CONFERENCE PROCEEDINGS

6TH INTERNATIONAL CONFERENCE ON CAPACITY BUILDING FOR NATIONAL SUSTAINABLE DEVELOPMENT (CBNSD 2018)/EXHIBITION

International Conference Centre, Multimedia University, Nairobi, Kenya

August 29th to 31st, 2018

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Multimedia University Conference Centre, Nairobi, Kenya

August 29th to 31st, 2018

WELCOME WORD

WELCOME WORD

On behalf of Ideal True Scholar/True Scholar Research Limited, and Multimedia University, Nairobi, Kenya. I welcome you all to the 6th International Conference, with the theme **Capacity Building for National Sustainable Development (CBNSD 2018)/Exhibition** taking place now (29th of August 2018) in Multimedia University**,** Nairobi, Kenya**,** and to end on the 31st August 2018.

Ideal True Scholar has a mission to bring together International Scholars as well as Practitioners and Scholars from related fields from all over the world with different intellectual traditions and expert views. It is particularly fitting that a scholarly reflection and dialogue on fundamental questions, dilemmas and challenges confronting African and the world at large as raised by the Conference theme Capacity Building for National Sustainable Development.

You are here because you believe that all things are possible for those who believe and are willing to play their part in their struggle for self actualization in the committee of the world's best economies. You left your numerous engagements and spent hours of study to prepare your papers for presentation at this scholarly gathering so that you will contribute in no small measure to learning and the social, political and economic development of your country.

You abandoned your numerous engagements to be here of all places because you have heard, observed, participated, benefited and or contributed research materials before to ideal true scholar, and may have come to the sincere understanding that the institute is one of the best having links and affiliations with renowned institutions around the world and partnering with many international organizations for the betterment of society today. You are welcome.

Ideal True Scholar Institute is immensely indebted to **Amb. Prof. Festus Kaberia;** Vice-Chancellor, Multimedia University of Kenya, for working in conjunction, and also gave opportunity for the university to host the International Conference, and for also finding time to present a keynote speech. Thanks to **Prof. Henry Kiptiony Kiplangat;** Vice Chancellor, Kabarak University, Kabarak, Kenya who also initially initiated the move to hold the conference in his University, Sir, thanks so much for also making yourself available out of your tight schedule to give a Keynote Speech. Also to the Lead/Keynote Speakers, **Engr. Prof. Sam B. Adejuyigbe,** Department of Mechatronics and Mechanical Engineering**,** Faculty of Engineering Building, Federal University, Oye-Ekiti, Nigeria, who have been my academic father and mentor all the way through my postgraduate studies, he is one of a kind and I pray God continue to elevate him gracefully, and to **Reuben Kimani,** Founder and CEO, Username Investment Ltd, a leading property company in Kenya, for making himself available to give a Keynote Speech.

I will note fail also to thank **Prof. Abel Mayaka,** Chairman; Local Organizing Committee and all other committee members, who work assiduously to make today a reality. Lastly to Prof Paul Mbatia, my contact man, he believed in me when I called to inform him of our desire to hold the International Conference in his University, and here we are today.

Thanks and God Bless all delegates here present, who, not minding the economic situation, still saw the need to be physically present. We urge all conferees and our distinguished guests to relax and savour the unique atmosphere of Nairobi city. Nairobi prides itself with so many natural and man-made tourist sites. Please find time to join others during the conference tour to visit some of these places.

We look forward to meet with you again in the **7th International conference** to hold in **South African.** Precise date will be announced later on the conference website.

Dr. Sam. O.O
Conference Convener
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FOREWARD

It is my pleasure to welcome all participants to this great Institution, the Chosen University to hold the 2018 International Conference, at Multimedia University of Kenya

The Sixth International Conference is organized by Ideal True Scholar and Multimedia University, Kenya.

The 1st International Conference took place in University of Ghana between 27th to 29th July 2014. The 2nd International Conference took place in American University in the Emirate, Dubai between 26th to 28th July 2015; The 3rd International Conference took place in DeMontfort University, Leicester, United Kingdom between 3rd to 5th August 2016. The fourth International Conference took place at the **Institute of Distance Learning, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana between 5th to 7th April 2017.** The 5th International Conference on Disaster Risk Management For Sustainable Development took place in Rochester Institute of Technology, Dubai, between 23-25 August 2017.

CBNSD 2018 will bring the most knowledgeable researchers from all over the world, as well as leaders in the industry to explore the important topics in Capacity Building for National Sustainable Development.

Permit me to inform you that a total number of two hundred and fifteen (215) papers were received, but after due review, only 160 papers were accepted to be presented, and YOU, being one of the lucky participants.

Going by the quality of papers received and personalities presenting keynote papers on well researched and structured Issues, I am convinced that an extremely rich cross fertilization of ideas of experts from across the globe is assured. The conference proceedings will serve as a compendium of intellectual property for researchers and policy maker as the material will be available online.

I wish you all very exciting and resource full deliberations and journey mercies back to your respective destinations at the close of the conference.

Thanks also to Dr. Sam, the conference convener, a tireless and erudite scholar, who put his best to make the conference a success. More Grace.

Regards,
Don Pedro
Director, Ideal True Scholar

KEYNOTE SPEECH

6TH INTERNATIONAL CONFERENCE ON CAPACITY BUILDING FOR NATIONAL SUSTAINABLE DEVELOPMENT/EXHIBITION (CBNSD 2018)

Multimedia University Conference Centre, Nairobi, Kenya

August 29th to 31st, 2018

REUBEN KIMANI
CO- FOUNDER and CEO,
Username Investment Limited

Session: Capacity Building in Real Estate Investment to Ensure Availability of Affordable Investment Opportunities for Young People in Kenya

What is the state of our young population? What is the current state of real estate in Kenya? What needs to be done by the stakeholders to increase the availability of real estate investments for young people?

INTRODUCTION

Prof. Amb. Festus Kaberia, Distinguished Guests, Ladies and Gentlemen,

It is a great honour for me to deliver, on behalf of Username Investment Limited, a key note speech on this important forum. I would like to first of all congratulate the Ideal True Scholar, in particular the Organizing Committee of this Conference; I recognize your great efforts of ensuring our country is equipped with the required capability of guaranteeing continuity of development that not only benefits the current generation, but also the future generations that are depending on the foundation laid by us in our different capacities and areas of specialization.
I will begin with a brief overview of the population of our young people in Kenya. I will then discuss the current state of investments by the youths especially those in our urban centers. I will also delve into what the stakeholders in the area of real estate investments are doing and need to do further to ensure affordable investment opportunities are available for the young people. I will finally link up these topics back to the broader issue of sustainable development in our country. I hope to elaborate further on these issues during panel discussions following this key note speech.

WHAT IS THE STATE OF OUR YOUTH POPULATION IN KENYA?

"If our youth arise and act, they have the strength and dynamism to create a huge transformation in society." As quoted by Amma, Hindu Spiritual Leader and guru who is revered as a saint by her followers. However, our young people need someone to hold their hand, strengthen them and help them identify their unique potential of transforming the future of our nation. On the 21st Century every industry is targeting the youths with different products and services. Clearly, everyone has identified the potential that lies in them. The question we need to ask ourselves is, how have we empowered them to seize all these opportunities? Are the strategies we have embraced able to stand the test of time?

Our Kenyan Constitution (2010) defines youth as those individuals between the age of 18 years to 35 years. Those aged 18-34 years constitute about 30 percent of Kenya's total population while those aged 0-34 years constitute 78 percent of the population. This is a great resource for our country when we create a suitable environment that allows our young people to invest in long term high return assets. The sad state of affairs is that at least five million young Kenyans are involved in sports betting according to Kenya's Betting Control and Licensing Board. These young minds, due to unemployment and other factors have to rely on luck to get their daily bread, the hope of having a generation that will invest in long term assets is still on with steps of reaching out to individuals and their peer groups with real estate investments especially vacant land, which is more affordable and gives them the ability to invest as a group and grow together. However, we have to lay a good foundation that will encourage them to come on board.

CURRENT STATE OF REAL ESTATE SECTOR IN KENYA

The real estate sector is experiencing a booming growth in 2018 due to the end of the long electioneering period, properties are on offer targeting the investors who held back their money last year for fear of investing. The launch of the Affordable Housing in the Government's Big Four Agenda in December 2017 has opened opportunities for further growth of the sector. The affordable houses to be constructed will be between Kshs 600,000- Kshs 3 Million. This is an encouraging initiative that needs the input of all of us to ensure the continuity of this noble idea.

The Kenya National Bureau of Statistics (KNBS) data on income distribution in the formal sector defines affordable housing as units that can be afforded by individuals who earn Kshs 50,000 and below per month, which is a total of

74.4% of persons employed in the formal sector in Kenya.This are more of young people who have been experiencing;

- High population growth in urban areas standing at 2.6% and urbanization rate at 4.4% according to the World Bank. They are coming to urban centers such as Nairobi in search of employment.
- This population continues to increase the demand for affordable housing to settle their families and avoid prolonged renting periods.
- A great need for infrastructural growth in areas closer to urban cities because the available properties in these areas are more affordable and basic infrastructural development will increase the convenience of travelling to work daily.

What needs to be done by the stakeholders to increase the availability of real estate investments for young people?

The United Nations has set apart 12th August as the International Youth Day. This year the theme is "Safe Spaces for Youth" and this is in line with what few trusted investment companies have been doing and should focus more on and target the young population who have the greatest ability to invest and cause an upward growth in the economy.

1. **Affordability**

We must recognize that the young population will always prefer purchasing properties that meet their monthly budget, they are in their first or second employments and they need to cater for their daily expenses and as well invest for their families. These calls for trusted real estate companies to offer affordable properties to ensure young people are able to seize the investment opportunities available in the country.

A survey conducted in 2013 by the World Bank indicated that 75 per cent of families in Nairobi, one of Kenya's affluent counties, had monthly incomes of below Ksh22,500. Due to the high rent prices, this has led to the development of informal settlements as they cannot find affordable, decent houses. These households can only afford a mortgage of up to Ksh500,000 as most developers tend to focus on high end houses that will guarantee them a return on investment. Therefore, if young people find land below Kshs 500,000 it will be easier for them to purchase it with an end goal of building a home for their families. The prices should also allow them to pay in installment options because majority may not be able to raise such amounts upfront.

2. **Offering strategic properties in areas closer to urban areas**

It is the desire of every young person to reside close to urban areas, they move from rural areas to urban areas in search of employment and better living standards. This is why properties should be strategically located near urban areas, areas closer to their places of work and businesses. This offers an opportunity to settle in areas that are free fromthe hustle and bustle of the city and enjoy serene environments with the convenience of urban lifestyle.

3. **Offering Value-added properties**

This applies to even the older generation; everyone requires a property that has access roads, water, electricity, perimeter fence and an estate gate. Such properties are ready for development and they ease the burden of any young investors who are willing to build a residential home or invest in agriculture.

4. **Cultivate a saving culture in them**

It is a common saying that life begins at 40, however a plot costing Kshs. 300,000 now, will be expensive and unavailable in 10 or 20 years' time. The older generation should instill a culture in young people of making savings and avoid spending their money in gambling and invest in sure long-term investments that will be of benefit to them and their generations. The continuity of providing affordable houses to the future generation is based on the ability of real estate companies to offer affordable properties that will encourage more investors to take up property ownership.

5. **Encourage youth group investments**

There is a great potential in young people. Young people have great capability when they come together, they can pull together resources, purchase a piece of land and invest in construction or agriculture. This will gradually create self-employment and encourage entrepreneurship among our young people. Real estate companies should also encourage and offer support to youth groups who approach them for investments.

6. Innovation in real estate

Every industry is embracing innovative technologies that will make business more attractive and efficient. The real estate sector should also initiate technology advancement in building materials, viewing properties and making purchases. This will further encourage investors by making the purchase process a straight forward and easy process.

CONCLUSION

The success and the potential of the sustainable development requires in-depth research of what our young population needs and partnering with the government to have private sector friendly policies and ensure the future of our young people is in safe hands and they will be able to venture in investments early in life for both their families and the upcoming generation. An African proverb says, "if you wish to move mountains tomorrow, you must start by lifting stones today." Those dedicated to building a thriving, self-sustaining and affordable investment opportunities in Kenya, are invited to bring your stones, so that we can move mountains together and ensure the future of our youths is secure.

CAPACITY BUILDING FOR NATIONAL SUSTAINABLE DEVELOPMENT

PROF. PAUL N. MBATIA[1]
Deputy Vice Chancellor, Academic Affairs, Research & Innovation
Multimedia University of Kenya

BACKGROUND

Around September 2017, I received a call from a Dr. Sam of the Ideal True Scholar, London, requesting me as the Deputy Vice Chancellor, Academic Affairs, Research and Innovation, of Multimedia University of Kenya (MMU), to partner in organizing and hosting this conference at our University. I readily accepted and from then on, I started communicating electronically with a stranger with a hope that this would not be a cyber ploy! I am glad today that the decision to partner has come through! As a University, we take profound privilege to host this 6th international Conference of the Ideal True Scholar here at MMU. On behalf of the Vice Chancellor, I wish to welcome you all to MMU and also to our capital city of Nairobi, Kenya.

AFRICA'S DEVELOPMENT CRISIS/STRUGGLES

Where there is no struggle, there is no progress

This conference is taking place in Africa. And as an Africanist, I find it most appropriate to first reflect on Africa in the context of its development crisis; a theme, which I believe, should find prominence in various presentations and discussions of the conference.

In the 1950s decade, most African countries were engaged with liberation struggles to emancipate their people from the yoke of colonialism. In the 1960s, we witnessed successes as many African countries attained their political independence. In the 1950s and early 1960s, the founding fathers of African nations were united by the philosophy of Pan Africanism.[2] African leaders like Kwame Nkruma, Ghana; Julius Nyerere, Tanzania; Ahmed Sekou Toure, Guinea; Moammar Gaddafi, Libya; Thomas Sankara, Burkina Faso, and W.E.B. Du Bois, USA, dreamt of one united Africa that would fight the remnants of colonialism and emerging forces of neo-colonialism (for countries that had already attained their political independence). However, by late 1960s, many independent African states were focused on nationalism more than Pan Africanism. There was a paradigm shift among the newly independent African states in the philosophy that guided on choosing development priorities. Indeed, independent African states focused on building their national economies using borrowed foreign development models -- such as capitalism, socialism, communism or a combination of the same. Most of them continued to hold close links with their colonial masters from where they borrowed economic models, technical expertise and foreign aid.

In the 1970s, it was clear that most African states had not successfully transformed their political independence into tangible development achievements. Indeed, throughout the 1970s, poverty, hunger, diseases and illiteracy became common defining features of the Dark Continent.

It was not surprising then that in the 1980s; most African states were in a *development crisis* that prompted the intervention by the World Bank (and other international forces like IMF) in form of Structural Adjustment Programmes (SAPs). While the World Bank accurately identified the internal factors (such as corruption, poor governance and inadequate capital for investment), its intervention was not successful largely because it ignored, inter alia, the external factors causing the crisis. Furthermore, the framework of the SAPs introduced the economic strategy of Cost Sharing in accessing public services (like health and education), hitherto provided freely by the national governments. The cost sharing strategy inevitably hurt the economically vulnerable people most whom were cut off from using public essential services. Consequently, in some countries (like Kenya, Zambia), the

[1] Paul N. Mbatia is an Associate Professor of Sociology; he is currently the Deputy Vice Chancellor, Academic Affairs, Research & Innovation at Multimedia University of Kenya

[2] **Pan-Africanism** is a worldwide intellectual movement that aims to encourage and strengthen bonds of solidarity between all people of **African** descent. ... It is based on the belief that unity is vital to economic, social, and political progress and aims to "unify and uplift" people of **African** descent (Pan Africanism Wikipedia)

introduction of SAPs provoked citizens to take up collective actions in form of riots and protests against their national governments leading to political instability.

Starting in the 1990s, some scholars and world leaders identified good governance that was epitomized by Multiparty Democracy, as the panacea of Africa's development crisis. It is notable that since their independence in 1960s, many African states adopted one-party state mode of governance which tended to nurture dictatorship and undermined democracy. Indeed, in the 1990s, largely supported by the foreign forces, Civil Society Organizations (CSOs) as well as Community Based Organizations (CBOs), emerged and flourished in Africa to promote the agenda of multiparty democracy and good governance. While a large number of African states have embraced multiparty democracy, the disappointing reality is that the political transformation has not resolved the continent's development crisis. Most African states therefore entered the 21st Century with a range of persistent development burdens in form of poverty, hunger, diseases, digital illiteracy.

The struggles to overcome the development crisis in Africa still continue. *How can this conference contribute in addressing Africa's persistent development crisis? Both internal and external factors should be addressed while the theoretical frameworks that draw heavily from the West and East to inform Africa's development crisis, should be challenged? Hopefully, innovative minds shall reframe and pitch the development discourses higher and address the lingering challenges of poverty, hunger, diseases and digital divide in Africa.*

CONCEPTUALIZING DEVELOPMENT AND SUSTAINABLE DEVELOPMENT

While it may sound simplistic in an international conference to pose the questions: What is development and what is sustainable development, I challenge participants to engage in the discourse of conceptualizing the two terminologies. Without clarity of the terminologies, we cannot theorize effectively and formulate sound frameworks that facilitate critical interrogation of factors that particularly impede (sustainable) development.

The meaning of the term development has changed over time! We have moved from the traditional and restrictive meaning of development as economic growth or economic transformation per se, to more broad and encompassing meanings. In this regard, Todaro (1977) clarifies that development is not a purely economic phenomenon but a multidimensional process involving reorganization and reorientation of entire economic and social system.

A more robust definition of development posits that development is a process of improving the quality of all human lives with three equally important aspects: 1) raising peoples' living levels; 2) creating conditions conducive to the growth of the people (such as supportive social, economic and political systems and institutions) and 3) increasing peoples' freedom to choose by enlarging the range of their choices (Amartya, 1999 and Bradshaw and Wallace, 1996).

In the context of UN's global agenda 2030, I find the following definition of sustainable development as quite instructive: It is *"development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends"* (Griggs et al in Sexsmith and McMichael, 2015: 584). More precisely, it is improvement of the quality of human lives without compromising the environment on which current and future human needs are based. The concept of sustainability underscores the reality that development has social costs which should be minimized to avoid deletion or exhaustion of earth's resources.

During the conference, participants can interrogate the link between development and sustainable development and examine why the Most Developed Countries (MDCs) first focused on development and later settled on sustainable development. One could also ask whether under developed countries can attain sustainable development before they are developed. Simply put can a country sustain (development) what it has not attained?

UN's Global Agenda 2030: Sustainable Development Goals (SDGs)

In September 2015, the UN announced the new global development agenda, namely the Sustainable Development Goals (SDGs) which succeeded the (8) Millennium Development Goals (MDGs) released in 2000. During the release of the SDGs, UN (2015:3) succinctly stated:

> The 17 Sustainable Development Goals and 169 targets which we are announcing today demonstrate the scale and ambition of this new universal Agenda. They seek to build on the Millennium Development

> Goals and complete what they did not achieve. … They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental.

As scholars, policy makers and practitioners, it will be useful to interrogate the extent to which the MDGs were successful and draw lessons learnt for and from Africa (Bianchi, 2015). In giving his personal verdict on performance of the MDGs, Jeffrey D. Sachs reports:

> My verdict is that the Millennium Development Goals (MDGs) have made a difference. They have not accomplished all that they should have accomplished. They have not accomplished all that they were promoted to accomplish back in 2000. However, they've made real difference in a way that teaches us a lot about how we can use the SDGs for even bigger achievements. (Sachs, 2015:53).

While this is an optimistic verdict of the MDGs, is the new global agenda (SDGs) likely to change the plight of the people in Africa? What efforts are required to ensure that Africa is not left behind, yet again? As a point of departure, Bianchi, (2015: 1) argues that despite Africa's overall registered positive rates of economic growth over the past fifteen years or so,

> poverty remains widespread and unemployment is reaching alarming levels. Making the development process sustainable thus represents a key challenge for the future of the continent, thereby calling for urgent country-specific actions.

It will therefore be instructive for the participants to explore the country-specific actions that will foster attainment of SDGs. In line with this concern, Jaiyesimi (2016:17) posits that "the success of the sustainable development goals in Africa, will hinge on a credible means of implementation." *Participants could therefore interrogate the national implementation plans of SDGs and assess the extent to which developing countries are adequately prepared for the attainment of the 17 SDGs and 169 targets.* Such discussions could draw from the success cases of the East Asian countries of Taiwan, South Korea, Hong Kong Singapore, Malaysia and Japan – whose economies took off drastically attaining high levels of industrialization (Vogel, 1993). *What lessons can participants draw from the success cases of these Asian countries to inform the current development crisis in Africa?*

The participants could also ask whether the change of the global universal agenda shall bail out Africa. On this concern, some critics have cautioned that:

> there will be no sustained growth and development in Africa if factions of powerful nations seek to eradicate history and assume everything is now all right. There will be no sustainability unless issues of equity, sovereignty and respect of human dignity are constantly raised (Nhamo, 2017:227)

This concern should prompt participants in the conference to ask: *what global reforms are required to create conducive environment for African (developing) countries to attain the SDGs? The world capitalistic system may require restructuring to provide more space and accommodate the interests of the developing countries. Who should spearhead such reforms and what is the timeframe?*

IS NATIONAL CAPACITY BUILDING A PANACEA FOR DEVELOPMENT?

Drawing from the literature on development, capacity building is cited as an essential ingredient for development. In fact, one can argue that to foster their development, developing countries should invest heavily in capacity building. According to Yolanda, et al., (2008: 179), "capacity building involves the transfer of competencies necessary for community groups or individuals to identify their issues and address their concerns." This school of thought was popularized in Africa in the 1960s and 1970s by the Most Developed Countries (MDCs) which were keen to send technical assistance in form of foreign experts to the developing countries. Has this worked? Not quite!

While capacity building may appear like a straightforward terminology that is easily understood by all, it should also be conceptualized to expose its meaning and complexity. In underscoring its inherent complexity, Kaplan (2000: 517) states that "capacity building is one of the most frequently invoked of current development concepts and yet it continues to defy a shared definition of what it means in practice."

In the development discourse, there can be diverse perspectives, dimensions and levels of capacity building. For example, after being recipient of foreign experts for a long time, one could ask whether or not Africa has built its capacity in specific fields/dimensions like innovative technology, computing, engineering, geothermal (Gieske, et

al., 2016:4). Further, as articulated by (Bloomfield, et al., 2018: 157), to develop diverse capacity-building initiatives required to meet SDGs, one can examine different dimensions (leadership, management, technical, institutional and organizational) and levels (local, national or regional) of the process. *Participants can therefore examine components and levels of capacity building particularly in state-centred development that shall inform the SDGs.*

Drawing from the foregoing background, participants can further focus on the discourse of capacity building and attempt to address the following questions in the context of SDGs: *Does capacity building matter in the attainment of SDGs? Who (actors) should determine the national capacity building gaps and how should they be filled? What is the role of external factors (actors) in determining capacity-building packages for Africa? What has worked in building and sustaining capacity in developing countries and what could be improved?*

AFRICA'S AGENDA 2063[3] VERSUS UN'S AGENDA 2030

At this point, one could ask: Within a nation state, is there competition between SDGs on one hand and national and regional agenda, on the other? Should national development priorities override the continental and global agenda? Which agenda should be supreme?

One can easily identify three distinct levels of development agenda in the world, namely, national agenda that are country-specific, regional agenda; that are continent-specific as epitomized by Africa Union's agenda 2063 and the UN's global 2030 agenda. At the country level, every country of the world has a national agenda that is largely inspired by the needs of its citizenry. The national agenda are executed through the national plans and attendant development blueprints. In Kenya, for example, we have the five-year development plans which are informed by a national development framework called Vision 2030.[4] The latter is considered as Kenya's long term development blueprint.

At the continental level, Africa's development priorities are guided by the Africa Union's agenda 2063. And at the global level, the UN has stipulated its agenda 2030 on SDGs (Lucci, 2016: 2). The attainment of the three development agenda is largely determined by the country-specific actions. *At the country level, what should come first or should be emphasized? Participants can therefore reflect on how at a country level, nation states can harmonize the seemingly competing development agenda by identifying the common development goals at the three levels.*

CONCLUSION AND WAY FORWARD

In my view, this conference has a comprehensive agenda – Capacity Building for National Sustainable Development. Scholars and experts from different fields represented herein as well as leaders and practioners, have the space and opportunity to make their respective contributions.

In my keynote address I have posed questions prompting participants to conceptualize the key terminologies. I have also reflected on the theme of the conference and identified some critical concerns (for example why Africa is still under developed) for the participants to examine by drawing from different discourses and experiences. Further, I have challenged participants to interrogate the suitability or conduciveness of the existing world capitalist system (order) within which developing countries are required to operate and attain the SDGs. Last, I have acknowledged the existence of different development agenda (national, regional and global) and invited the participants to engage on how to harmonize them.

Out of this conference, we anticipate that new knowledge shall be generated and systematically documented in form of scientific papers by the scholars for publication. Beyond the academic outputs, leaders and practioners present can draw innovative ideas and strategies on how to build and sustain capacity required for the attainment of national sustainable development. Jointly, we should be better equipped on how to improve the quality of lives of our people – at national, regional and global levels.

[3] It is a strategic framework for the socio-economic transformation of the continent over the next 50 years. Its builds on, and seeks to accelerate the implementation of past and existing continental initiatives for growth and sustainable development (https://au.int/en/agenda2063)

[4] The Kenya Vision 2030 aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment (http://vision2030.go.ke/)

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EXPLORING ROBOTICS AND MECHATRONICS WORLD FOR AUTOMOBILE, AGRICULTURE AND BIO - SYSTEMS

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PROTOCOLS

I would like to begin by appreciating the organizers of this conference for the great efforts put into the event which have resulted into the success we are all witnessing today. I will also wish to specifically commend them for the well-thought theme chosen for this conference. Development has to be maintainable before its long term effect can be sufficiently felt most especially in the developing nations of the world which are seriously craving for emancipation from the doldrums of gross underdevelopment.

ABSTRACT

The fundamental principle of Mechatronics Engineering in the development of Engineering in Nigeria and the development of the New Subject from the old Mecahnical Engineering and Electrical Engineering called "Mechatronics" allow everybody to acquire new technical skills and also make the youth have intelligence understanding of the increasing complexity of engineering and technology. Engineering and technology are as old as human race. The mind of man has always been creative and full of imaginations right from the Stone Age – a period of human technological development characterized by the use of stone as the principal raw material for tools and this spanned the Paleolithic, Mesolithic and Neolithic Periods. Therefore, the paper explores the new Technology called Mechatronics in relation to Robotics and Mechatronics World for Agriculture and Bio – Systems. Developed agriculture needs to find new ways to improve efficiency. One approach is to utilise available information technologies in the form of more intelligent machines to reduce and target energy inputs in more effective ways than in the past. Precision Farming has shown benefits of this approach but we can now move towards a new generation of equipment. The advent of autonomous system architectures gives us the opportunity to develop a complete new range of agricultural equipment based on small smart machines that can do the right thing, in the right place, at the right time in the right way. Mechatronics is one of the newest profession and courses offered in our tertiary institutions as one of the modern invoking engineering courses of today. In this paper I also looked at my area of specialization in Mechatronics, which is Manufacturing, Computer Aided Engineering (CAD, CAM, CADD, CIM), Virtual Reality and Artificial Intelligent, and its relationship with the use of Robotics and Mechatronics Engineering for Agriculture and Bio- Systems.

Keywords: Mechatronics, Automobile, Bio-Systems, Artificial Intelligent, Virtual Reality and Nigeria

WHAT IS MECHATRONICS?

The word, mechatronics, is a term first used by the Japanese to describe Industrial robot systems being developed in the 1970's.

- It is composed of "**mecha**" from **mechanism** and the **"tronics**" from **electronics.** In other words, technologies and developed products will be incorporating electronics more and more into mechanisms, intimately and organically, and making it impossible to tell where one ends and the other begins.

- "The **synergistic integration** of precision **mechanical engineering**, with **electronics** and **intelligent computer control** in the **design and manufacturing** of **industrial complex products and processes**"
- **"A methodology used for the optimal design of electromechanical products".**
- **"Desigining intelligent or smart machines"**

There are three main engineering technologies to be integrated to work as a team;

- Mechanical – actuator, mechanisms, valves, machinery, drive systems.
- Electrical – microelectronics, instruments/sensors, actuators
- Computing or Processing – information, control, signal processing, artificial intelligence, software programming

The three technologies have many sub-categories:
Thermodynamics, Fluid Mechanics, Pneumatics, Electronics, Electrical machinery, Micro-electronics, Logic Functions, Programmable logic controllers, Software programming, Instrumentation, Control and so on.

Mechatronics Engineering is applied to nearly all aspects of real life situations and problems. It focuses on the development and manufacturing of products such as video cameras, camcorder, airplanes, ATMS (Cash machines or automatic tellers), high speed train, Unmanned aerial vehicles used for different purposes e.g military, monitoring, agriculture etc., unmanned land vehicles, smart robotics, transportation systems, Fly by wire aircraft, Drones, Suspension control on road vehicles brake- and steer-by-wire, Vending machines, domestic appliances, FI racing cars systems, vehicle engine management, Printer/scanners, 3D printers, aircraft simulator and automobiles, all of which are mechanical components that are controlled by electronics and computer programmes
It allows you to major in

- Mechanical engineering; Electrical engineering; Industrial engineering; Computer engineering; and Chemical engineering

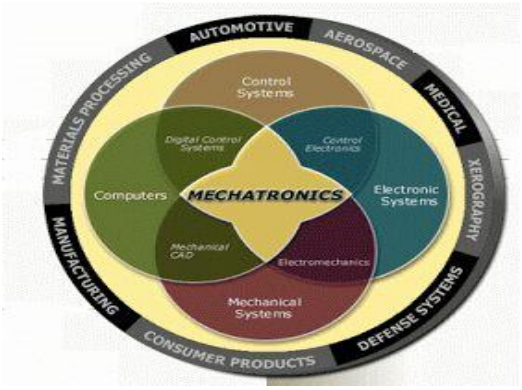

Fig. 1 Specialialized Areas Involve in Mechatroniucs Engineering

From the Fig. 1 above the Speciliazed Areas Involve in Mechatronics Engineering are:

1. Manufacturing Engineering – My Area of Specialization
2. Material Processing
3. Automotive Engineering
4. Consumer Products
5. Defence Systems
6. Xerography
7. Medical
8. Aerospace

The Core of Mechatronics from the Fig.1 above Involves;

1. Computers
2. Mechanical CAD

3. Mechanical Systems
4. Electronics Systems
5. Control Systems
6. Electromechanics
7. Digital Control System
8. Control Electronics

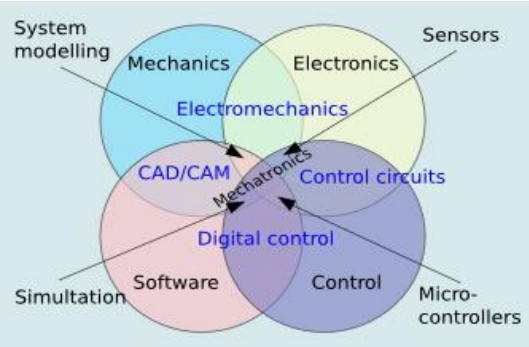

Fig. 2 Mechatronics Venn Diagram or Competency Area for Mechatronics
Source: Wikipedia, 2007 and Shuvra Das (2010)

Key Elements of Mechatronics
The study of mechatronics systems can be divided into the following areas of specialty as shown in the Fig.2 above thus;:

1. Physical Systems Modeling
2. Sensors and Actuators
3. Signals and Systems
4. Computers and Logic Systems
5. Software and Data Acquisition

From the Fig. 2 above the Mechatronics subjects are shown thus;

1. Mechanics
2. Electronics
3. Electromechanics
4. CAD/CAM – My Area of Specialization
5. Control Circuit
6. Digital Control
7. Software
8. Control

What Drives Research in Mechatronics?
The need to improve performance on products produced. For example:

- Improve performance of Computer Hard Drives – Small vibrations in the disc cause read/write error.
- Improve performance of Large Robots, that is interface of different scales – large range(large scale) robot with fine precision (small scale). Interface of different fields – fluids and vibrations in the fluid-dynamic bearings
- New Scale or Emerging New Field Application in Mechatronics like Nano Technology and Bio-Medical
- Automated Annealing, Healing and Screening of Protein Crystals – Collaborative research with Bio Chemistry and Biological Specialists. They have projects as 1. Nano-Bio Imaging. 2. Nano/Bio Fluidic Systems

Examples of Mechatronics System – Attributed to: [Dr. Lufti Al---Sharif] www.saylor.org
The following are further examples of mechatronic systems:

1. Home appliances (e.g. washing machines): Many of the home appliances that are in use today are mechatronic systems. They are manufactured in large numbers en masse and typically require small controllers to be "embedded" within them.
2. ABS (Anti-lock Braking System) and many areas in automotive engineering: An Antilock Braking System on a vehicle is a system that prevents the wheels from ceasing up or stopping to rotate when the brakes are suddenly pressed. Another good example of a mechatronic system from automotive engineering is the Engine Control Unit (ECU).
3. Elevators and escalators: Elevators present good examples of mechatronic systems. They have many sensors to detect the position and speed of the elevator car, as well as any calls registered by the passengers. It has many actuators, the most important of which is the main hoist motor. Safety is also paramount in these systems as they carry human beings.
4. Mobile robots and manipulator arms: Robots are widely used today in all spheres of life. Robots are generally used for applications that are inaccessible (difficult locations to get to due to height or space), dull (repetitive and tedious tasks), or dangerous (hazardous environments).
5. Sorting and packaging systems in production lines: Mechatronic systems are effectively the basis for modern factory automation.
6. Computer Numerically Control (CNC) production machines: CNC machines are critical in modern manufacturing systems. They allow the user to produce a product directly from a computer model of the piece.
7. Aeroplanes and helicopters: These are complex examples of mechatronic systems that incorporate hundreds or even thousands of smaller sub-mechatronic systems.
8. Tank fluid level and temperature control systems: An example is the process used to produce bio-fuels from vegetable oil.
9. Temperature control system in an industrial oven: Many industrial processes require close control of the temperature of the process in order to achieve the exact required outcome. These systems have very long lag times; thus, they take a long time to heat up and cool down.

THE DEVELOPMENTOF THE AUTOMOBILE AS MECHATRONICS SYSTEM

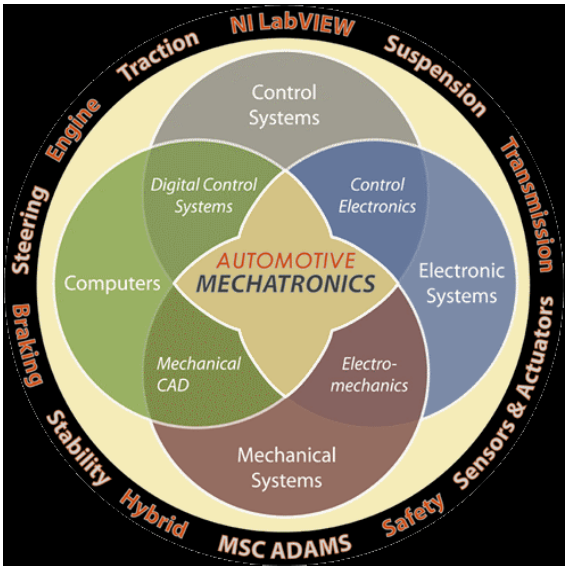

Fig. 3: Automotive Mechatronics
Source: Automotive Mechatronics by Dr. Kevin CraigGreenheck Chair in Engineering Design & Professor of Mechanical Engineering Marquette University

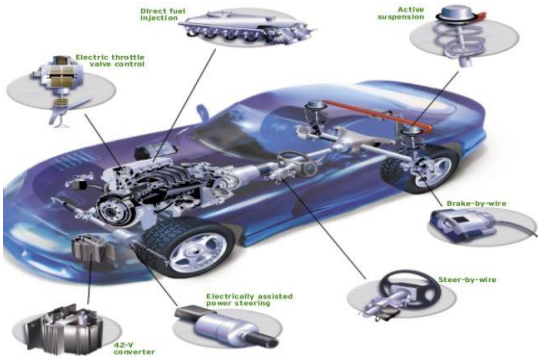

Fig. 4 Basic Mechatronics Components in Automobile
Engineering – What is Mechatronics Tuesday, March 8, 2011 (engg-learning.blogspot.com/2011/03/what-is-mechatronics-basic-definitions.html?n)

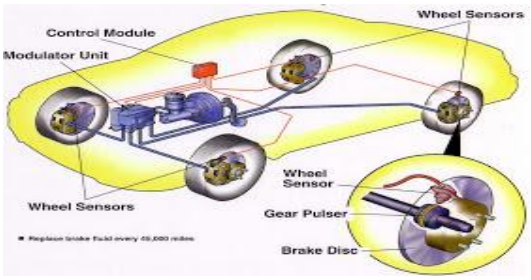

Fig. 5 Basic Mechatronics Components in Automobile

Fig. 6: Basic Mechatronics Components in Automobile

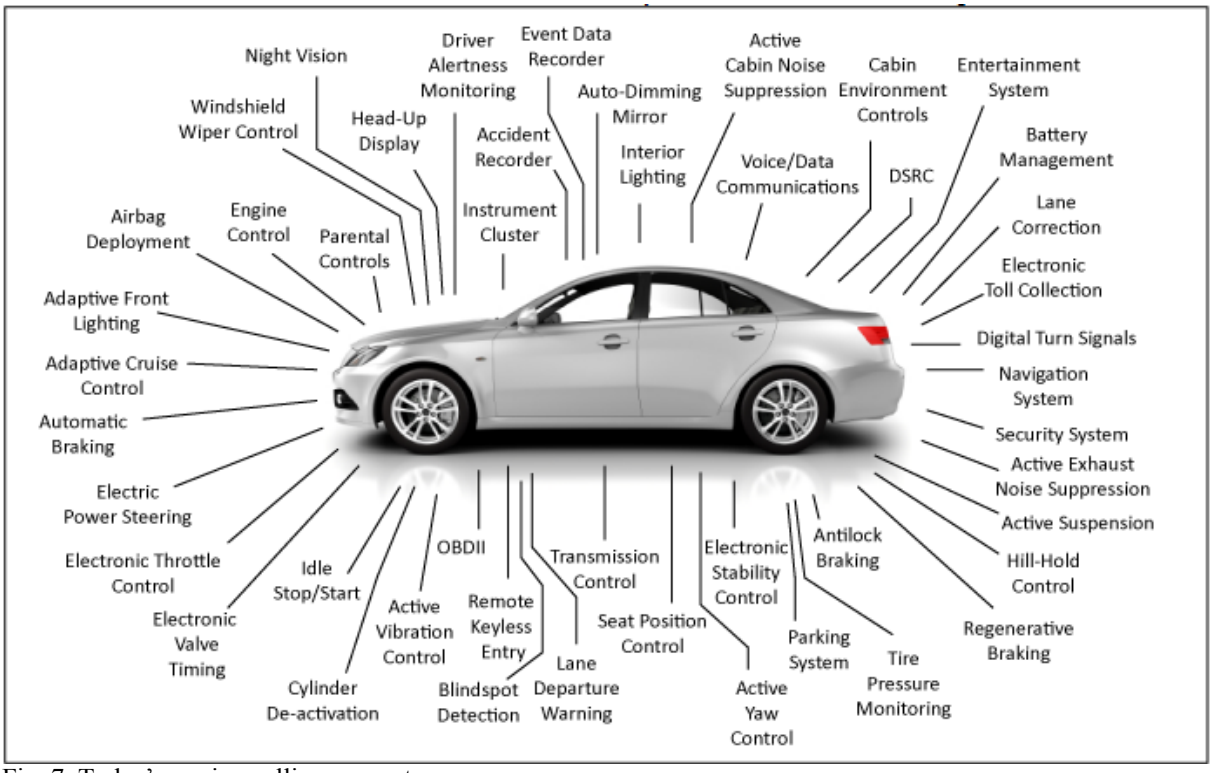

Fig. 7 Today's car is a rolling computer

There are 30-100 microprocessors in a carcontrolling various systems

The more complicated systems are not just on/off control

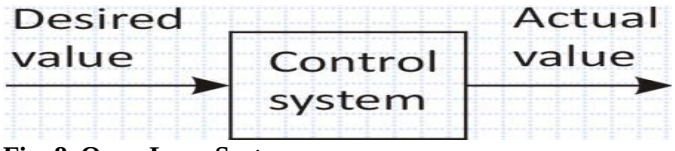

Fig. 8 Open Loop System

They are built up as control systems, not just on/off-logic systems. A control system in its simplest form is the expression of a wish and then its fulfillment. The input to the control system is a wish, a desired value. For example, if this were a cruise control system for a car, this would be the desired speed. The output is the actual value of the parameter that the control system controls. For a cruise control system, this would be the actual speed of the car. If the control system is working right, the actual value equals the desired value.

Mechatronic network in vehicle
All of the sensors, actuators, and microprocessors are networked together

The Electronics Ignition System was one of the first mechatronics systems to be introduced in the automobile in the late 1970s. The electronics ignition system consists of a crankshaft position sensor, cam shaft position sensor, airflow rate, throttle position, rate of throttle position change sensors, and a dedicated microcontroller determining the timing of the spark plug firings.
The Antilock Brake System (ABS) was introduced in the late1970s in automobile. The ABS works by sensing lockup of any of the wheels and then modulating the hydraulic pressure as needed to minimize or eliminate sliding.
The Traction Control System (TCS) was introduced in automobile in the mid – 1990s. The TCS works by sensing slippage during acceleration and then modulating the power to the slipping wheel.

In China, Global Driverless Cars were developed to hit 12 million by 2035 saying that Auto Market Goes High –Tech. CCTV News 27th April, 2016.

Figs. 9–13 Shows The Development of Various Types of Cars Using Mechatronics Techniques and Inventions

Fig. 9: Speedometre of a Mercedes Benz Car that can Run 400 Km

Fig. 10: Mercedes Benz Car with 6 Silencer

Fig. 11; The Gearing System of a Mercedes Benz Car that has 8 Gears including reverse

Fig. 12: Special Design Car

Fig. 13: Special Design Transparent Car

THE DEVELOPMENT OF THE AGRICULTURE AS MECHATRONIC SYSTEMS

From Ages, the story of agriculture has been one of increasing mechanization. As the demand for food production steadily increases with rising population and shrinking cultivable land resources, there is a constant need for improved food productivity and quality. To sustain such high demands, automation has been introduced in agriculture. Automation removes the reliability of quality and productivity on human skills or labour. To meet such increasing food challenges of the future, automation solutions need to be constantly improved by incorporating current cutting edge technology.

Fig. 14 Diagram with the sciences which cooperate to agricultural mechatronics.

Agricultural Mechatronics involve the following according to Fig. 14 shown above;

1. Mechanics
2. CAD – CAM – CAE – My Research Area
3. Computing
4. Agromatics
5. Agriculture
6. Agronics
7. Electronics
8. Electromechanics

Agricultural mechatronics needs some sciences as shown in Figure 14 including ; the Agromatics which is the application of the principles and techniques of computer science and computer theories and laws of operation and management of the agro intended to serve as operational support in diagnosing problems and in the design and evaluation of alternative solutions. Ureña 2013.Innovative Agricultural Mechatronics gives to support precision agriculture in the small farm holdings of the developing and the underdeveloped countries..Benji 2015.

Fig. 15 Mechatronics and Agriculture – The New Future of an Ancient Art

The development of agriculture and the machinery behind it was invented with basic cultivation skills within a green environment..

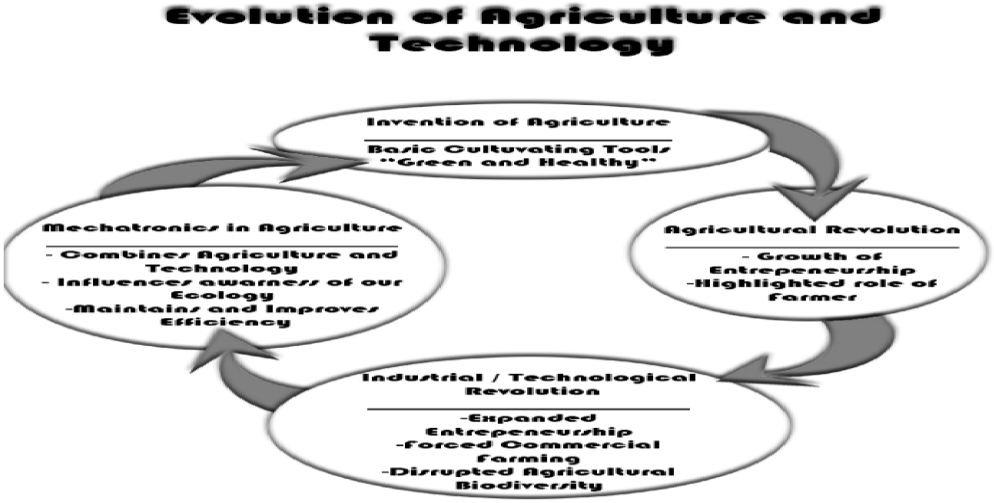

Figure 16 : Evolution of Agriculture and Technology

In Mexico the pressure for food is increasing, as in other countries, so there is no way to make use of modern technologies for providing food for the growing population, these technologies are precision agriculture , automation and robotics, which were based on Mechatronics, which is an integrative discipline in the areas of mechanics, electronics and computer science which aim to provide better products, processes and systems. As the aim of this paper review the status of the applications of mechatronic in Mexican agriculture and perspectives for the future..

Applications in agriculture and animal production are numerous; They are a reality today;

- Automatic guided tractor electronic, control failures planters, automated control trans planters transplant failure, electronically controlled dose of fertilizer using GPS maps as fertility, pruning robot for vineyards, agricultural robots (Agrobot, robot mower Lawn mower etc), robot for graft, sheep shearer robot, robot milker, meat cutter robot, robot shepherd, robots for harvesting fruits and vegetables, robots that eliminate weeds are already replacing agrochemicals, sensors for early detection of diseases in plants and animals, cotton picker robot is already in development in China.Mulan, 2008.

Nigeria needs these technologies to rapidly increase food production.
Here are just a few of the ways that modern mechatronics has changed the ancient art of agriculture;

- Historically, human being was respoonsible for even the most mental of agricultural tasks – think pickiing each individual fruit from the vine, or planting of seeds one by one. Now, machines and automation have taken over..

- Mechatronics means more food faster. That's important because the world's population has exploded
- Modern mechatronics has created agricultural perfection when's the last time you have to think about the soil acidity required to produce juicy tomatoes.
- Human being can't control the the weather – yet. But our modern agriculture technologies gives us crops where crops were once impossible and livestock far from its native origins.
- Perhaps most importantly, people in Western society are no longer even capable of securing their own food . Completely depending on Mechanical processes, there is never a need to hunt down a gluten-free taco in its den, or find a safe place to store diet soda through dry season.

There's a deep responsibility in the field of mechatronics embeded in the fun and satisfaction that come with hand – on experience..

In Nigeria it is possible to increase the productivity of agriculture , if the decision to guide and formed human capital and training are taken at all three levels; Bachelor, Masters and PhD, to the research and application of agricultural mechatronics, results in developed countries so it is evident Nigeria can not be left behind in this regard, besides that is the only way to increase food production , applying mechatronics in precision agriculture and agricultural and livestock robotics. The survival of agricultural mechatronics in the country can be successful, if some notable Universities can join the already existing Universities in Nigeria like Federal University, Oye Ekiti to train our students to acquire Bachelor, Masters and PhD in Mechatronics Engineering.

ROBOTIC AGRICULTURE

The idea of robotic agriculture (agricultural environments serviced by smart machines) is not a new one. Many engineers have developed driverless tractors in the past but they have not been successful as they did not have the ability to embrace the complexity of the real world. Most of them assumed an industrial style of farming where everything was known before hand and the machines could work entirely in predefined ways – much like a production line.

The approach is now to develop smarter machines that are intelligent enough to work in an unmodified or semi natural environment.

- These machines do not have to be intelligent in the way we see people as intelligent but must exhibit sensible behaviour in recognised contexts.
- In this way they should have enough intelligence embedded within them to behave sensibly for long periods of time, unattended, in a semi-natural environment, whilst carrying out a useful task.
- One way of understanding the complexity has been to identify what people do in certain situations and decompose the actions into machine control. This is called behavioural robotics and a draft method for applying this approach to agriculture is given in Blackmore *et. al.* (2004b).

The approach of treating crop and soil selectively according to their needs by small autonomous machines is the natural next step in the development of Precision Farming (PF) as it reduces the field scale right down to the individual plant or Phytotechnology (Shibusawa 1996).

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The Agricultural Robotics and Mechatronics group focuses on developing automated systems for agricultural production applications.

- The primary application areas are associated with fruit and vegetable production with special emphasis on harvesting technologies.
- They are additionally interested in green house systems with an overall objective of improving labour productivity,
- health worker and safety in agricultural systems,
- production cost and efficiency,

So that agricultural producer can be competitive in the global market. For achieving this goal they at the ARM group conduct research in

- Autonomous vehicles & Systems, Machine Vision, Robotic and Mechanical Mass Harvesting Systems.

They require expertise in different areas like field robotics, mechatronics, mechanical design analysis, sensing and perception, actuation, dynamics and controls

MECHATRONICS APPLICATION IN AGRICULTURE

Mechatronics applications in agriculture can be traced back to mid-1980s, when research on automated systems for fruits harvesting showed up in Japan, Europe and USA. Since then, impressive advances have been reached in advanced sensing and perception, navigation and planning, actuation and manipulation, cognition and learning, communication and cooperation among Mechatronics systems. These advancements allowed Mechatronics systems to tackle quite complex tasks even in dynamic and challenging environments, disclosing the possibility of their introduction into a wide extent of agricultural operations such as harvesting, pruning, thinning, mowing, spraying, weed removal and phyto-pharmaceutical treatments application using variable rate technologies. Mechatronics advances can give a contribution in tackling some of the issues ahead of agricultural production including:

- Optimizing the use of inputs by selective delivering at very high precision;
- Long-term autonomy and navigation in the farm (extending working time and production timeliness);
- Orchard and broad-acre crop production;
- Nurseries and greenhouses;
- New concepts in perception dealing with changes in appearance and geometry of the environment;
- New learning and adaptive approaches to novel environments (due to seasonal and weather changes or to adaptation for operation in a completely different crop);
- Aerial and ground Mechatronics systems for soil/crop monitoring, prediction, and decision making;
- Sensing in intensive agriculture;
- New techniques for resource management, with special emphasis in new energy storage technologies in service units;

Among other related topics to face intensive and precision agricultural problems

Some Typical Examples of Mechatronics in Agriculture

Mechanization in such countries as the United States and Canada has dramatically reshaped the agricultural landscape since the time of early settlement. The introduction of new technologies – such as the mechanical tomato harvester, grain combines , and largefour-wheel – drive tractors has resulted in an increase in both farm size and agricultural output, a decrease in demand for farm labour, andt he demise of rural communities. Some typical examples where Mechatronics and Automation are used are discussed below;

Seed bed preparation

Figure 17. (Left) Japanese adapted to take a (Centre) Seed mat with rice seeds and fertiliser embedded in card
(Right) Rice seedlings ready for transplanting

Crop Care - Crop scouting

Figure 18 (Left) Portal crop platform (Madsen and (Right) Sub canopy robot ISAAC2 built by a student team from Hohenheim University (www.fieldrobot.nl)

The portal robot shown in Figure 18, has been extensively modified and rebuilt and has been used to provide automated crop surveys (Bak and Jakobsen, 2003).

Figure 19. (Left) The Christmas tree (Right) Young Christmas trees with patchy weeds.

Controlled biodiversity is an opportunity that could be realised with robotic weeding. Non-competitive weeds can be left to grow when they are at a distance from the crop. This is part of the design parameters for the Autonomous Christmas Tree weeder being developed at KVL.

Fig. 20 Steam Engine and plow
Source: Farm Collector website

Fig. 21 Greenhousenursery hydroponic tomato enterprise
Source: Ontario Greenhouse Alliance website

Fig. 22 Automated rock picker
Soource: Degelma

Fig. 23 Rice setting Machine
Source: xoomclips.com

Fig. 24 Confinement pork operation
Source: Epoh Times website

Fig. 25 Citrus harvester – Tree shaker
Source: University of Florida, Citrus Mechanical Harvester website

Fig. 26 Turkey feeding operation
Source: Journalster.com

Fig. 27 Lettuce harvester
Source: Ramsay Highlander website

Fig. 28 Modern Tractor with hydraulic fron-end loader
Source: http://static.wixstatic.com/media/7c998a_ef6be35f071331a566065086a30830d9.jpg_1024

Fig. 29 Cotton stripper with bailer
Source: John Deere website

Fig. 30 Agricultural Robotics
Source: Vision Systems Design website

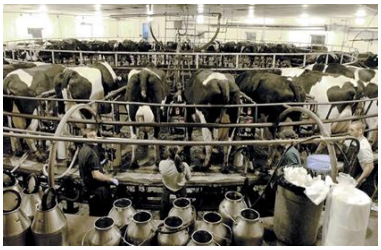


Fig. 31 Dairy milking parlor
Source: Thomas Michael Corcoran website

Modern agriculture in developed countries can not be imagined without intelligent machines and intensive usage of chemical fertilizers. This is necessary in order to keep good fertility level of the soil where it is used intensively.. The widely used technologies of non-adaptive soil fertilising which undoubtedly leads to the imbalance of agro-systems, especially in the sense of ecology and food quality.

THE DEVELOPMENT OF BIO – SYSTEMS AS A MECHATRONICS SYSTEMS

Agriculture and Biological Engineering Department can work together to develop robots which are smart autonomous or semi-autonomous machines that can reliably replace human labor and human-dependent heavy machinery, and that can work around the clock, in all weather conditions.

This is of particular importance for applications in agriculture, where robots can help solve problems such as

- shortage of labor,
- growing production costs,
- food safety and product quality,
- soil compaction, efficient use of resources and
- reduction of emissions of chemicals to the environment.

Biomechatronics is an applied interdisciplinary science that aims to integrate biology, mechanics, and electronics. It also encompasses the fields of robotics and neuroscience. Biomechatronic devices encompass a wide range of applications from the development of prosthetic limbs to engineering solutions concerning respiration, vision, and the cardiovascular system.[1]

Biomechatronics mimics how the human body works

Biosensors

Biosensors are used to detect what the user wants to do or their intentions and motions. In some devices the information can be relayed by the user's nervous system or muscle system.

Mechanical sensors

The purpose of the mechanical sensors is to measure information about the biomechatronic device and relate that information to the biosensor or controller.

Controller

The controller in a biomechatronic device relays the user's intentions to the actuators. It also interprets feedback information to the user that comes from the biosensors and mechanical sensors. The other function of the controller is to control the biomechatronic device's movements.

Actuator

The actuator is an artificial muscle. Its job is to produce force and movement. Depending on whether the device is orthotic or prosthetic the actuator can be a motor that assists or replaces the user's original muscle.

Research

Biomechatronics is a rapidly growing field but as of now there are very few labs which conduct research.

- Analyzing human motions, which are complex, to aid in the design of biomechatronic device
- Studying how electronic devices can be interfaced with the nervous system.
- Testing the ways to use living muscle tissue as actuators for electronic devices

Analyzing motions

A great deal of analysis over human motion is needed because human movement is very complex.

Interfacing

Interfacing allows biomechatronic devices to connect with the muscle systems and nerves of the user into order send and receive information from the device.

Robotic

Herr and his colleagues made a robotic fish that was propelled by living muscle tissue taken from frog legs. The robotic fish was a prototype of a biomechatronic device with a living actuator. Many biomechatronic researchers are closely collaborating with military organizations. Despite the demand, however, biomechatronic technologies struggle within the healthcare market due to high costs and lack of implementation into insurance policies.

A BIO- INSPIRED CLIMBING CATERPILLAR ROBOT

Climbing mechanism of the caterpillars

Caterpillars are among the most successful climbers and can maneuver in complex three dimensional environments, burrow, and hold on to the substrate using a very effective passive grasping system (Mezoff, et al., 2004). They consist of a head and neck part, a body with several segments and a tail end part, as shown in Fig. 32 and Fig. 33 Their movement

depends mainly on the muscle's expansion and contraction. Caterpillars use passive grip to secure themselves to complex branched substrates and can effect multidimensional movements. They are able to bend, twist and crumple in ways that are not possible

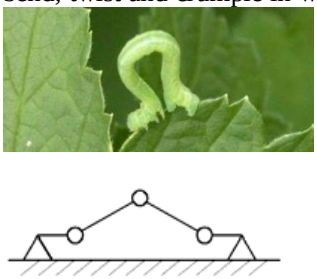


Fig. 32. Inchworm and its locomotion mechanism

A Bio-Inspired Small-Sized Wall-Climbing Caterpillar Robot 5

There are two kinds of typical locomotion modes adapted by different caterpillars. The corresponding representative worms are the inchworm (Fig. 32) and Manduca sexta larvae (Fig. 33) respectively. Caterpillar kinematics

Fig. 34. 3D-animation of the planned robotic caterpillar

with a rigid skeleton. The prolegs provide astonishing fault-tolerant maneuvering ability and stable, passive attachment

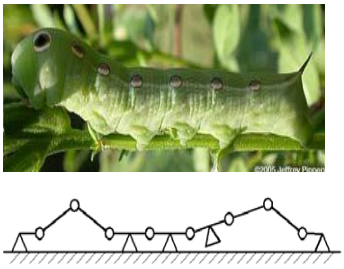


Fig. 33. Manduca sexta larvae and its locomotion mechanism

models are also presented in two figures. In order to analyze the kinematics of caterpillars, an adhesion module is indicated as " and an active rotating joint module is indicated as " " in our discussion

Fig. 32. Inchworm and its locomotion mechanism (Figs. 34 to 36)

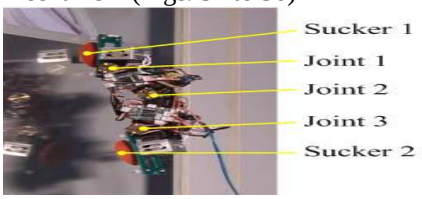


Fig. 35. Robotic inchworm design in CAD and real prototype

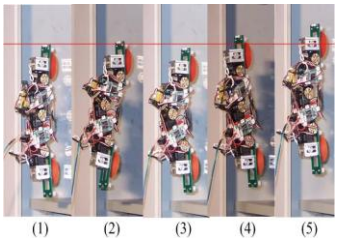


Fig. 36. Climbing

SUMMARY OF MY RESEARCH CONTRIBUTION IN THE AREAS OF COMPUTER AIDED ENGINEERING/ COMPUTER AIDED DESIGN / COMPUTER AIDED MANUFACTURING / ARTIFICIAL INTELLIGENCE / ROBOTICS AND MECHATRONICS

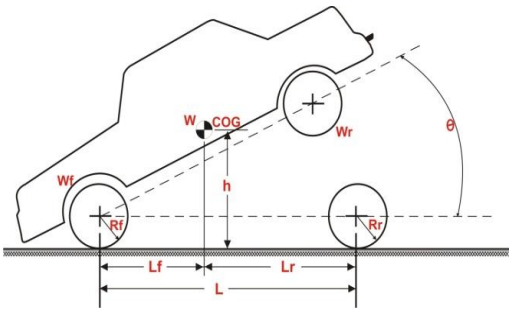
- Improvement on Development of CAD Software for Shaft under Various Loading Conditions
- Design of Plastic Spur Gears Using Virtual Reality.
- Computer Aided Model for Costing Aluminium Using Die Casting.
- Development of Expert System for Material and Welding Rod Selection in Robotic Welding.
- Appraising Road Design and Material – Cost Component using Virtual Reality.
- Material Selection for Computer Aided Design Software for Crankshaft Design.
- Design and Application of CAD Expert System for Gas Turbine Power Plant for Electricity Generation in Nigeria.
- Computerized Inventory Management for a Manufacturing Industry: A Case Study in Nigeria.
- Software Package for Small Scale Bottled Water Industry in Nigeria.
- Modeling and Simulation of Wave Load on Periodic Support for Isolation System of Offshore Platform.
- Development of Computer Aided Management for Grain Reception at Grain Storage Silos in Nigeria.
- Development of CAD Software for Mechanical Chains Design.
- Computer Aided Management for Stored Grain Monitoring in Nigeria.
- Development of Software for a Tracking Device
- A Knowledge Based Expert System for Silicate Glass Plant Maintenance
- Development and Performance Evaluation of a Mini – Robot for Welding Applications in Manufacturing
- Exploring the Mrechatronics World for Sustainable Development and Disaster Management.
- Exploring Robotics and Mechatronics World For Agriculture and Bio-Systems

Some Typical Example of My Resarch from those Mentioned above in the Area of Computer Aided Engineering, Mechatronics and Robotics.

Virtual Reality

System setup for developing the semi-immersive driving framework by Adejuyigbe and Laseinde 2011 used to design the FUNAAB Virtual Reality Gate, Automobile and the FUNAAB Ceremonial Road.

In general, people are more familiar with graphics based Virtual Reality. In graphics-based systems, the virtual environment is created to visually simulate a real or imaginary world. Technically, this environment can be either Two-Dimensional (2D) or Three Dimensional (3D). However 3D environments are more immersive, they are used more frequently to create virtual worlds. These world may either be partially (Semi) immersive or fully immersive.



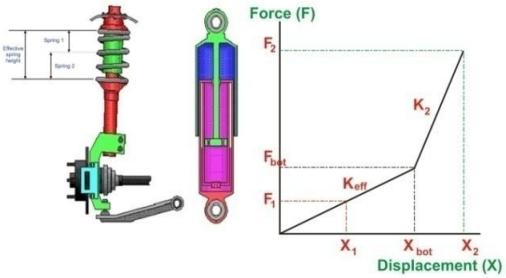


Fig. 40d
Figure 40 a, b, c, d: Visuals given a synopsis of the Virtual Reality
Fig 41: System setup for developing the semi-immersive driving framework by Adejuyigbe and Laseinde 2011 used to design the FUNAAB Virtual Reality Gate, Automobile and the FUNAAB Ceremonial Road

ROBOTICS
Research on the Development of Mini Welding Robot PIC by Oladebeye, Adejuyigbe and co. (2016) (Fig. 42 to 44)

Robotics is the field of study concerned with developing and using robots. Robots by definition are so many computer-controlled machines that mimic or imitate the motor activities of humans
There are several definition of an individual robot; some of them are reviewed below;

- Is a reprogrammable multi-functional manipulator designed to move materials, parts, tools, or specify devices through variables programmed motions for the performance of a variety of tastes.
- A re-programmable, multifunctional manipulator
- Is a manipulating device that is both versatile, and also easily programmed for re-programme to perform a sequence of operations..

There are so many types of robot used in factories and in assembly tine which are programmed to do more than one task. It can also be used to take some hazardous or dangerous, repetitive task always found in assembly line. The development of extreme-work environment robots for use in disasters. Research into Medical and Bio- Mechatronics


Fig. 39: Research on the Development of Mini Welding Robot by Oladebeye, Adejuyigbe and co. (2016)


Fig. 40: Research on the Development of Mini Welding Robot by Oladebeye, Adejuyigbe and co. (2016)

Fig. 41: Research on the Development of Mini Welding Robot PIC by Oladebeye, Adejuyigbe and co. (2016)

Tertiary Institutions offering Mechatronics Engineering in Nigeria

Presently there are about ten universities offering the course in Nigeria, aside from the Polytechnics

1. Federal University, Oye Ekiti (FUOYE)
2. Bells University of Technology, Ota (BELLS)
3. Abubakar Tafawa Balewa University, Bauchi (ATBU) – Mechatronics and System Engineering
4. Afe Babalola University, Ado Ekiti (ABUAD)
5. Federal Univesity of Agriculture, Abeokuta (FUNAAB)
6. Bayero University, Kano (BUK)
7. Federal University of Technology, Minna (FUTMINNA)
8. University of Port Harcourt, Port Harcourt (UNIPORT)
9. Bauchi State University, Bauchi (BASU) – Mechatronics and System Engineering
10. Federal University, Aliko Iduffu (FUNAI)

From our research findings, the Polytechnics in Nigeria are now trying to imbibe Mechatronics Engineering education. Some are already establishing Mechatronics Engineering Department most especially at National Diploma (ND) Technician level, for example;

1. The Polytechnic, Ibadan.
2. Osun Sate College of Technology, Esa Oke
3. Federal Polytechnic, Oko, Anambra State
4. Yaba College of Technology, Yaba Lagos
5. Federal Polytechnic, Bauchi
6. Federal Polytechnic, Nkede, Owerri, Imo State.
7. Akanu Ibiam Federal Polytechnic, Uwana,
8. Institute of Mangement and Technology, Enugu (IMT)

At National Board for Technical Education (NABTEB) approval for some Vocational and Technical Institutions to run Automotive Mechatronics was given. Some of the Technical Colleges has started to run courses in Mechatronics at Craft Level.

Mechatronics Engineers Payment

From the 252 Social Share on "Salary for Mechatronics Engineer" in the US found in the internet (www.recruiter .com) Mechatronics Engineers gets an average compensation ranging from $64000 and $96000 based on tenure level. Mecahtronis Engineers are paid most highly in the District of Columbia, where they get job pay of approximately $116420. Employees with these job titles have the highest pay levels in Public Administration, where they can earn a compensation of $103380

CONCLUSION

The development of agriculture and the machinery behind it was invented with basic cultivation skills within a green environment. We have seen how mechatronics has influenced the evolution of our agriculture, and how it is

becoming the primary element of our future cultivating habits. Using mechatronics, our contemporary technology will be fused with our native elements of basic agriculture in the usage of "green," less harmful components within the machinery that we use in our farms.. Taking on a grasp of time, accuracy, and efficiency, tasks can be completed at a proficient rate compared to basic cultivating customs. The unique structure of this robot emphasizes on our journey back to a "green" ecology without removing the role of the farmer.

The development of Research Group, Mechatronic courses in collaboration with different Universities in Nigeria or even developed world, Research Institutions and Companies of an intelligent mechatronic system for the use of precision and sustainable agriculture. The research collaboration in the Agricultural Mechatronics should include the following components: photographing and decoding of the soil surface; fertility determination and formation of the fertility map; generation of the controlling signal for mechatronic dosing device; intelligent dosing of fertilizers; simulation, prototype and testing; human machine interaction and training preparation

There should be a stoppage to underdevelopment in Nigeria or Africa and the Developing Nations by embracing the modern day technology of Mechatronics discussed in this paper. We need to witness in Nigeria the Robotics and Mechatronics development and evolution as witnessed by the advanced countries (G7).

ANY UNIVERSITY IN DEVELOPING COUNTRIES LIKE NIGERIA, READY TO INNOVATE? GET ON THE PATH OF A CAREER IN MECHATRONICS. IF YOU LOVE THE IDEA OF RE-ENGINEERING AN ANCIENT SCIENCE WITH CUTTING EDGE TECHNOLOGY, MECHATRONICS WILL BE THE FIELD FOR YOU.

THANK YOU.

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