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Documentation of Akan Akuaba Dolls Using Computer Aided Design Technology

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ABSTRACT: *There are many works of intellectual property from Ghana's Akan ethnic group in the fields of art and culture that are currently underrepresented. One of these intellectual properties that is of particular importance is the Akuaba doll. In its original form, the Akuaba is composed of wood. Even though many researchers have represented this cultural element, which has long been a part of Ghanaian traditional society, using resistant materials such as wood and metal, there are still a lot of other media, techniques, and approaches that have yet to be employed. Some of these are; digital modelling, artificial intelligence, and virtual reality. This paper seeks to explore the use of rhinoceros 3D and KeyShot to model the three different Akuaba* dolls*, pertaining to the Asante, Fante and Bono tribes of the Akan ethnic group.*

KEYWORD: *Akan, Akuaba Doll, Design, Computer Aided Design (CAD), Asante Krofofrom*

I. INTRODUCTION

In Akan, as in many ethnic societies around the world, the value and significance of Intellectual Property are largely related to the preservation of tradition and cultural practises. Undoubtedly, the Akan Akuaba dolls are some of the most important cultural representations of Ghana and have become part of the accepted spiritual objects that serve to express faith in the Ghanaian traditional religion. As custodians of this valuable Intellectual Property, it is a priority for everyone within the community to preserve and promote its uniqueness, which is why the researchers, one from Akan, have decided to delve in. The dolls in question are the depiction of a female body and an exhibition of the Akan concept of ideal woman (Nkrumah, 2021).The Akuaba dolls in their original forms are made of wood but have over the years been depicted in several different media, including metal, wax, clay, and POP, by different researchers. These are all physical materials that are prone to varying weather conditions such as rain, sun and others. As a result, the pieces may lack durability and not be able to stand the test of time.

The main objective of this paper is to explore the use of digital modelling resources to virtually represent all three types of the Akan Akuaba dolls as adapted by the tribes of Asante, Fante, and Bono for longer preservation. Three CAD software programmes, Rhinoceros 3D, Keyshot and Adobe Photoshop are used. It can hereby be justified that, unlike resistant materials, since virtual models are not tactile pieces, their durability cannot be compromised. The corresponding research question is: how can an 'Akuaba' doll be replicated virtually so as to be preserved forever? The purpose and significance of this study are to help the younger

generation of Ghana acquire more knowledge about the history, value, and philosophy of their traditional art and cultural practises.

The text of this study has been organised systematically as follows; while Chapter One deals with the introduction to the whole of the study, Chapter Two seeks to review literature that are related to the study. Chapter Three discusses features of the methodology, and Chapter Four gives a detailed account of the analyses and presentation of the data collected for the project. The summary, conclusion, and Recommendations are found in Chapter 5.

II. LITERATURE REVIEW

2.1. The Akan Ethnic Group And Dolls

The Akan ethnic group is the largest ethnic group in Ghana. They predominantly inhabit the Ashanti, Eastern, Central, and a portion of the Western regions. The Akan people have an interesting and rich cultural heritage that is a product of a combination of their language, music, dance, art, and traditional beliefs. Particular to this project is the concept of the traditional dolls, which fall under the Akan Art. As described by Encyclopaedia Britannica, a doll is basically a child's toy that is modelled in human or animal form, and it is perhaps the oldest plaything.(Encyclopedia, 2019). Similarly, Sofia Harkin adds that a doll, by its simplest definition, is a figure of a human or animal that is made in close likeness to the 'real thing', either as a kid's toy or a religious symbol. She further goes on to suggest that the concept of a doll dates back to the oldest of civilizations, such as Ancient Rome, Egypt, and Greece(Harkin, 2021). Historians say that the existence of dolls in general dates back to the 13th Century.

Dolls are described in so many ways, sometimes based on the materials they are made from and other times based on the purpose they serve. When they are based on materials, there are wooden paddle dolls and plastic dolls, just to mention a few. A blog post called History of the Doll, claims that wooden paddle dolls are one of the oldest dolls found in the world since they were discovered in ancient Egyptian tombs that date from 2000 BC. However, their purpose is not entirely clear (History of Dolls, 2023). Talking of plastic dolls and considering the name, they are made of plastic while wooden dolls are made of wood. Figure 2.1. Below is an example of a wooden doll, whilst 2.2 is a plastic doll.

Figure. 2.1. Wooden Dolls from Anhwiaa, Ghana (Ross D. H., 2023)

Figure. 2.2. Yellow and pink moulded plastic female dolls (National Museum of Scotland, 2009)

When the doll concept is considered in the context of Akan culture, they are usually not children's playthings, but rather objects that are laden with ritual and religious associations within the community. The history of dolls within the Akan culture is such that a young Asante's woman named Akua (Wednesday born) was having trouble conceiving a child (ba). She consulted a local priest, who divined that Akua should commission a woodcarving of a little child. After it was blessed by the fertility deity in the rites conducted by him, Akua was instructed to treat the carving as if it were a living child: to carry it on her back, feed, Bath, sleep with it, and adorning it with beads, earrings and necklaces. When Akua appeared in the village with the carving on her back she was the target of mockery: "Look at Akua'ba" (Look at Akua's child). But eventually Akua became pregnant and gave birth to a beautiful, healthy girl. Her success encouraged other women struggling with infertility to follow suit, and subsequently the carving was called Akua'ba in her honour. The legend and tradition continued as most carvers carved these "Akua'ba" dolls and people bought it with the belief that it will free them from a barren situation. Once the woman conceived and had a successful delivery, she would return the figure to the shrine as a form of offering. But if the child died, the "Akua'ba" might be kept by the woman as a memorial (Abena Tribal Art Gallery, 2016). Find below; figure 2.3 is an Akuaba doll, figure 2.4 is an old picture of a barren woman carrying her wooden doll on her back. Figure 2.5 is a shrine where rituals are made on Akuaba dolls. Figure 2.6 is an Akan mother carry her baby at her back.

Figure. 2.3. An Akan Akuaba doll (Mrachek, 2023)

Figure. 2.4. An Akan barren woman carrying Akuaba doll at her back (Cole, 1972)

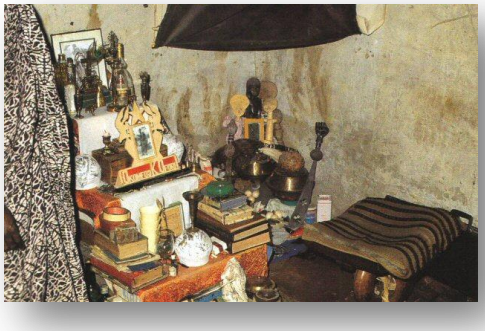

Figure. 2.5. Akua'mma in an Akan shrine(Cole, Rand African Art, 1976)

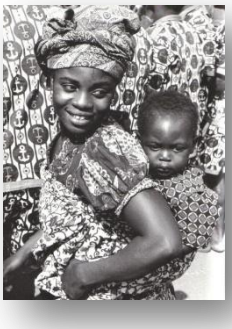

Figure. 2.6. A Akan Mother Carrying Her Child at Back (Ross D. H., 1976)

As explained above, dolls in the Akan culture are basically called Akuaba. Akuaba dolls, therefore, in context as relating to Akans are attributed to three tribes in Ghana. These tribes are the Asante, the Bono and the Fante. Each one of these tribes has its own unique way of depicting the Akuaba doll, even though the similarities are clear, as well as the differences. See image of the three traditional doll pertaining to the three tribes below whilst the next three subsequent chapters give details and more. Figure 2.7 is a traditional doll belonging to the Asante tribe from the early days whilst figure 2.8 and 2.9 pertain to the Bono and Fante tribes respectively.

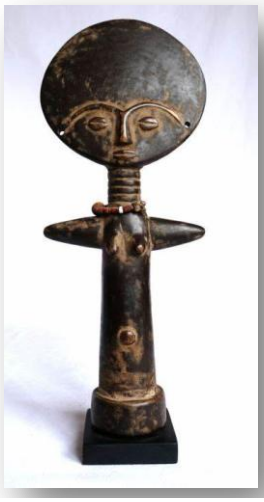

Figure. 2.7. Asante Traditional Doll in The Early Days (Netherlands, 2023)

Figure. 2.8. Bono Traditional Doll in The Early Days (Rahman, 2020)

Figure. 2.9. FanteTraditional Doll in The Early Days (Magasanik, 1982)

2.2. Design

In the basics, design is a plan or specification for the construction of an object or system or for the implementation of an activity or process, or the result of that plan or specification in the form of a prototype, product or process (Wikipedia, 2019). In other words a design is a plan to make something new for people, that they perceive as beneficial. In order for one to be a good designer, there is always a way of thinking within a space of time- an approach that has been describe by many intellectuals as Design Thinking. Rikke Dam and Teo Siang, claim that Design Thinking is an interactive process in which we seek to understand the user, challenge assumptions, and redefine problems in an attempt to identify alternative strategies and solutions that

might not be instantly apparent with our initial level of understanding. At the same time, Rikke and Teo refer to design as that which provides a solution-based approach to solving problems. It was added that there are five phases of Design Thinking; empathise with your users, define your users' needs, their problem, and your insights ideate by challenging assumptions and creating ideas for innovative solutions. Lastly, consider making a prototype to start creating solutions Test(Rikke Dam and Teo Siang, 2019).

2.3. Computer Aided Design Technology (CAD)

A common misconception is that computer-aided design only applies to drawings. In actuality, it does not. According to Wesley Chai, CAD is the use of computer-based software to aid in design processes. CAD Technology is frequently used by different types of engineers and designers and can be used to create two-dimensional (2-D) drawings or three-dimensional (3-D) models(Chai, 2023).Market Business News highlights that CAD refers to any use of software to help in the design process. CAD software replaces drafting by hand with an automated process. People working in architecture today have probably used 2-D or 3-D CAD programs. Those working in MEP or structural engineering have also probably used 2-D or 3-D CAD programs. MEP stands for mechanical, electrical and plumbing engineering (MBN, 2018).There are several benefits to using CAD as a design and analysis tool. Some of these benefits include; visualization, detail, optimization, expertise and realization. As expanded by Aktif Lazer, with the benefit of detail, digital representation in CAD is very close to real life and makes it accurate up to a certain level and you can add as many details as you need.In the benefit of optimization, it is very difficult to find faults in the design process, but CAD software can help you with this very reliably, even if it is not perfect. More complex CAD programs even let you run simulations to test for defects. In the benefit of expertise, Aktif claims there is CAD software specifically designed for almost every professional industry, making it widely applicable. Lastly in the benefit of realization, with the help of fabrication technologies and CAM software, which will be more difficult and expensive with traditional fabrication methods, you have the opportunity to bring your digital design into the real world as a physical object.In addition, with CAD software, you can increase the efficiency of the designer and enable more projects to be designed in a short time. This increases the quality of the design. By creating a large database, it provides easy access to everyone using CAD software(Lazer, 2023).

2.4. Asante Krofofrom Township

Krofofrom Township is about 14 kilometres from the south of Kumasi when using the old Bekwai road. The formation of the town came about by the coming together of four small towns namely Apaaso, Kwaaso, Adumasa and Aboabota which then gave birth to the name Krofofrom which literally means "Newtown". The people of Krofofrom belong to the Asante tribe of the Akan ethnic group and they speak the Akan language "Twi". The indigenes are predominantly Christians and traditional worshipers. The Craftsmen are mostly famers and some are also full time involved in the sale of brass artefacts. Casting in brass gained very high prominence after all the Asante states came together to form the Asante kingdom and the town became a host of traditional lost wax casting(Eric Appau Asante, Oppong Christopher, Samuel Kissi Baah, 2019). Figure 2.10 is a brasscraftman from Asante Krofofrom.

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Figure 2.10 A Brasscraftman From Asante Krofofrom.

III. MEHODOLOGY

3.1. Research Design And Methods

Descriptive research technique was adopted in order to have a well-defined and meaningful method of the lost wax casting as executed by local casters of Asante Krofofrom. Opines by Muhammad Hassan, descriptive research design is a type of research methodology that aims to describe or document the characteristics, behaviours, attitudes, opinions, or perceptions of a group or population being studied. Descriptive research design does not attempt to establish cause-and-effect relationships between variables or make predictions about future outcomes. Instead, it focuses on providing a detailed and accurate representation of the data collected, which can be useful for generating hypotheses, exploring trends, and identifying patterns in the data (Hassan, 2022). The purpose of this study is such that, it provides a detailed and accurate representation of the Akan Akuaba doll designs in Computer Aided Design (CAD) based on metal casting, and exploring the trends they take.

Interviews and questionnaire were employed as the research tool for gathering relevant data. According to George Tegan, an interview is a qualitative research method that relies on asking questions in order to collect data. Interviews involve two or more people, one of whom is the interviewer asking the questions (George, 2022). In simple term, questionnaire is consider to be a written interview consisting standardized questions which can be answered face-to-face, over the telephone, through the post, or even online (Pahwa, 2023). The population of thestudy was chosen base on the theoretical framework of the research. The population of the study was the Akan ethnic group whilst the sample of the population was of the people of Asante Krofofrom in the Ashanti region of Ghana. The paper targeted a total population of50 artisans and Art collectors but a sample of 26 people were used.

The conceptual framework of the research dealt with four main ideas which are; Observe, Conceive, Design and Interpret. An inspiration for subsequent designs were taken from the Asante Akuaba doll. Figure 3.1 below is a chart depicting the theoretical framework.

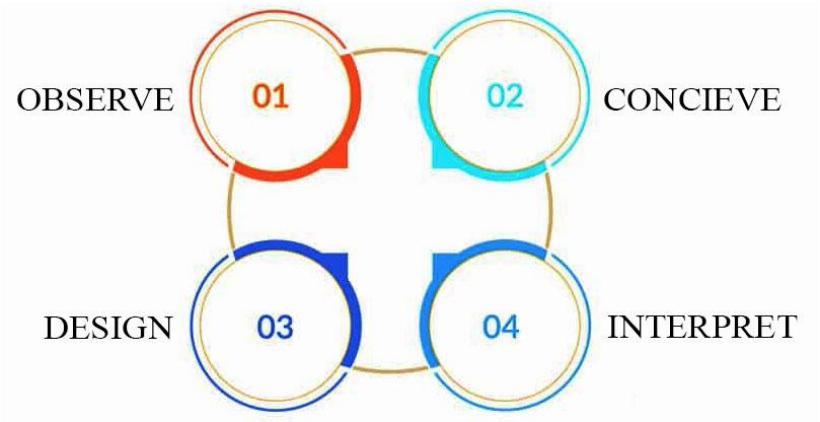

Figure 3.1. Graphical Presentation of Conceptual Framework. (Adapted by Author)

IV. RESULTS AND DISCUSSION

4.1. Demographic Characteristics Of Participants Of Data Collection

26 volunteers were chosen for the study based on several criteria. The participants were chosen from a variety of groups, which improved understanding of the subject and enhanced the information gleaned from the participants. The demographic details of the participants are shown in the charts below from figures 4.1–figure 4.4.

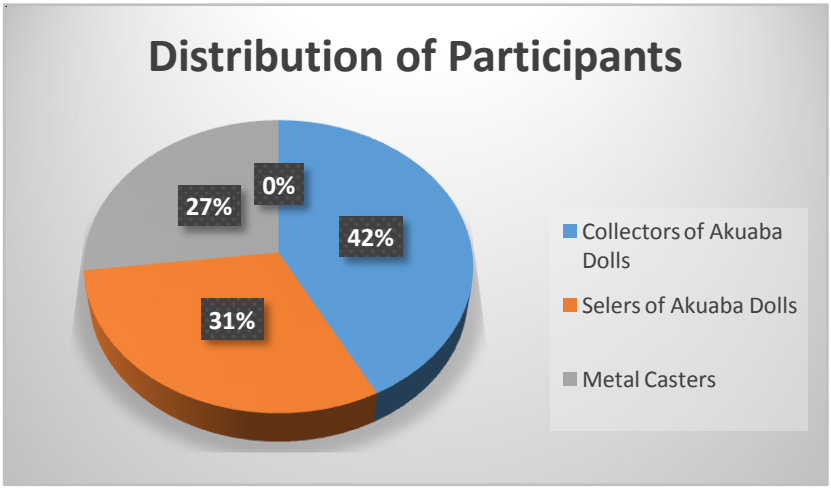

Figure 4.1. Distribution of Participants

According to Figure 4.1, eleven (11) representing 42% of the participants were collectors of Akuaba dolls, eight (8) representing 31% of the participants were sellers of Akuaba doll while seven (7) representing 27% of the respondents were metal casters from Asante Krofofrom. This indicates that the majority of the participants are collectors of Akuaba dolls.

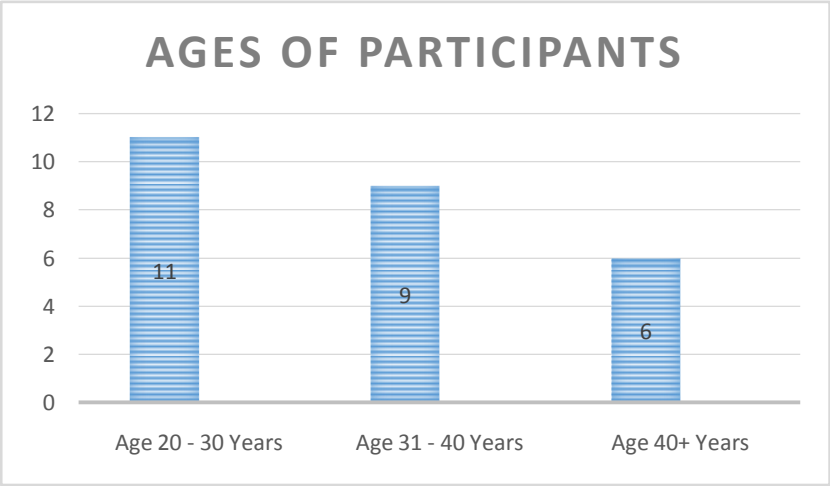

Figure 4.2. Ages of Participants

The ages of participants are capture in Figure 4.2. The graph shows that among the 26 participant of the survey, eleven (11) belonged to the ages of 20 to 30 years, nine (9) were belonged to the ages of 31 to 40 years and 6 belonged to the ages of 41 years and above. This suggests that the majority of the participants were young people.

Figure 4.3. Years of Experience of Participants

The experience of participants in their individual fields of expertise in relation to the survey is found in figure 4.3. The yellow graph above shows that among the 26 participant of the survey, seven (7) people have 1 to 5 years' experience, eleven (11) have 6 to 9 years' experience and eight (8) people have ten (10) years and more experience. This indicates that majority of the participants have 6 to 9 years' experience in their field of expertise as far as this paper is concerned.

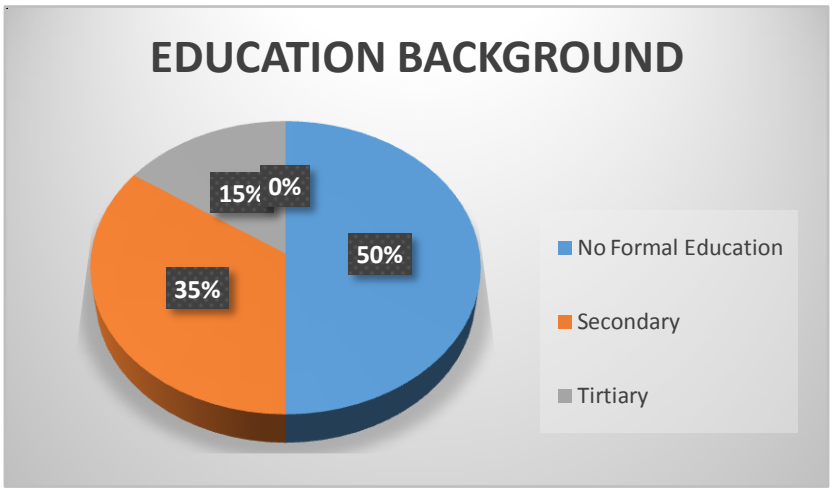

Figure 4.4. Education Background of Participants

The education background of participants in relation to the survey is found in figure 4.4. The chart shows that among the 26 participant of the survey, four (4) have no formal education and they represent 15 percent of the sample, nine (9) have secondary education, representing 35 percent whilst thirteen (13) have tertiary education, representing 50 percent. This concludes that the with secondary education are more

4.2. 3D Modelling Of Akan Dolls Using Computer Aided Design (CAD) Technology

According to CAD Culture, Rhinoceros 3D, or Rhino 3D, is the world's most versatile 3D modeller which can create, analyse, edit, animate, render, document and translate polygon meshes, point clouds, solids, surfaces and NURBS curves (Admincc, 2015). KeyShot is an interactive computer-rendering application for Mac and PC that allows you to import your 3D models and create beautiful photo-realistic images in minutes. KeyShot runs on CPU-processing power (Keyshot, 2020). Techopedia suggest that Adobe Photoshop is software that is extensively used for raster image editing, graphic design and digital art. It makes use of layering to allow for depth and flexibility in the design and editing process, as well as provide powerful editing tools, that when combined, are capable of just about anything (Rouse, 2017). Figure 4.5 and 4.6 are respective graphics display of Rhinoceros, Keyshot and 4.7 show the graphics interface of Adobe Photoshop CC. These three software programs were used in building the virtual doll.

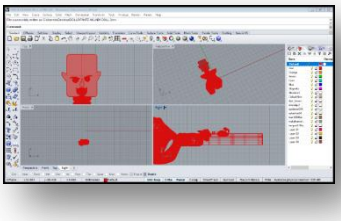

Figure 4.5. Graphic Interface of Rhinoceros 5 (Screen Capture by Author)

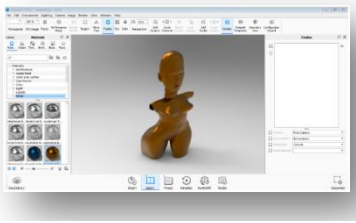

Figure 4.6. Graphic Interface of Keyshot 7 (Screen Capture by Author)

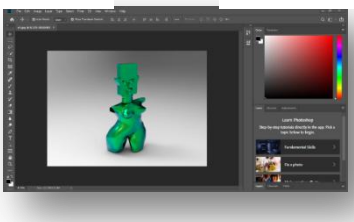

Figure 4.7. Graphic Interface of Adobe Photoshop CC (Screen Capture by Author)

The Akan Akuaba dolls were rebuild in these software to achieve the desired effects necessary for the development products inspired product; pedestal, table, chair, sconce, comb and pendant. The gold colour-rendered dolls below are 3D models of an Asante Akuaba doll. Figure 4.8 is a 3D front view model of Asante's doll, figure 4.9. 3D side view model of Asante's doll, figure 4.10 is 3D back view model of Asante doll and figure 4.11 is 3D below eye level view model of Asante's doll.

Figure 4.8. 3D Model of Asante Doll, Front View (Modelled and Rendered by Author)

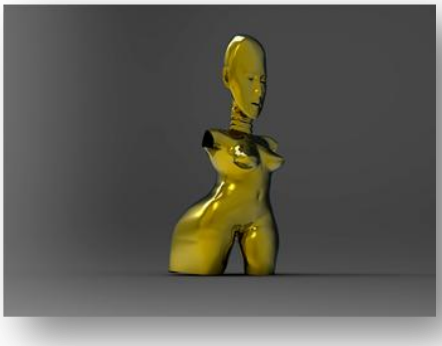

Figure 4.9 3D Model of Asante Doll, Side View (Modelled and Rendered by Author)

Figure 4.10. 3D Model of Asante Doll, Back View (Modelled and Rendered by Author)

Figure 4.11. 3D Model of Asante Doll, Above Eye Level (Modelled and Rendered by Author)

The green colour-rendered dolls below are 3D models of Fante Akuaba doll. Figure 4.12. 3D is a model of Fante doll, ¾ Front view, and figure 4.13. 3D is a model of Fante doll, Side view, Figure 4.14 is a 3D model of Fante doll, ¾ back View, figure 4.15. 3D is model of Fante doll, view above eye level.

Figure 4.12. 3D Model of Asante Doll, ¾ Front View (Modelled and Rendered by Author)

Figure 4.13. 3D Model of Asante Doll, Side View Front View (Modelled and Rendered by Author)

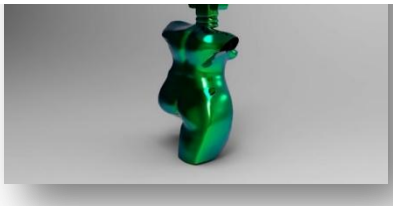

Figure 4.14. 3D Model of Asante Doll, ¾ Back View (Modelled and Rendered by Author)

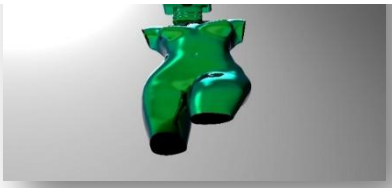

Figure 4.15. 3D Model of Asante Doll, View above Eye Level (Modelled and Rendered by Author)

Below is a silver colour-rendered 3D model Akuaba dolls of the Bono tribe. Figure 4.16 is 3D Model of Bono Doll, ¾ Front View, figure 4.17 is 3D Model of Bono Doll, ¾ Back, figure 4.18 is 3D Model of Bono Doll, Back View, figure 4.19 is 3D Model of Bono Doll, Back View.

Figure 4.16. 3D Model of Bono Doll, ¾ Front View (Modelled and Rendered by Author)

Figure 4.17. 3D Model of Bono Doll, ¾ Back View (Modelled and Rendered by Author)

Figure 4.18. 3D Model of Bono Doll, Back View (Modelled and Rendered by Author)

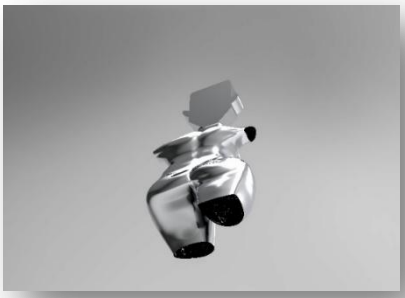

Figure 4.19. 3D Model of Bono Doll, Back View (Modelled and Rendered by Author)

V. CONCLUSION

In order to maintain the culture of the people and pass it on to future generations, it is advised that Ghanaian officials with responsibility for art and culture pay close attention to virtual representations of Ghanaian art. Ghana's Ministry of Tourism, art historians, chiefs, and stake holders are urged to encourage scholars and artisans to document some of these significant intellectual properties so that they can be properly recognised and credited, which could help the country's tourism industry and local economy.

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