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Technical Improvisations for Carnival Float Robotics: A Study of Passion 4 Designs in *Carnival Calabar* (2008–2012)

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Abstract

The paper discuses a series of technical improvisations created on carnival floats by the technical team of Passion 4, a band in Calabar Carnival in Nigeria between 2008 and 2012. The team, consisting of artists and engineers has over the years been saddled with the challenge of designing and building carnival floats with robotic components to convincingly capture the annual carnival themes and sub-themes, and to make meaning to the target audiences. Constrained by lean resources, it has been difficult for the team to fabricate special robotic models for specific designs that need mobility. So, the designers have always depended on the option of improvising by adapting found materials and in some cases re-fabricating them to create moving parts in the float designs. Using the descriptive procedure, the paper highlights the carnival themes, the interpretation of the themes for float design, and the corresponding visual artistic renditions for the years under review. The paper also narrates the artistic and engineering procedures; improvisation techniques and resourcefulness in the use of materials in the carnival float construction projects.

Key words: Technical improvisations; Carnival float Robotics

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INTRODUCTION

In a bid to develop cultural tourism in Nigeria, a number of states of the Federation have recently developed carnivals in which they showcase aspects of Nigerian and popular cultures in street performances. Cross River State, Rivers State, Lagos State, and the Federal Capital Territory—Abuja are at the forefront of this initiative. *Carnival Calabar* in Cross River State is probably more popular than the rest, judging from the organization, publicity, patronage, utilitarian thrust and artistic profile of the carnival.

In terms of organization, the carnival held every 26th and 27th December is run by a commission made up of technically competent members who are either drawn from the performing and visual art industry/academia or are connoisseurs of the arts. The commission also collaborates with and draws technical manpower from the well-established carnivals of Trinidad and Tobago and Rio in Brazil. As part of technical manpower development for *Carnival Calabar*, workshops and series of interactive sessions have been held over the years for creative personnel involved in costume production, float construction, headgear production and other technical activities. In 2012, a detachment of a band from Brazil participated in *Carnival Calabar* probably to strengthen the technical partnership, while also providing a different variety of cultural performance. A steel band group from Trinidad and Tobago also participated in the parade the same year to orchestrate the show of cross-cultural collaborative performances. Coupled with detailed organization, the carnival is well publicized. Information about the carnival is posted on a periodically updated website–Official Carnival Calabar website (http://www.carnivalcalabar.com).

Moreover, varieties of promotional jingles are shown in numerous national and international media networks prior to the carnival. Consequently, patronage to the carnival has improved, and in recent years the attendance of revellers and audience members has increased

progressively. The ripple effects on the economy are remarkable, particularly in the hospitality and transportation industries, and in the visual and performing sectors of arts. There have been a number of media reports on the surging number of tourist into Calabar for the carnival and the effects on the economy (www.news24.com.ng).

Moreover, the thrust of the carnival appears to be utilitarian to a large extent, and this feature is unique. This is exemplified in the fact that every year, the carnival theme addresses a particular development issue within society. The fact is that *Carnival Calabar* has been developed to become a medium through which societal shortcomings can be addressed. The carnival does not merely provide a forum for "talking back at power" through revelry, which potentiates 'catharsis' as the concept of carnival originally entails (Prendergast & Saxton, 2009, p.7).

Carnival, also, creates room for organization and expression of thoughts towards improving the lots of the society. *Carnival Calabar* shares the burden as a theatrical form "to find links and connections to all committed to the power of theatre in making a difference in the human life span" (Taylor, 2006, p. 93)

The carnival is in the mould of applied theatre, about which Thompson (2006) says "creates a practice that seeks to debate vital issues and see those concerns transformed into new stories... to provide people with a means to work their way through difficult periods" (pp.200-2002).

The acclaim of the carnival also arises from the nature and quality of artistic display or performance. The carnival is an assemblage of visual and performing arts displayed as costumes, make-up, dance, choreography, props, carnival float on wheels, special effects and sound production. Many of the presentations are products of complex creations usually put together by groups of artistic and technical personnel. The themes made into scripts are usually interpreted using the elements of artistic creation. These are created by designers assembled from different professional and cultural backgrounds. In a bid to produce the best, win the carnival and claim the fabulous prizes and prestige, some performing groups (bands) in the carnival, notably Masta Blaster, Seagull and Bayside draw artistic and technical personnel from Europe and South America to assist in production, while others, namely Passion 4 and Freedom Band use local manpower to create the various artistic designs, direct the performances and other technicalities for the carnival. The competition spirit is heightened by the offer of 10 million Naira (approximately 66,500 US Dollars) and other sponsored items and opportunities as prizes for winners. Consequently, carnival bands bend over backwards to introduce innovations that would give them a leverage over rival bands.

The competition is judged based on the bands' ability to interpret the theme through the various media of expression–float, dance and choreography, costumes, band movement and organization on the road, carnival spirit, among others. Carnival bands therefore go an extra mile to introduce fresh ideas, surprises and special effects (where required) to stay at the top, claim the prizes and retain a measure of respect or 'bragging rights' as a reveller once put it. In this quest, some bands have been more innovative than the others, outstanding of which is the performance of Passion 4.

This study specifically reviews the effort and innovations of Passion 4, a band that uses local resource persons and materials and yet has become the most productive band in the carnival so far in terms of the number of laurels won and the comparative ovation drawn from the audience during performance. The study systematically lays out the general themes of the carnival through a five-year study period (2008–2012), and the band's interpretation using the float as an index throughout the years under review. The float is so chosen because it is the most dominant singular visual art form in the carnival train and can be described as ambulatory scenery that embodies the theme of the production in aesthetic and functional units. This paper is an experiential narrative of the peculiar challenges encountered and the solutions adopted from artistic and engineering perspectives to produce glamorous floats, which dominate the artistic ensemble, capture the theme of production and yet blend with other components of the carnival procession.

1. PASSION4: THE BAND

Passion 4 is a six-time winner of *Carnival Calabar* in 2005, 2006, 2008, 2009 (tied with Seagull), 2010 and 2011. The band took the 2nd position in 2007 and 2012. Passion 4 has been generally outstanding in introducing innovations to raise the standard of the carnival every year. The group was the first to introduce beautiful young female performers at the front of their carnival procession as 'intro-girls'. Martins(2007) describes Passion 4 as being unique in parading "the prima ballerina of the carnival and certainly a bevy of beauties that turn heads". The Band was the first to introduce moving parts in float construction with the inclusion of flapping bird wings in the float design of Eden in 2005; they introduced the first rolling intro-gate/theme carrier and closing gate/message carrier, bearing the band's name, theme and message in *Carnival Calabar* in 2010. The Band was also the first to introduce rolling standards (section theme carriers) in 2007 and motorized theme carrier in 2011. Virtually all these practices have now been emulated either directly or with few modifications by all the other bands. Passion 4 can therefore be described as pace-setters in *Carnival Calabar*.

Apart from winning the overall carnival severally, Passion 4 has won the carnival float design 6 out of 8 years of carnival in Calabar. This repeated feat fascinates

reviewers who have variously described the Band's float presentations as 'master pieces' and 'artistic statements' in the media (Olapade, 2011; Alara, 2011). Connoisseurs, scholars and critics have now sought to examine the winning formula and the processes of execution of the band's design team. This paper is therefore a vital document reviewing the various creative techno-artistic projects that have resulted in the strings of successes of the carnival band in Calabar.

2. THEME INTERPRETATION, ARTISTIC AND ROBOTIC DESIGN CHALLENGES 2008-2012

As stated earlier, a central theme is usually given to guide the carnival every year. From the moment the theme is issued, the bands are saddled with the challenge and responsibility of interpreting the general theme, first into sub-themes; bringing out scripts that tell clear stories, and then playing out the scripts using various artistic sub-heads–costumes, make up, music, choreography, use of space and float. In this paper, emphasis is laid on the float as a multi-componential medium of artistic communication to convey the message in the theme and to make meaning to the diverse audiences.

The carnival float is often an assemblage of artistic and technical components. The artistic structure of the float in multiple dimensions is often static and therefore generates little interest. But when the artistic structure is animated and the static forms are made to assume mobility, the design comes alive to the excitement of the audience. The art of creating mobility in dormant parts is robotic engineering, which in the discipline of theatre technology could well be described as an extension of Vsevelod Meyerhold's concept of constructivism in scene construction. Meyerhold's concept does not only underline hyper efficiency, but also calls for a high degree of resourcefulness in the selection and use of materials as demanded in float construction. Meyerhold in a lecture quoted in Baugh (2005) explicated thus:

In arts, our constant concern is the organization of raw materials. Constructivism has forced the artist to become both artist and engineer. Art should be based on scientific principles; the entire creative act should be a conscious process. The art of the actor consists in organizing his materials. (p.63)

In line with the principles of constructivism, some sculptural compositions and other artistic images in the carnival floats were designed to be mobile, in other words animated using peculiar techniques of improvisation.

2.1 2008

2.1.1 The Carnival Theme and Interpretation in 2008

The central carnival theme for the year was "Sustaining Earth's Treasures through Our Culture" from where Passion 4 drew its sub-theme "Colours of Our Heritage". The interpretation was that Nigeria's cultural heritage could best be appreciated looking at the different epochs–past, present and future, each with a different socio-economic "colouration", hence the reference "Colours of our Heritage". The float concept and design were anchored on periods of economic heritage/dependency segmented into *yesterday*, *today* and *tomorrow*. In the past, Nigeria was largely dependent on agriculture as the means of sustainability. These were the days of agro-culture where palm produce, cocoa and groundnuts, were the major export items. Later on, the discovery of oil on and off the shores of Nigeria ushered in the era of petro-economy and industrial culture. Now, the bulk of the nation's revenue is derived from crude oil exploration and sales coordinated by the Nigerian National Petroleum Corporation (NNPC) and major oil multi-nationals. With the postulation that Nigeria's crude oil will soon ebb out, there are contemplations on how to develop more sustainable energy sources to replace petroleum and to provide another source of revenue. The country may thus, be contemplating ways to develop an eco-friendly culture. The float therefore tells a story of the metamorphosis of economic dependency from yesterday to today, and projects into tomorrow using clear artistic indicators.

2.1.2 The Design/Artistic Outlook of the 2008 Float

In line with the narrative, the artistic layout of Nigeria's transiting economic heritage opened with yesterday at the front with indicators of the early agro dependency such as the palm tree, cocoa trees and groundnut (in basins). The palm and cocoa trees were created using artificial materials and composed on a wooden platform at the front of the float. The palm tree at the front of float was formed, first by producing a metal armature for the trunk. This was covered with expanded metal wire and then with canvas, and painted to simulate a natural palm tree trunk. The palm fronds and leaves were realized using flat 1-inch metal bar profile for the mid-rib and stripped aluminium printing plate for the leaves. The cocoa trees were produced by cutting out tree branches, forming them into the shape of cocoa tree and attaching artificial leaves and cocoa fruits to them.

The middle part of the float tagged today was represented by a refinery artistically created using a network of water tanks, PVC pipes, control valves, metal pipes for furnaces and oil flow meters. The storage tanks of the refinery at the middle of the float were constructed either with wood or with plastic tanks, normally used every day for water storage. The pipes connecting them were PVC pipes, and the total outlook was convincingly similar to that of a refinery. Tomorrow was depicted at the rear of the truck with artistically created items indicating alternative energy sources such as wind mills, bio-fuel pump and solar energy panels. The bio-fuel pump at the rear of the float was again an assemblage of found

items. The pump was constructed with plywood, while the discharging nozzle was water hose connected to an empty container of toilet stain remover *Harpic*. All the 3-D images in the float were built directly using found or improvised materials; there was no casting. The lower part of the truck was covered with canvas painted with motifs of refinery and oil installations. The colour scheme of yellow, green and black was consistent throughout the work.

Figure 1
Front and Side Views of the Carnival Float in 2008. (Photograph from Esekong Andrew)

2.1.3 Robotic Components Used in the 2008 Float

The major robotic components were a processing plant with a conveyor belt carrying agricultural products from yesterday to processing plants today at the middle of the truck; the flaring flames from the furnaces of the refinery, and the turning blades of the wind mill. The processing plant was made up of, a conveyor belt, metal rollers, 1.5 horse-power electric motor and gear to regulate the speed of the motor. The formwork was fabricated with metal. The processing plant was therefore an assemblage of these various units into a mechanism that could carry bunches of palm fruits and cocoa into a 'processor' made up of a large water tank. The fruits were not actually delivered into the processing tank as they were fastened on to the conveyor belt, which carried them over for repeated rounds, but the movement actually gave the appearance of carrying the fruits into the processor to the audience.

Another robotic devise was the creation of flame effects to simulate gas flaring. The initial plan was to mount a large fan under an 8 inch pipe which would generate enough wind to blow strands of red fabric at the top to simulate flickering flames. On experimentation, it was discovered that the wind from the fan was too feeble to raise the fabrics, and that much wind was lost at the base of the pipe where the fan was mounted. The alternative plan was to cut out aluminium sheets in the shape of flames, paint them with reflective flame colours and mount them on the blades a D/C powered car radiator fan facing upwards. The assemblage was then mounted at the top of the hollow pipes to simulate flickering flames from a distance.

The third robotic devise was to create turning wind mills. This was done by using a light metal gauge to fabricate the blades of the wind mills. The blades were mounted on free-rolling bearings in an angle that would allow breeze to turn the mills and welded to 4-inch vertical galvanized pipes planted on the truck bed. The wind mill only turned when there was sufficient breeze. To this extent, the experiment was successful.

2.2 2009

2.2.1 The Carnival Theme and Interpretation in 2009

From the central carnival theme "Land of Our Birth: Our People, Our Heritage", Passion 4 developed a sub-theme "A Feather to *Becheve*: A Journey to Greatness", within which the progress of Cross River State of Nigeria was reviewed in various sectors. "A Feather to Becheve" was a coinage to suggest a flight to a high geographical altitude in Cross River State. (Cross River State Carnival Commission, 2010). From a deeper philosophical insight, the expression connotes a four-dimensional journey in time and space to greatness. As an item that facilitates flight, the feather has been used in many myths to symbolize ascension to fame and greatness. Again, it was used in this interpretation to connote the aspiration of Cross River State to attain greatness. Becheve, on the other hand is the highest geographical location in the Obudu mountain ranges of Cross River State on which there is a bird watching facility. In the interpretation, it was used to portray the peak of greatness. The feather in the narrative ascends from the coastal lowlands through the jungles, representing travails and pain; the plains, representing the pleasures and gains to the hills of Becheve, the constructed utopia of achievements and fulfilment.

In the 2009 presentation, Passion 4 reviewed the segmented history of Cross River State in the journey to greatness–its culture and heritage, its people, institutions and landmarks, which have significantly contributed to the global cultural heritage.

2.2.2 The Design/Artistic Outlook of the 2009 Float

The float in 2009 captured the geographical landmarks and aspects of the culture of Cross River State in miniaturized models, ranging from the coastal and shoreline scenes through the waterfalls of Agbokim and Oban to the cable car on the scenic mountains of Obudu and Obanliku. The float also reproduced the ancient anchors of the Atlantic slave ships and the University of Calabar gate as symbolic architectural landmarks in the state, both built with plywood and timber. The legs of the *Leboku* maiden with the iconic metal springs around them were formed with canvas and foam wrapped around a metal armature and painted skin colour. These wide-ranging landmarks and cultural symbols indicating Cross River State's greatness were arranged into a unified composition.

Figure 2
Front and Back Views of the Carnival Float in 2009. (Photograph from Esekong Andrew)

2.2.3 Robotic Components Used in the 2009 Float

Certain movements were incorporated in the artistic composition to enliven the presentation. A waterfall was introduced at the front of the float to represent the major waterfalls found in the state. This was achieved by creating a cyclic flow of water using a 1.5 horsepower water pump connected to a 250-gallon capacity reservoir situated at a platform at the front of the truck. The water pump delivered water through a pipe into another reservoir at the top of the truck cabin, which then flowed back through a metal trough to the reservoir at the base. This simple cycle created the water fall.

The cable car at the middle of the float was an assemblage of metal pillars, a network of ropes and the passenger buckets. The movement of the buckets from pillar to pillar was activated manually. The buckets were affixed to ropes which were connected to pulleys located at critical points to facilitate smooth movement. The ropes were manually pulled by performers at each end to make the cable car buckets move back and forth the pillars.

2.3 2010

2.3.1 The Carnival Theme and Interpretation in 2010

In 2010, the general theme of the carnival was "Our Strength, Our Resilience, the Bedrock of Our Future", and Passion 4's sub-theme was "Ebony Colourseum: The Ripples of Survival". In the sub-theme, Ebony was used as a metaphor for the black race, and the family was identified as the strength of the black race both in Africa and in the Diaspora. The family was said to be the centre point of Ebony's (the black man's) strength amidst the struggle for racial supremacy or *colour fight* (Colourseum). The float adopted the symbolism of the family and was designed to capture images of the family in an African architectural setting. Though the family in the African context consists of not only the nuclear, but also the extended family, the artistic composition on the float was streamlined to include only sculptures and prints of the father, mother and children. The presentation was supported with a message at the rear of the float "The Family: Strength of Ebony. Keep It Together".

2.3.2 The Design/Artistic Outlook of the 2010 Float

In visual artistic terms, the float was an assemblage of both three-dimensional and two-dimensional (print, collage and montage) images to represent the family in a setting. The figures were set within the environment of a home, represented abstractly by the roof of a house at the front of the float and at the back. The burst of the male and female figures were larger than life to gain visual prominence in the composition. The female figure was sculpted to carry a baby, while another child was positioned in front of the parent figures. The sculptural composition of the man, woman and children was mounted at the front of the float. At the middle of the float

was a 4-foot cube where pictorial (2-D) compositions of family were pasted on the four outward sides. The cube was mounted on a rotating pedestal welded firmly to the floor of the truck. The rotation was timed to move slowly to enable gradual appreciation of the composition of images.

On the sides of the float were decorative motifs and fractals from traditional African architecture, which Eglash (2005,p.20) agrees are "excellent examples of cultural design themes" in African architecture. The design introduced some popular fractals in African settlement architecture as repeat patterns. Each motif in use was significant to black civilization either in Africa or in the Diaspora. In this regards, motifs from sub-saharan (tropical) Africa, especially Nigeria, South America and the Caribbean were represented.

Figure 3
Front, Side and Back Views of the Carnival Float in 2010. (Photograph from Esekong Andrew)

2.3.3 Robotic Components and Improvisation Techniques used in the 2010 Float

Three robotic components were incorporated in the float design. First, the head of the male and female sculptures were made to turn side to side. Second, the hand of the male figure was designed to systematically raise and lower an affixed decorated staff. And finally, the cube at the centre of the truck was meant to rotate slowly to enable the spectators appreciate the pictorial compositions. To make the heads of the sculptures to turn, the head of a rotating fan with oscillatory parts was needed and new ones were purchased for the purpose. Ordinarily, the standing fan can be set to swing from side to side when the blade is rotating. This mechanism was transferred to the sculptures. The fan blades and casing were removed and the fan motor head was welded to a metal set within the hollowed centre of the sculpted head. This connection enabled the head of the sculpture to turn just like the fan head. Electrical (A/C) power was required to activate the devise.

To provide solution to the design problem, whereby a vertical "up and down" movement was desired for the hand, a car wind shield wiper engine acquired from a used car part shop was used. The wiper in normal function slides from side to side to clean the wind shield, but in this robotic design the mechanism was detached from normal usage and welded to a free-standing metal framework to provide a vertical up and down movement. On this mechanism the sculpted hand of the man with the staff was affixed. In other words, the wiper movement was angled in a vertical direction and the sculpted hand, bearing the staff was tied firmly to it. It was necessary to use a powerful wiper engine to carry the weight of the sculpted hand and the staff. For this reason, a Mercedes wiper engine was chosen. The wiper was timed at the lowest interval of 5 seconds per swing to achieve a slow movement of the hand up and down. This device was powered from a battery (D/C) source.

For the third problem, a ceiling fan motor head was used. Again, a new ceiling fan was bought and the blades removed. A metal platform was welded on the motor head and mounted on a pedestal. The cluster of printed images on the cube was then mounted on the platform with bolts and nuts. The motor fan, which ordinarily turns with a five-speed fan regulator at a high speed, was reconfigured to reduce the speed to a visually tolerable minimum, whereby the devise would turn slowly with the mounted images on the cube. Again, this connection was powered by electrical (A/C) current.

2.4 2011

2.4.1 The Carnival Theme and Interpretation in 2011

The general theme for the year was "Endless Possibilities". From this, Passion 4 created its sub-theme "Harmony between Man & Nature: A Pathway to Eldorado". The philosophy behind this coinage was that a harmonious relationship with nature would enable man to achieve endless possibilities. To capture and demonstrate the harmony between man and nature, the float started with images of nature, exemplified by wild life. The elephant, the largest creature in the forest was chosen as the dominant visual symbol. Nature was also represented by trees with broad foliage, shrubs and fruits. Man derives assorted gifts from nature and processes them into wide-ranging items for food, drugs, clothing, housing materials, and others. The message was that nature should not be

destroyed in the process of processing, using of harmful chemicals, machinery, non-degradable and other materials that deplete nature. Automated processes should also be compatible with nature. Knowledge is desired to harness nature sustainably and to preserve man's habitat for meaningful livelihood and as a heritage to posterity. These steps and many more would ensure that man arrives at the "utopic" Eldorado.

2.4.2 The Design/Artistic Outlook of the 2011 Float

The artistic outlook on the main float included an elephant pulling the forest with other animals - leopards, lions, gorillas, snakes and birds flying above forest with colourful feathers. The elephant head was produced using metal, wire mesh and canvas and the metal frame work for the elephant head was large enough to cover the cabin of the truck. The other covering materials served to finish the work by adding flesh and tone as appropriate. The gorillas and leopards were moulded and cast with fibreglass. The snakes were formed with fabrics simulating their skins and stuffed with saw dust. The birds, readymade were inflated and tied to tree branches with thin rubber thread. A mechanism with a conveyor belt was made at the centre of the float to take farm produce–artificially cast large pineapples, oranges, tomatoes and other fruits into a processor, which turns the products into juice. The juice flowed like a fountain into a large transparent glass. The float also created room for revellers at designated points to demonstrate man's relationship with nature. The presence of architectural structures on the float indicated physical development. A space craft was modelled and positioned at the rear to indicate man's quest for knowledge for sustainable livelihood.

Figure 4
Side View & Fibre Cast of Gorilla Used in the Carnival Float in 2010. (Photograph from Esekong Andrew)

2.4.3 Robotic Components Used in the 2011 Float

A number of robotic components were built into the carnival float in 2011. First, there were flapping ears of the elephant at the front of the float. The flapping was achieved manually by positioning a performer in the hollowed elephant head to manipulate two rods connected to the two ears periodically. The trunk was also made to rise and fall intermittently. This was done by connecting an invisible string to the tip of the trunk and pulling it from time to time. The gorillas in the bush were made to shake tree trunks with their hands periodically. The car wiper mechanism used to activate the hand of the man in the 'family' sculpture was again used here. The snakes were made to turn as if they were alive using the remote control system of television outdoor antennas. To achieve this, outdoor antenna were dismantled and the turning parts implanted in the stuffed snakes and connected to a power source. On pressing the remote button, the snake heads were made to turn and the bodies twist as if there were alive. This generated much ovation from spectators especially as the snakes were covered with fabrics that resemble snake skin. The float also had a conveyor belt, which carried raw agro products from the forest to the processor at the middle of the float. The engineering of the conveyor mechanism with a belt was similar to the one made in 2008, just that a 2.0 horsepower motor was used this time. There was also the juice fountain which was powered by a 1.5 capacity water pump. The design was to recycle the flow of the juice made up of coloured water. A large hole was perforated at the base of the fabricated juice glass to enable the juice to recycle as desired. The juice glass itself was produced with perspex material assembled into the structure of a hexagonal container with a very strong adhesive. The production of the juice glass was somewhat challenging. The initial plan was to heat and bend transparent perspex material into the shape of a drinking glass. On trial, it was discovered that the material was flexible only to an extent beyond which it would break. The curvature achieved was not smooth, hence not convincing. Having failed in this technique, another option was chosen. This involved the cutting of the perspex material into planes which was later assembled in the shape of a hexagon. The pieces were later bound with a strong adhesive to form the shape of a hexagonal glass. At the rear of the float, the space craft was enlivened by mounting a fog machine at its exhaust chambers to

simulate the foggy effect created by a rising space craft.

2.5 2012

2.5.1 The Carnival Theme and Interpretation in 2012

Arising from the Band's interpretation of the central theme "Celebrating a New Dawn", a sub-theme was created–"*Phos* Glamorous... a Celebration of Light". "Phos Glamorous" was a coinage to describe the spectacular and intellectual glamour of light. *Phos*, the Greek word for light was introduced to enforce the deep meaning and connotations of lighting both as an art and as a necessity. The context of celebration of light in the presentation was open. In any situation, images of 'darkness' or circumstances, which may have created backwardness and pains usually precede celebration. With the command "let there be light...", there was light both in the physical, which include spectral reflections drawn from the sun, moon, stars and other planetary bodies; and the intellectual, consisting of knowledge, beginning with glimpses of what happened in the biblical Garden of Eden to ancient civilizations of Egypt, Greece, Rome and the indigenous knowledge domains. In the final analysis, it was argued in the interpretation that in every setting, intellectual illumination was as relevant as physical illumination in creating the transparency and other conditions needed to launch into a new dawn.

The float drew directly from the sub-theme "...a celebration of light" to create a feast of colours in a large "light box", a creative assemblage of lighting points and systems, which showcased light from multiple perspectives–its functionalism (*real light*) aesthetics (*own design form*), and its symbolism. (Parker, Wolf & Block, 2003, p.33)

2.5.2 The Final Design/Artistic Outlook of the 2012 Float

The display on the float incorporated the basic qualities of light, being colour, intensity, distribution and movement. Apart from showing these qualities in varieties of lights, the float was also used reflective materials such as mirrors, sequins and glitters to orchestrate luminosity. The final outlook was asymmetrical with the light box at the centre and other structures at the front and at the rear ends of the float to balance the composition. The lower part of the float was an abstract artistic composition made of cut-off wood patterns covered with luminous materials and distributed evenly across rectangular planes. The colour combination was green of various shades, yellow and gold. Numerous ornamental materials were used for trimming and finishing. Decorates were drawn from various background sources including fabric trimmings, automobile decorates, woodwork trimmings, architectural ceiling materials made of POP and PVC, metal shop and artist materials for signage and finishing.

As frequent with most designs, the final outlook was slightly different from the paper work. As work progressed, there were needs for modification in some parts of the design, arising from either availability of materials or ability to produce certain structures by the work men. The original concept of a symmetrically balanced float was changed to enable the designers introduce new artistic innovations. The lights were not just meant to be decorative anymore, but also to capture salient philosophical attributes and manifestations of light or illumination. For instance, books and a reading lamp were introduced to reflect knowledge as a source of illumination. Facilities for power generation and distribution were introduced to indicate the activity needed before electric power can be obtained. The front of the float was redesigned to give room for a wider distribution of lighting units and strips. The circular spinning unit at the front was designed with interactive luminous gold and green interplayed to achieve an optical illusion. This was transferred from the sides in the original design to the front to introduce a major point of activity which would engage the viewer as the float approaches. Even though the final out look of the float became asymmetrical, the colour scheme of green and yellow was maintained. Being dominated by colourful lights and lighting effects, the float was best appreciated in the night.

Figure 5
Front and Side Views of the Carnival Float in 2012. (Photograph from Esekong Andrew)

2.5.3 Robotic Components and Improvisation Techniques Used in the 2012 Float

Though the robotic components in the float for 2012 were relatively few compared with the previous years, they were peculiar for the functions they served in the overall design. By the nature of the design, many lighting equipment were used which had in-built effects. For instance, the strip-lights and the flame machine had in-built flashers. External flashers were also procured for the other coloured lights. The flashers only enabled the lights to change in intensity and movement; they do not activate a robotic function in the sense of physical movement of the component parts. Nevertheless, the flickering lights enlivened the work to a large extent. The flame machine produced in China has in-built motor-driven fans which blow a light-weight fabric to flicker like a flame. The lighting at the base of the flickering fabric gives the illusion of an actual flame. This was a case of adopting an existing technology for use in the context of a carnival float to enforce the interpretation of the theme.

Perhaps the real challenge of creating a moving part locally was at the front of the float where a spinning circle was desired. This was achieved by fabricating an A/C powered spinning unit with a 1.5 horse-power motor and a gear, which were mounted on a metal base and connected with pulleys and a belt. The gear was meant to reduce the speed of the motor to a limit that would allow the viewer to appreciate the optical illusion created by the spinning object.

To summarize this discussion of the themes, interpretation challenges, artistic layout and robotic design for the floats, a tabular profile (Table 1) is presented below for a picturesque review.

Table 1
Carnival Calabar Themes, Passion 4 Interpretation & Float Robotics Components

Year	Central theme	Band's sub-theme	Float theme/description	Artistic layout	Robotic components
2008	Sustaining Earth's Treasures through our Culture.	Colours of Our Heritage.	Images of our Heritage: Yesterday, Today and Tomorrow.	Yesterday: Agro-culture at the front. Today: Petro-culture/Refinery at the middle. Tomorrow: bio-fuel facilities at the rear.	Conveyor belt, Refinery flame; Bio- fuel pump
2009	Land of Our Birth: Our People, Our Heritage.	A Feather to Becheve: A Journey to Greatness.	Cross River State, the People's Paradise.	Layout of Cross River State, Nigeria, showing tourism facilities from the marine South to the mountainous North	Waterfall, Cable Car
2010	Our Strength, Our Resilience, The Bedrock of Our Future	Ebony *Colourseum:* The Ripples of Survival	The Family: Strength of Ebony	Images of the family set within fractal geometric motifs in a homestead.	Turning Heads and moving hands of figures.
2011	Endless Possibilities	Harmony between Man & Nature: A Pathway to Eldorado	Processing Nature: Harmony between Man & Nature.	Large processing plant with conveyor belt, processing natural products into popular consumer items.	Flapping elephant ears, moving gorilla hands. Moving snakes and processor with conveyor Belt, Juice fountain and Rocket Station
2012	Celebrating a New Dawn	*Phos* Glamorous... A Celebration of Light	Let there be light!	Large light box, abstract lighting facilities and a pile of books on the float depicting light as illumination and as knowledge.	Light Box, led strip lights, flickering flame and spinning fantasy.

3. METHODOLOGY FOR FLOAT BUILDING AND CASTING OF SCULPTURAL IMAGES

All the carnival floats in the years under review were built with a combination of metal and wooden framework on flat-bed trucks approximately 55 feet in length and 8 feet in width (See Figure 6). The materials were either welded or nailed to the bed or cabin of the truck.

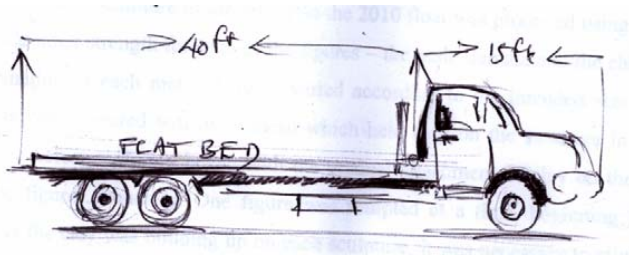

Figure 6
Sketch of a Flat Bed Truck. (Sketch: Esekong Andrew)

As a standard procedure, once the framework is created, the work of covering begins and this depends on the nature of the design. Wide –ranging materials are used for covering including, wire mesh, canvas, and foam of varying thickness, perspex material, and metal pans, among others. The framing and covering materials are similar to those enumerated by Parker et al. (2003) for the construction of irregular forms, columns and tree trunks for stage scenery (pp.173–176). But the articulation of the materials and the choice of methods are subjective. In this regards, Brockett and Balls (2004) opine that "traditional and innovative stage-craft co-exist to supplement each other" (p.373).

Carnival float design and production have been likened to building a set, the difference being that the set this time is on wheels. The peculiarity of float design is that the float must be seen as an artistic entity. The idea is to deconstruct the outlook of the truck upon which it is built, and this was often a challenge in the float projects under review, being that the image of a truck is very obvious. In many of the cases of the trucks were fully covered such that many spectators were puzzled about the mechanism behind the movement.

During construction, emphasis was laid on making the structures firm so that in the process of movement, the delicate designs will not be dismantled by the vibration from the truck engine or the rocking effects on the carnival route. Another technical issue in the float projects was that of creating sight-holes for the truck drivers. If this is not properly done in float design, the sight-hole could mar the work. The creative solution to this was that the sight-holes in the float were made to become parts of the design, and they were made to align to the drivers' sightlines comfortably. In some cases, see-through decorative net fabrics were used to block wide openings so as not to make them too obvious.

In some of the years under review, sculptural images were used to enhance representation of the concepts. Similar production/fabrication methods were used in many cases. Basic procedures were followed where casting or direct building and covering were used. The cluster sculpture of the family in the 2010 float was produced using skeletal frames to provide inner strength for each of the figures – the male, female and the children. The size and formation of each metal skeleton varied according to the intended size of figure. The skeletons were covered with wire mesh which held clay on the structure in the process of sculpting. Actual sculpting began with the gradual attachment of clay on the form work to build the figures manually. One figure was sculpted at a time, beginning from the male figure. As the clay was building up on each sculpture, it was necessary to allow intervals for drying or what is technically referred to as setting to avoid the warping off of portions of the work. The size of each sculpture was larger than life as it was meant to be appreciated from a distance. As the build-up of clay approached the intended size, detailing was done to bring out facial features, each to distinguish sex and age. Deep cleavages were introduced at indented or hollowed portions of the face such as nostrils, eye sockets, facial line and dimples to enable the retention of the features after casting. Such features are usually lost if they are not expressed boldly in the process of sculpting.

The images completely sculpted in clay had to be cast in a lighter, stronger and more durable medium, being fibre glass in this case. To enable casting, the clay images had to be reversed in moulds using cement mortar. In creating the moulds, engine oil was applied on the clay to act as a barrier between the clay and cement mortar. Without this barrier, cement would set and stick firmly to the clay, making the separation of the negative images in cement mould from the positive images in clay difficult. The moulds were demarcated into four parts–the facial area, the back of the head, the front of the body and the back. This was done to reduce the weight of each component. The procedure of demarcation was by sticking metal pans along the lines of division into the clay before applying the cement mortar. The moulds not yet separated though demarcated were left on the figure to set and dry completely before separation. During separation, the clay sculptures now inside the cement moulds were dismantled following the division of the moulds, and clay was scooped out from inside each cement mould. Each mould was washed to clean out residual clay in preparation for the final casting in fibre glass.

Fibre glass casting was done in stages. First, a barrier of oil was applied inside the cement moulds to ensure easy separation after casting. A mixture of resin, catalyst and accelerator, which would solidify into fibre glass, was applied with brush to each mould. This process was repeated to achieve thickness. Fibre matt, another important item in the fibre glass mixture was laid after the second coat to strengthen the composition and ¾ rods were affixed inside the sculpted heads to provide added support and anchor points required for mounting. Again, the fibre glass mixture was applied. When set, the fibre mixture was pulled out from the moulds to have complete but lighter replicas of what was earlier done in clay. The front and back fibre cast of the figures were merged using the same fibre medium as binder to have whole figures. Each figure was dressed up with costumes and accessories to reflect role and status.

Peculiar challenges were encountered in the narrated process. While creating the moulds for casting, some were badly damaged. Where it was impossible to repair them by assembling and binding the broken parts, casting was done directly. Direct casting involves repairing the original clay image where it was deformed maybe in the process of scooping out; applying the fibre glass mixture outwardly and later scooping the clay from under the hardened resin. This unconventional procedure did not in any negative way affect and the final image. This innovation became

necessary when the clay mould was damaged and time was running out. What appears to be uncommon and may well be a new finding in the float project is the production of fibre cast by applying the resin and activator mixture from the top of the moulded clay.

Figure 7
Photographs Showing the Casting Processes of "The Family" Group Sculpture in 2010. (Photograph from Esekong Andrew)

The gorilla and the leopard in the 2011 float were produced using clay modelling and fibre casting procedures similar to those narrated above, this time with no challenges of broken moulds. The hand of the gorilla was segmented at the elbow to enable flexibility after the implantation of the robotic device.

4. PECULIAR CHALLENGES IN CREATING MOVING PARTS IN THE FLOATS

Engineering practice in Nigerian is confronted with peculiar challenges such as absence of specialized machinery for fabrication of components, lack of skilled manpower and poor funding and timing of special projects, among other problems. Against this background, the artist/designer who needs technical support must figure out ways by which these challenges could be circumvented. Quite often, ingenuity is needed in the choice and management of resources to achieve set goals. In the Passion 4 float projects, much improvisation was needed to provide technical solutions to the identified design problems. This was demonstrated in many areas.

The designers needed to think outside the box and to break certain operational conventions. By improvising or adapting objects from conventional usage, one is bound to either make mistakes or encounter a number of unexpected challenges. One area where there was a remarkable challenge was the assembling of the fabricated robotic mechanical components with three-dimensional sculptures. In the case of the family sculpture of 2010, the necks of the figures were dismembered from the bodies using a filling machine for the purpose of fixing the mechanical components to the heads of the completed sculptures. For each sculpture, the fabricated mechanical parts were attached to the parts to be animated–the heads of the male and female figures, and the hand of the male figure. The mechanical components were affixed to the ¾ metal rods fixed in the sculptures during casting and tied with adjustable bolts and nuts. The movement of the heads and arm was as programmed by the engineered devices. The bodies of the sculptures were later coupled to the mechanical stand to complete the re-assemblage of the structures. The mechanical fabrication therefore became stands for the sculptures. But after the mechanical components engineered to achieve robotics were fixed, the neck of the male and female figures became longer, thereby appearing deformed and disproportional. And at this point there was neither sufficient time nor money to re-fabricate the components to address the deformities, but quick remedial measures had to be taken. The much that was done to partially address the problem was to cover the affected areas of the figures with costumes. This solution later impeded the robotics - the turning female head repeatedly got hooked in the fabric! At a point the fabric was cut off and part of the mechanism was exposed. Similarly, the hands of the gorilla were cut to enable the fixture of the robotic mechanism. On reassembling, it was not possible to cover the joining effectively, and this again partially exposed the mechanism moving the hand.

In another case, midway into the performance as the truck was moving; the neck of the revolving cube at the middle of the truck was broken. It was later discovered that the bearing at the neck of the ceiling fan was not stable enough to support the weight of the turning box. This design failed but not without leaving a lesson - an alternative plan is necessary when improvising, particularly in designs for competitive performances.

Failing electric motors also presented a challenge. In 2008, the conveyor belt failed midway into the performance. The 1.5 horse power was not sufficient to power the weight on the belt, which consisted of divided palm fruits bunches and other fruits. But this again

provided a lesson for the subsequent experiment where in 2011 the weight on the conveyor belt was reduced and a higher capacity 2.0 electric motor was used. The fruits on the conveyor in 2011, though readymade were cast with polystyrene. However, a different problem was encountered. The conveyor was moving backwards for a good part of the performance until the connection was reversed by the technical crew.

RECOMMENDATIONS AND CONCLUSION

The experience gathered so far in making robotics for carnival floats in an ill-equipped environment is acquired by experimental trials and errors. Some lessons are learnt from the series of mistakes made. As long as the technical atmosphere remains unfavourable as it has been in Nigeria, the solution still lies in adaptation, improvisation and innovation to create exciting carnival floats. Even though some results appear crude, the processes of creation challenge the designers and seem to bring out the best in them. It is recommended, therefore, that more experiments be done in the area of robotics for carnival floats and other media of expression in carnival street performances as they intensify the glamour in such performances.

It must also be stated that the strength of the mobile parts of carnival floats lies in their simplicity. The fact that there exists a possibility of trouble shooting during the display requires that the mechanism of operation should be as simple as possible. This will facilitate quick fixing of any arising problem during the performance.

From the experience of the Passion 4 projects, it is ascertained that robotic design needs much time and money. The availability of these resources is imperative for sophisticated carnival designs which would engender effective carnival performance in artistic and technical terms. The organizers and sponsors, therefore have a burden to provide resources to support the acquisition of machineries by technical teams, training of manpower and funding of research in robotics. In addition, the carnival theme should be publicized early and sponsors should release funds for early preparation. If work commences on time, mistakes made in the process would easily be corrected and other pitfalls averted.

In conclusion, it must be observed that effective cross-disciplinary collaboration contributed to the relative success of the Passion 4 projects. A collective approach was adopted in the adaptation of materials for the execution of work and in proffering innovative solutions for each design problem. As ideas were contributed from various resource pools of knowledge to make the projects successful, it follows that the power of team work must never be undermined and this approach must be adopted if the carnival in Calabar must grow. With specific reference to robotics in artistic performances, it is clear that some fabrications could be reused to create other effects in other productions. And this was the case in the Passion 4 float projects. While looking for new solutions for emerging problems, it should be noted that older fabrications can still be adapted to address new needs. Improvisation continues.

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