gets culminates in 1 and 3.7 rounds off to 4; but if an additional value of 1.6 rounds off to 2 and 4.1 gets rounded off to 4; what will be the final result? The indicator 1.4 and 1.6, which are supposed to be near to each other, appears to be divided by a space of 1 and not 0.2 in the figure, which is, that the smooth nature of the figure connecting these points is misplaced. Conversely, the points 3.7 and 4.1, instead of showing to be different, appear the same in the image. No such amendments make the shape look uneven instead of a smooth form.

Response time

In the case of animation, Boden (2004) assumes that the velocities at which fresh calibrations are done including the velocity at which the monitor can interact are of immense importance. In an example of a fast-moving vehicle, shown on the monitor, each new location of the vehicle and its ambiance, if desired has to be calibrated and sent to the monitor while the monitor deletes the earlier position of the vehicle and shows its latest position; these maneuvers have to occur at a velocity which should convince the onlooker that the motor vehicle is, in reality, moving at the set velocity; or else a high-speed moving car may appear as though crawling. Therefore, most of the velocity of the algorithm and the velocity of the display gadget are very essential. Furthermore, the whole procedure must show even and not erratic; if not, in simulation application, the results can become counterproductive.

There are situations when the size of the image becomes too large that it does not fit onto the screen; in this case, it is either that some areas of the image should be cut off or the entire picture reduced or constrained to fit the screen; so, a system known as clipping or windowing has to be adopted. Only vector graphics are easily created directly on the monitor; for a bitmap graphics like photograph, these can only be imported onto the screen and the necessary amendments made using the appropriate software.

Importance of Computer in graphic design process and outcomes

Making use of the computer to make designs and its outcomes is also known as computer graphics. In this write-up, it is instructive to note that the terms or phrases Computer graphics, computer design, advertising design and graphic design are one and the same concept and are most cases used interchangeably.

Computer graphics is receiving much emphasis now because the days of manual and analog designs are over, just as we are now having obsolete manual, tape-based cameras being replaced by digital, disc-based cameras. Some of the advantages of using computer in designs to both students and professionals are enumerated below:

1. It makes the user express themselves seamlessly.

2. Accuracy and fewer mistakes are guaranteed.

3. It enables the user apply elements that are not readily available in manual graphics like postscript designs, clip art and photos.

4. With the use of the computer, photographs are enhanced both in aesthetics and thematic approach for instance, ordinary photographs could be changed into duotones and effects be added on it.

5. It enables students task their intellect even though the artificial intelligence of the computer

gives them advantage for ready-made inputs.

6. The use of computer to make designs saves time and energy

7. The use of the mouse during computer graphic design enhances the psychomotor development of the user.

8. Computer graphics is important in the promotion of goods and services.

9. Computer graphics is critical to good web design and brand recognition.

10. It is useful for virtual reality for people with learning difficulties.

11. It allows users to effectively and meaningfully interact with art and image data which is important in the design of 3D models.

12. It helps users to think fact

13. It provides tools for motion dynamics

14. The computer is a vital tool for accessing and processing information and data as it is the first window to access the internet.

Brief History of Graphic and Advertising Design

Meggs and Purvis (2010) postulated that there is a German word, *Zeitgeist*, which does not have an English equivalent but which have become part of the English language. It means the 'spirit of the time' it refers to the cultural trends and attributes that are traceable to a given era. Microsoft Encarta Encyclopedia (2010) describes it as the ideas prevalent in a period and place, particularly as expressed in literature, philosophy, religion and the visual Arts. The nearness and transient nature of graphic design, coupled with its relationship with the political, social, and economic life of its society, enable it to more closely articulate the *zeitgeist* of an era than many other forms of human expression. It is this spirit that necessitated the beginning of the practice of Graphic and Advertising Designs. Meggs and Purvis (2010) noted that Ivan Chermayeff (b.1932), a renowned graphic designer said "The design of history is the history of design" therefore the necessity for the practice of graphic design cannot be separated from the design itself which became the concomitant result of such necessity.

Since primitive times, people have inquired for ways to give image form to ideas and models to accumulate understanding in graphic form and to bring organization and clearness to information. Over the years these needs have been filled by various people including artisans, scribes, printers and artists. In line with the above, Sturken and Cartwright (2001) noted that it was not until the early twentieth century, and precisely 1922, when the outstanding book designer, William Addison Gwiggins (1880-1956) coined the term Graphic Design to describe his activities as an individual who brought structural order and visual form to printed communications. Thus, the emerging profession received the appropriate name hence. The contemporary graphic artist is heir to this illustrious ancestry.

While the Sumerian scribes invented the cuneiform writing, Egyptian artisans combined words and images on papyrus to produce the hieroglyphics manuscript. Chinese block printers, medieval illuminators and fifteenth century printers and compositors designed early European printed books. All these became part and parcel of the prosperous heritage and history of Graphic design. By and large, this is an anonymous tradition, for the social value and aesthetic accomplishments of graphic designers, many of whom have been creative artists of extraordinary intelligence and vision which have not been sufficiently recognized. Somehow, history is in large measure a myth, because the historian looks back over the great sprawling network of human struggles and attempts to construct a web of meaning.

Oversimplification, ignorance of causes and their effects and the lack of an objective vantage

point are grave risks for the historian. When we attempt to record the accomplishments of the past, we do so from the vantage point of our own time and history and become a reflection of the needs, sensibilities and attitudes of the historian's time as surely as it represents the accomplishments of bygone eras. As much as one might strive for objectivity, the limitations of individual knowledge and insights ultimately intrude.

The concept of art for art's sake, a beautiful object that existed solely for its aesthetic value as noted by Baldwin and Roberts (2006), did not develop until the nineteenth century and before the industrial revolution the beauty of the forms and images that people made were linked to their function in human society. The aesthetic quality of Greek ceramic works, Egyptian hieroglyphic writings and primitive manuscripts were perfectly incorporated with helpful values, life and art were integrated into a cohesive whole. The results of the industrial revolution imparted positively in a process of upheaval and technological progress that continued to accelerate at an ever-quickening pace. By jolting the arts and crafts from their social and economic roles, the machine age created a gap between people's material life and their sensory and spiritual needs.

A Graphic Artist is a professional that creates works that are meant to communicate an emotion or feeling that are intended to set a frame of mind. Professional Graphic artists basically use their design in a commercial way. According to Edwards (1999), Graphic Artists crafts scenes and images using visual media such as Computers and Pen and Ink to present drawings, sketches, icons, typography and photographs. These are used on everything from light packaging to the walls of buildings. Their works are used to promote products, services and ideas; they are experts, schooled and trained in this area.

With the arrival of the Industrial Revolution of the 18th century, there was a rapid explosion of the production of consumer goods and so there arose the need to inform the public of the availability of these goods, services and ideas. Therefore advertising avenues such as hand-drawn posters and hand bills became a ready tool for producers and manufacturers for notifying the public. Henderson and Landau (1980) stated that one of the earliest media of communication was the stele (ancient stone slab: an ancient stone slab or pillar, usually engraved, inscribed, or painted, and set upright) of the ancient Egyptians. These were wooden boards cut from basalt with specific measurement displayed in town centers and other areas of high traffic and these were the earliest forms of advertising known to man.

Mass production of printed matters came into being with the invention of printing machine in 1450 by Johannes Gutenberg. This was probably the beginning of modern advertising as handbills and posters were mass produced and distributed using various media. As the production of bills and posters increased and spaces became scarce, there arose the need to seek alternative ways of posting bills. So the use of billboards was started. Houck (1989) wrote that American marketers picked up the technique of billposting with much interest and this was what gave birth to the modern day billboard system of advertising. Advertising under this research paradigm is not only in the aspect of products and services but also for ideas and policies, advocacies, institutions and events.

Advertising in Nigeria dates back to the pre-independence days, as this business was dominated by Europeans and Americans. They had their offices in Nigeria and other African cities but had their main operational headquarters in London, New York, Paris and other American and European cities. After independence, local advertising companies began to spring up after the promulgation of the indigenization decree of 1974 when Nigerian investors bought the foreign companies from their owners. This was the beginning of upsurge of advertising, communication and printing houses in Nigeria.

Knobbler (1980) wrote that as people continuously agitate for reinstatement of humanity's unity with the natural environment; there has also been an increasing awareness of the rationale to return to human and aesthetic values in hand-made products. The history of graphic design is written for the fact

that if we understand the past we will be better able to continue a culture of beautiful form and effective communication.

Components of Graphic and Advertising Design Layout

Composition is the bedrock of any good design. They give the work the structure that makes it easier to navigate from the margin on the left and right, up and below to the content in-between these margins. Composition is important because it underscores the delight of any design irrespective of whether the artist is working with text, images or other elements in the design because without a well thought-out composed layout, the design will basically become incoherent and chaotic.

Pointer (2011) describes Composition as the manner in which pieces or components are combined and arranged visually to tell a story. Proper composition reflects alignment, placement, grouping, visual flow and space, within a layout thus this outline can be any standard. Once a targeted audience and rationale have been determined then composition, constituents and concept can cover that identified purpose making for a successful design.

This assertion of Pointer (2011) was also corroborated by Simmons (2013), who thinks that designers often

make judgments regarding layout composition by instinct which is a result of constantly discerning in visual terms. He continued that some projects leaves one confused no matter how hard one tries to fit the elements, they just don't look or feel right. In these situations it can be advantageous to revert to basics, and see which one offers the best solution to the problem.

Therefore composition remains the framework on which any meaningful design is based. In like manner, Simmons (2013) opines that the traditional indices on which a good composition should be based are balance, golden proportion, rule of thirds, rhythm, hierarchy, unity and distinction of positive and negative space. In relation to the above, Pointer (2011), advanced five indices of good composition thus: Proximity, White Space, Alignment, Contrast and repetition. Whereas, Simmons (2013) and Pointer (2011) came up with different levels of principles, Irivwieri (2011) has a somewhat more comprehensive explanation on the various levels of advertising design layout. He posits that principles of design should include 'Eye Movement' in addition to other principles that have been advanced by other authors. Explaining further, Irivwieri (2011) outlined the physical elements of layout to include Illustration, White Space, Trade Mark and Signature. Taking a cue from these indices advanced by Simmons (2013), Pointer (2011), and Irivwieri (2011), this writer has come up with the following as components of Advertising and graphic Design Layout thus:

Introductory Slogan

This is usually the introduction of the advert. It may be directly or indirectly connected with the actual product advertised. In most cases, it is used to attract the interest of a prospective consumer.

Subject Matter

In any advertising and graphic design, there is always a subject matter. This subject matter has to do with what is being advertised be it a product, service, institution or event. This subject matter takes the center stage and receives the most emphasis in the design. In most cases, if the subject matter cannot be emphasized in illustration, it is done in text by the size of the font and colour.

Illustration

This is the picture or drawing that elucidates the subject matter. In most other cases, a different illustration is used to advertise a product.

Copy

This is the typography or text aspect of the advert. Usually it sends a message to the consumer about the product, service, institution or event itself. If it is a product, it explains the component and the efficacy of the product. It may also highlight the price and the manufacturer and the overall benefit of the product.

White Space

This is an important part of every composition. It does not mean literal white space; it only means negative space, like the spaces between content, lines, and even the outer margins. There is no one way to use white space correctly, but it is good to understand its principle. White space helps define and separate different sections. It gives the content 'room to breathe'. If a design starts to feel chaotic or congested, a little white space might be just what will resolve the problem.

Pay Off

In most exiting advert designs, there is always a pay off. This could be regarded as 'the final word' as it comes usually at the bottom of the design but this position is not absolute as it varies from designer to designer. It could be the slogan for the product, service, institution or event for instance in the advert of Gulder Lager Beer, Figure 1. The slogan - 'Looking Forward' therefore for the product is inserted at the middle of the design which is regarded as the pay off.
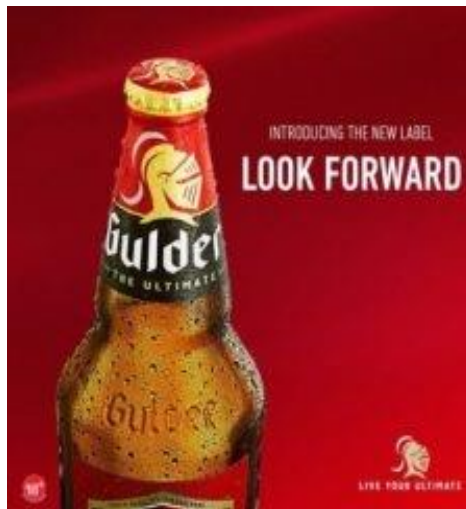

Figure 1. *Osaigbovo Felix. Advert of Gulder. Source: Nigeria Breweries.*

A typical example of a graphic or advertising design prototype that incorporates the above elements can be seen in figure 1.
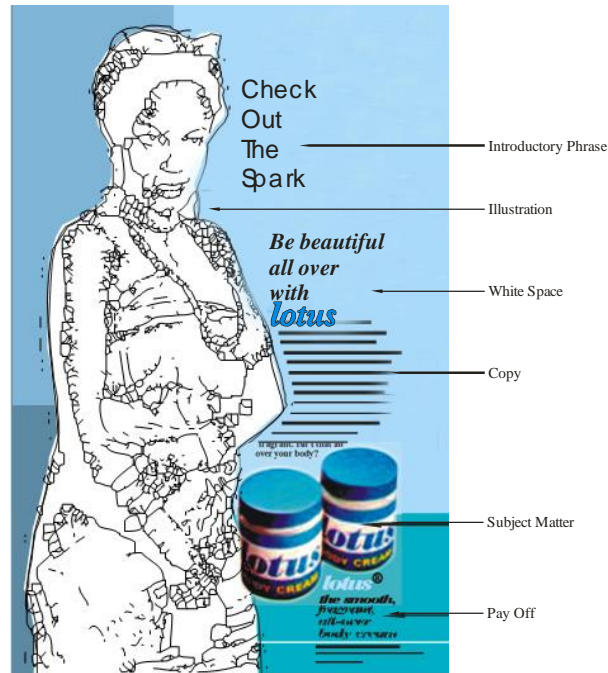
Figure 2. *Osaigbovo Felix. A prototype of a graphic advertising design. (Pen and Ink20x40cm), (2016).*

Figure 3 is another typical example of a computer designed advert poster of a service. In this particular design, all the elements of a good composition have been taken into consideration. As it were, this is an advert for logistics and Haulage Company. The illustration, though surreal, attests to the fact that the operators of this business goes to any length and height to satisfy their clients' desires, irrespective of the risks inherent in making sure their clients are satisfied. This underscores the use of this unique illustration of a truck wading through the seas to deliver the goods of their clients. Normally, no truck driver does that but that illustration serves a metaphorical expression to invite clients and earn their trust. "We earn your trust" therefore became the 'slogan' or 'pay off' for the company.
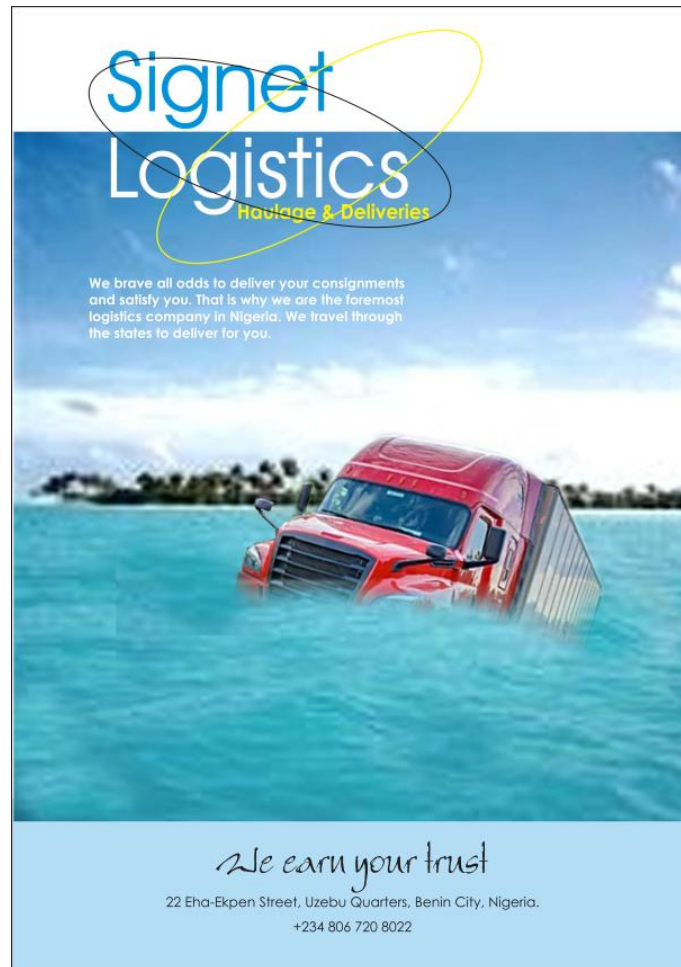
Figure 3. *F. Osaigbovo, "Advert design" Corel Draw / Adobe Photoshop CS4, 2022*

Summary and Conclusion

Images that are created by computer are called computer graphics and examples are line art, photographs, drawings, engineering drawings, mathematical graphs, charts, maps, diagrams, typography, numbers, geometric designs, medical image simulations, symbols, and other images. Osaigbovo (2014) postulated that the four major sub-divisions of graphic design careers are Brand identity and Logo designs, web and mobile design, layout and print design and packaging design. To buttress the above claims, Newell (2015) outlined the trendy research areas of Graphic design as geometric computing, sketch-based designing, image-based rendering and animations, 3D reconstruction, printing, modeling and analysis, shape and surface modeling and matching, volume and scientific revelation and virtual and augmented reality.

Carson (2003) postulates that computer graphics comprises two rubrics viz: describing displaying images. There may be numerous other problems that may come up with computer graphics; questions like, is the figure standing alone or part of a sequence of images in an animation? Or is the figure or images to be stationary, or can a computer user communicate with software in order to transform it? Is the objective of the figure to be highly pragmatic because it will be seen at length, or is it just to give a rapid feeling of the scene?

From the earliest days of computing, according to Peter and Michael (2001) people were interested in using computers to draw pictures and diagrams, and data graphs were created on line printers by skillful printing spaces and signs on succeeding lines. Input materials that were related to the mouse and light pen are part of the early computer system. Karaata (2018) posits that Ivan Sutherland

was one of the pioneers of communicative computer graphics when he came up with the "Sketch pad" drawing method in the year 1963. This structure integrated input and interactive skills for making line drawings which includes dragging, icons, and pointing that we are still using today. This structure also uses the method of hierarchy for developing objects from easier parts that still influence software. Computer-aided design and computer-aided manufacturing evolved from the understanding that the computer can help with drawing-demanding activities. Projects also evolved to help with vehicle design as in the case of General Motors, and lens design such as in *Itek* incorporated. Even while graphics manifested great prospects, there arose restrictions on its extensive use; graphics hardware was so specific and costly. There were no clear-cut standards, so it became complicated to craft programs for such devices, and the outcomes were not transferable to different platforms. Furthermore, the low speed of graphics gadgets makes it hard to create communicative systems with rational and reliable reply periods.

Earlier hardware to run a graphics show according to Newell (2015) was much different from that being used today, continuing, Newell stressed that during the 1960s, displays were monochromatic and based on vector, with all figures drawn as a set of lines. A full show system comprised of the display processing unit, a display file, and a Cathode Ray Tube. The display list saves a sequence of point standing for the last part of the line to be illustrated and the singular duty of the monitor display processing unit is to draw repetitively the lines on the Cathode Ray Tube. Altering the figure on the monitor requires varying the point saved in the show list. Lugar (2009) noted that Cathode Ray Tubes often create images with electron and phosphor beams. Drawing lines on the monitor, the beam is diverted along the pathway of the shape and as the electrons hit the phosphor, it gets animated; this extra power is set free by the phosphor in form of light. As the occasion progresses, the light diminishes, and energy is released. The phosphor's energy has to be revitalized at least 30 times per second or else, the onlooker may not be able to experience the degradation of the phosphor therefore the figure soon appears to flash. The issue amid the vector-based display is that as the difficulty with the figure increase, it would take long to get to the beginning of the list to start drawing the figure again. Suffice it to state here that as technological improvements began to evolve, most of these problems were beginning to get solved.

Various authors, experts and researchers have over time advanced their suggestions and definitions of computer graphics; while the American Institute of Graphic Arts (AIGA), defined graphic as "the art and performance of preparation and projecting thoughts and experiences with illustration and textual content", putting it succinctly, it is apt to say that graphic design communicate definite thoughts and messages in a visual manner. The designs could be simplistic may be as an organizational insignia, or as complex as page layouts designs on websites. Graphic design is used by organizations to advance and trade goods during advertising or by websites to communicate complex messages in some simple ways through information graphics, or by businesses to build up distinctiveness via branding, among others. Computer graphics is the art of depicting lines, charts, pictures, shapes and manipulating figures with the use of computers with the aid of encoding. Computer graphics encompasses several pixels; a pixel is the minutest graphical element or piece illustrated on a computer monitor. To further comprehend the importance of graphic design, it becomes imperative to know some principles and elements that make up good design. Element is utilized in a combination or conflict with one another to generate visually outstanding and interesting designs. These graphic design elements include: Color, Form, Line, Shape, Size, Space and Texture.

Graphic designers also hold fast to the principles of design that are fundamentally a portion of the procedure that help a design achieve an effective masterpiece. These basic principles assist in creating permanence and stability for a piece of design work.

These graphic design principles include: Balance, Contrast, Emphasis, Movement, Proportion

and Rhythm. There is this old maxim that says "rules are meant to be broken," in this case, rules can actually be broken yet a good graphic designer has to first and foremost master these values before making the conscious decision to break the rules and expand horizons of this aspect of art. Young and aspiring artists that want to take up computer graphics as a vocation and profession have to understand the rudiments of this strenuous but an interesting and profitable vocation. And so, as technological advancement continues to evolve, there is every possibility that the teething problems that were observed *ab-initio* would begin to disappear gradually. The graphic design profession can be very intriguing just as it is rewarding and profitable so this piece of the write-up should give those that are interested in this fields some head-start into the business.

Contributions to Knowledge

1. This study has shown that Computer graphics influences graphic work of art with originality.
2. The study shows that character and model customization of subject matter is possible in handmade illustration.
3. The study established that Graphic design illustration enhances image making with elasticity in contrast to raster based medium of image production.

This essay is a reawakening of the potentials of computer graphics to budding graphic artists that will sensitize their creative talent. In most cases, manual graphic illustrations are vector based medium of image making whose elasticity cannot be quantified since information within the structure of the art form is maintained. The essay reinvigorated draftsmanship skill amongst graphic artists and it has also ensured originality and the artist's identity.

REFERENCES

Baldwin, J. & Roberts, L. (2006). *Visual Communication*. Lausanne: AVA Publishing, S.A.

Boden, M.A. (2004). The creative mind: Myths and mechanism. London: Routledge.

Edward, L. (1999). *Thinking About Art.* London: Calder & Boyars.

Henderson, S. & Landau, T. (1980). *Billboard Art.* London: Chronicle Books.

Godse, A.P. & Godse, D.A. (2001). Computer Multimedia Graphics. Pune, India: Technical Publications

Houck, J.W. (1989). Painting for Billboards in Nigeria. *Journal of Advertising, P12-14*

Hyatt-Major, A. (2012). Prints and People. Princeton: Princeton University Press.

Karaata, E. (2018). Usage of Artificial Intelligence in Today's Graphic Design. *Online journal of Arts and Design.* Vol 6, issue 4, October 2018.

Knobbler, N. (1980). *The Visual Dialogue.* New York: Holt, Rinehart and Watson Inc.

Lester, P.M. (1995). *Visual Communication*. Washington: Wadsworth Publishing Co.

Lugar, G.F. (2009). Artificial Intelligence: Structures And Strategies For Complex Problem Solving. Boston: Pearson.

Malvik, C. (2020). What id graphic design? A beginner's guide. www.designlife.com Retrieved 7th April, 2022

Meggs, P.B. & Purvis, A.W. (2010). *History of Graphic Design*. New Jersey: John Wiley & Sons.

Microsoft Encarta Online Encyclopedia (2010). *Zeitgeist: Meaning and Significance.* Microsoft Corporation. Retrieved: 27th April, 2017.

Newell, A. (2015). Unified Theories Cognition. Cambridge, M.A.: Harvard University Press.

Osaigbovo, F.O. (2019). Motion Pictures and its Evolution in The Nigerian Film Industry. *The Quint, An Interdisciplinary quarterly from the North.* Vol.14 no. 1 SSN 1920-1028

Osaigbovo, F.O. (2019). Application of inverse square law in photography. Acta Graphica, [S.I.], v.30, n. 3, p. 1-10, mar. 2022. ISSN 1848-3828. http://www.actagraphica.hr/index.php/actagraphica/article/view/214

Peter, M. & Michael, B. (2001). Infirmation Graphics. London: Thames and Hudson.

Philip, M. (2012). A History of Graphic Design. New York: Van Nostrand Reinhold.

Pointer, K. (2011). "Composition and Layout". Free online Encyclopedia. Wikipedia.org/composition and layout. Retrieved 21st April, 2017.

Simmons, T. (2013). *Looking into Art*. NewYork: Holt, Rinehart & Watson Inc.

Sturken, M. & Cartwright, L.(2001). *Practices of Looking*. New York: Oxford University Press.

Wu, S. (2020). Development of Graphic Design based on artificial intelligence. Journal of physics conference series. 1533 032022

Wu, S. (2020). Development of Graphic Design based on artificial intelligence. Journal of physics conference series. 1533 032022