

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
NIGERIA

AND

PROF. ABIODUN MUSA AIBINU AND FAMILY

Cordially invite



to the

Inaugural Lecture of the University

TITLED

**SPIRITUAL INTELLIGENCE:
BEYOND MECHATRONICS ENGINEERING AND
ARTIFICIAL INTELLIGENCE**

To be delivered by

ABIODUN MUSA AIBINU

B.Sc. (OAU, Nigeria), M.Sc. (BTH, Sweden), Ph.D. (IUM, Malaysia), MNSE, R. Eng (COREN)
Professor of Mechatronics Engineering, Head, Department of Mechatronics Engineering, Federal University of Technology (FUT) Minna, Nigeria
Director, Centre for Open Distance and e-Learning (CODEL), FUT Minna, Co-ordinator, Advanced Engineering Innovation Research Group (AEIRG)

Date: November 30, 2017 | Time: 2:30pm

Venue: Caverton Lecture Theatre, FUT Minna, Main Campus, Gidan Kwano, Minna, Nigeria

Chairman of the Occasion

PROF. MUSBAU A. AKANJI FNSBNB, FAS

R.S.V.P

MRS. V. N. KOLO
Registrar, FUT Minna

PROF. BISI AYANWALE
Chairman, University Seminar &
Colloquium Committee, FUT Minna

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THEME: **SPIRITUAL INTELLIGENCE:
BEYOND MECHATRONICS ENGINEERING AND
ARTIFICIAL INTELLIGENCE**

delivered by

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Professor of Mechatronics Engineering

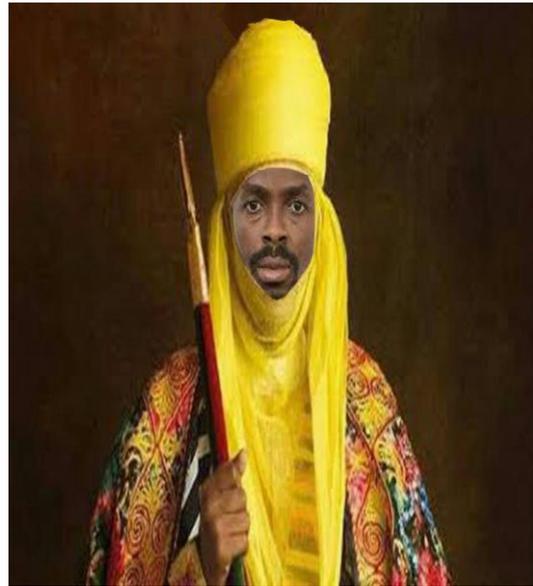
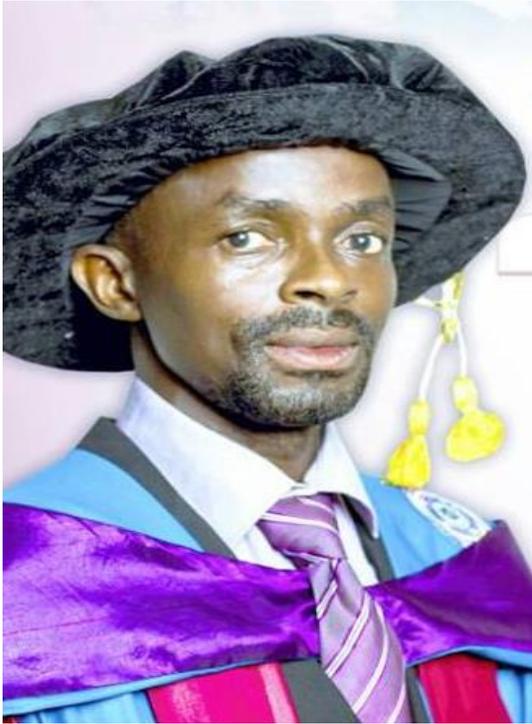
Head, Department of Mechatronics Engineering (DOME), FUT Minna, Nigeria

Director, Centre for Open Distance & e-Learning (CODeL), FUT Minna, Nigeria

Coordinator, Advanced Engineering Innovation Research Group

ABOUT TODAY'S LECTURE

SPIRITUAL WHAT ???



SPIRITUAL WHAT ? RELIGIOUS WHAT ?



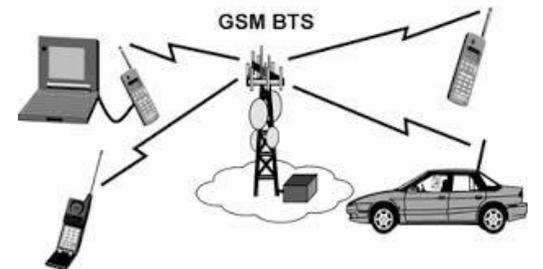
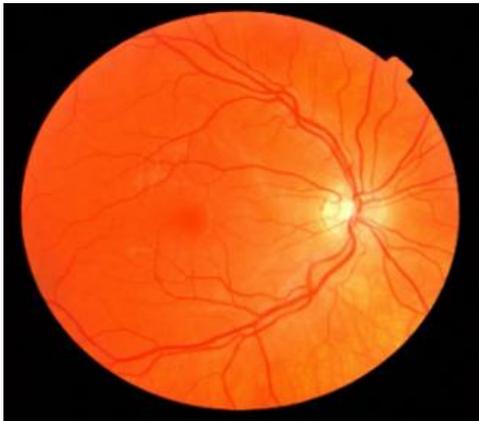
ABOUT TODAY'S LECTURE

However, ahead of **SPIRITUAL INTELLIGENCE**, I will talk about **Mechatronics Engineering and Artificial Intelligence**



ABOUT TODAY'S LECTURE

After which, I will give just a glimpse into my contributions in Research, Manpower Development and CSR



INTRODUCTION



USE OF CONVERSATIONAL TONE AND INFOGRAPHICS IN THIS LECTURE

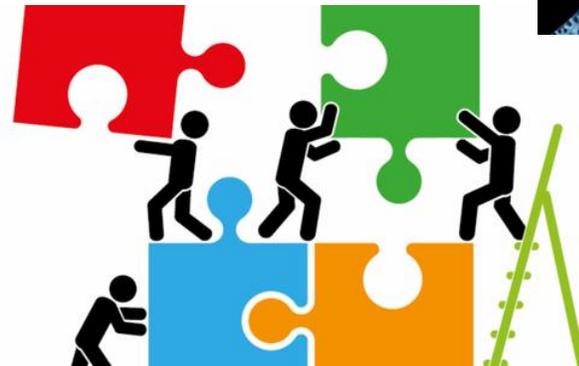
1 To achieve meeting of “town and gown”



2 To connect you with me and the lecture



3 To involve you in our approaches and contributions



ABOUT TODAY'S LECTURER

Age at Inauguration	Duration Before Inaugural
58	4 years +
46	4 years +
54	3 years +
54	7 years +
52	6 years +
57	9 years +
61	12 years +
58	3 years +
56	2 years +

a. Motivation to my colleagues/students

1. Presented by Prof. A. M. Aibinu – a.k.a. Youngest Professor
2. Duration between Appointment and Presentation Day :< 16 months

b. Undisputable Facts

1. 1st from the field of Mechatronics Engineering in FUT Minna /Nigeria
2. 1st Professor of Mechatronics Engineering to present Inaugural Lecture
3. Last lecture to be presented during Prof. M.A. Akanji's Administration

WHY PROFESSORIAL INAUGURAL LECTURE ?



1. Affords a Professor to speak *ex cathedra* (“*from the chair*”)[1].
2. An opportunity to share his/her research career and efforts made so far [2].
3. A Special Occasion to introduce a newly appointed Professor to a new rank and to his professorial chair [3].
4. To concentrate on the development of the department[4].
5. An avenue for a Professor to speak on any general topic [4,5].
6. To bring “town and gown” together in a celebration of academic excellence[6].

WHY PROFESSORIAL INAUGURAL LECTURE ?

- I. Affords a Professor to speak *ex cathedra*
(“*from the chair*”)



WHY PROFESSORIAL INAUGURAL LECTURE ?

2. An opportunity to share his/her research career and efforts made so far.



WHY PROFESSORIAL INAUGURAL LECTURE ?

2. An opportunity to share his/her research career and efforts made so far.

Chronicle of my Contributions to Knowledge

Research, Innovation and Development

1

• Novel technique for detecting vascular intersection in retinal fundus images [8-10]

2

• New approaches for estimating AR and ARMA model parameters using AI techniques [11]

3

• New data classification procedures based on AI techniques ap [12]

4

• Development of Cognitive phone/ Multiple Operators enabled SIM cards (MOES)/ [13]

5

• Introduction of new Hybrid optimization approach [14]

6

• Development of several Mechatronics systems, repair and maintenance of equipment for public and specialized usage [15-16]

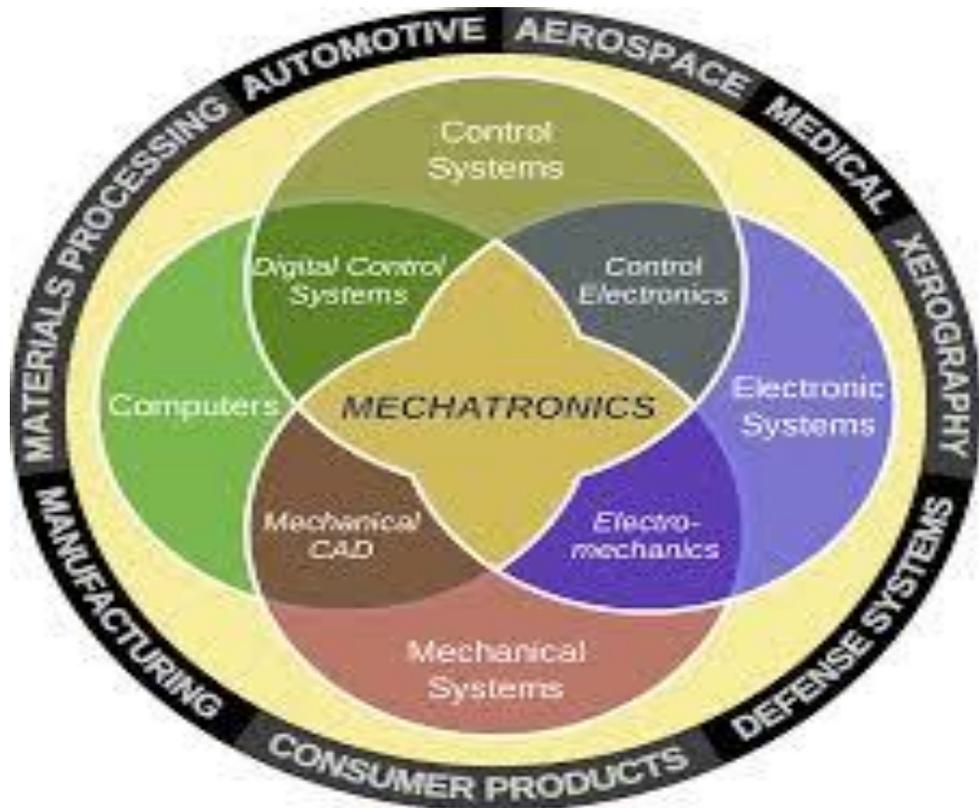
WHY PROFESSORIAL INAUGURAL LECTURE ?



3. A Special occasion to introduce a newly appointed Professor to a new rank and to his professorial chair

WHY PROFESSORIAL INAUGURAL LECTURE ?

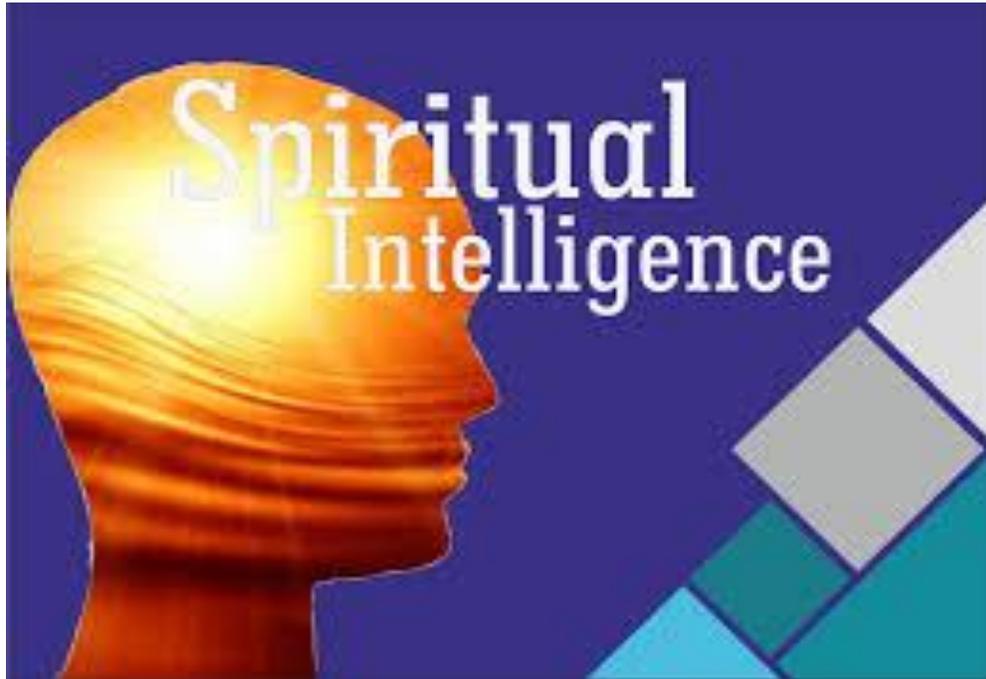
4. To concentrate on the development of the department



Mechatronics Related Courses

Mechatronics Engineering Program

WHY PROFESSORIAL INAUGURAL LECTURE ?



5. An avenue for a Professor to speak on any general topic

Need for Spiritual Intelligence

How it can be applied to our community and national development

WHY PROFESSORIAL INAUGURAL LECTURE ?

6. To bring “town and gown” together in a celebration of academic excellence

Efforts in organizing mentoring activities within our small circle of influence

Involvement with the society and the Military establishment especially the Nigerian Air Force and the Nigerian Army



MANUSCRIPT'S CONTENT

Conceptual Clarification

Mechatronics Engineering

Artificial Intelligence

Chronicle of my Contributions to Knowledge

Teaching

Research, Innovation and Development

Community Social Responsibilities

Training, Mentoring and Collaborations

Beyond Now

Future Research Direction

Spiritual Intelligence

Recommendation

Transformation of Mechatronics Engineering Innovation Centre



WHAT I HAVE BEEN DOING

WHAT HAVE I BEEN DOING?

I. TEACHING

A. TEACHING MECHATRONICS ENGINEERING RELATED COURSES

B. SETTING UP MECHATRONICS ENGINEERING DEPARTMENT

TEACHING MECHATRONICS RELATED COURSES

Within the
last 10 years

Mechatronics Engineering

At undergraduate
and postgraduate
levels.

Artificial Intelligence

Digital Signal Processing

Digital Image Processing

Machine Vision

Multimedia Communication and Data Representation

Intelligent Systems and Applications

Advanced Computer Communication Networks

Engineering System Reliability

Applications of Computer to Project Management

Complex Analysis and Partial Differential Equation, etc

EVERYTHING IS MECHATRONICS

Mobile Phones

The Automobile System

Automated Teller Machines (ATM)

Washing Machine

Airplane

Vacuum Cleaners

Air-conditioning System

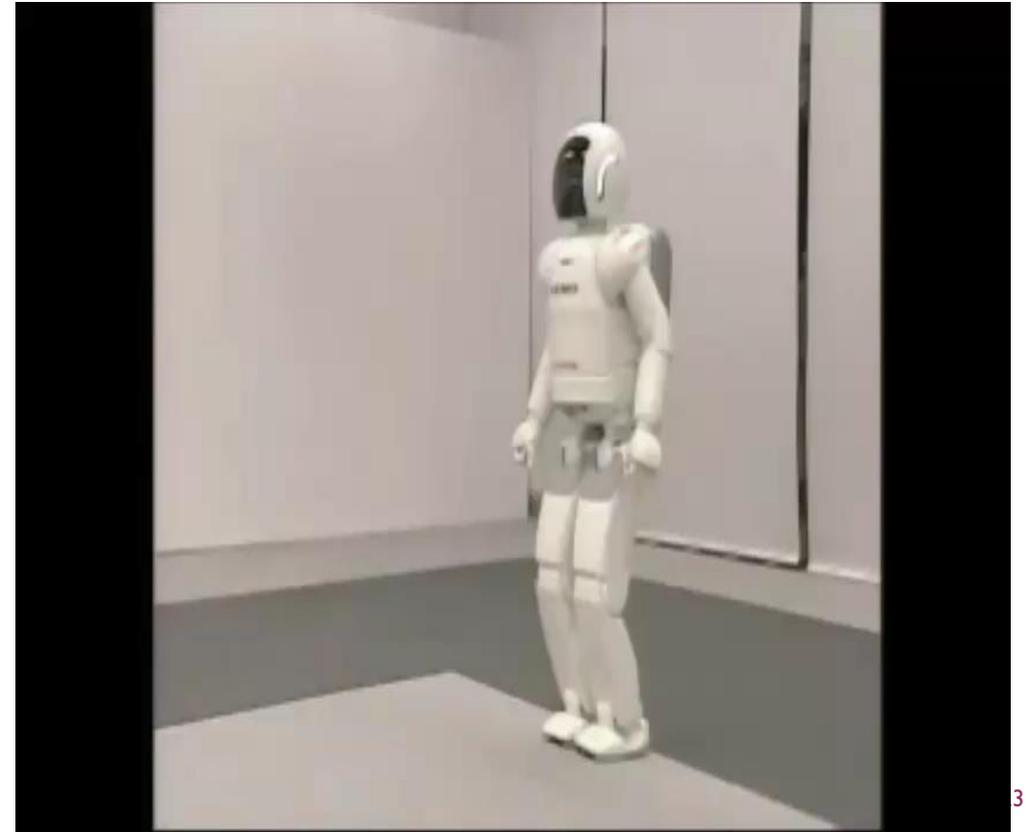
Public Address system

Digital Thermostats

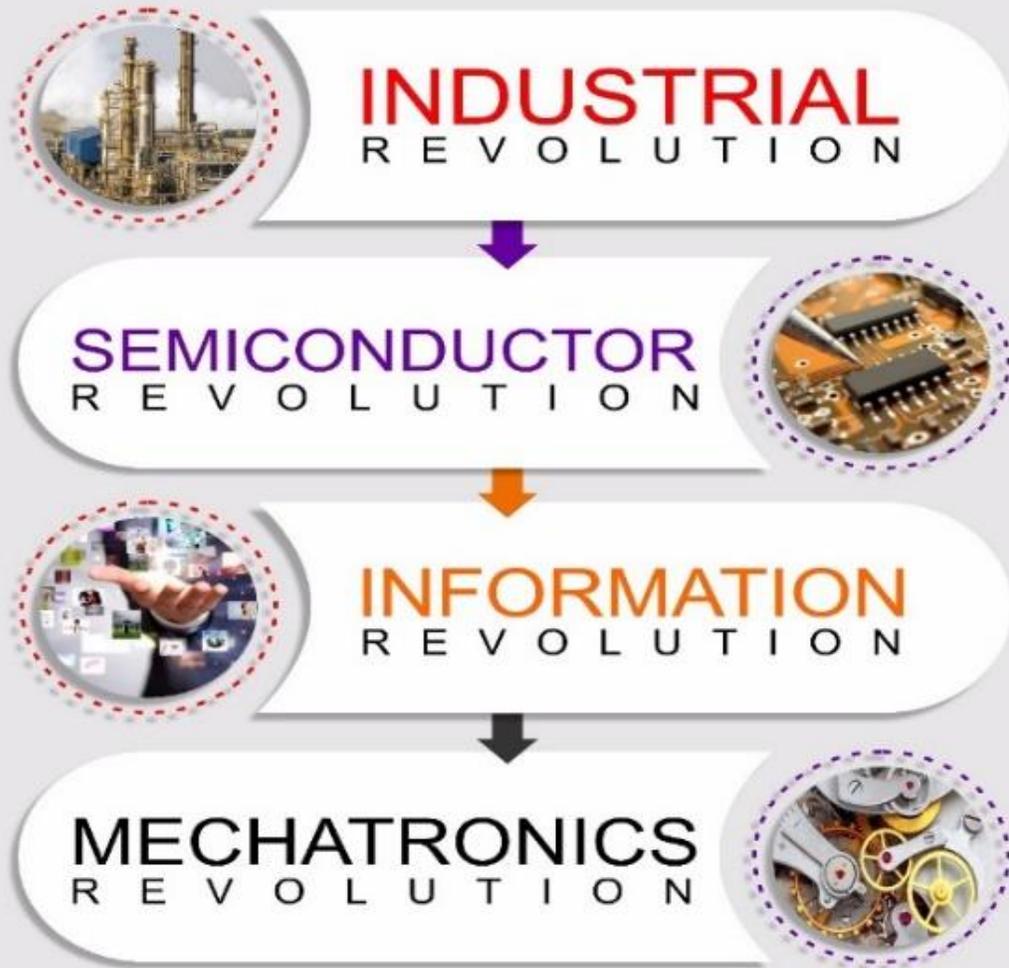
Robots

Biolooids

MECHATRONICS IN ACTION



FROM SIMPLE TO INTELLIGENT SYSTEMS, TECHNOLOGICAL REVOLUTIONS TO DATE



- We have **witnessed four different revolutions** in the last three centuries and presently we are witnessing **“Mechatronics Revolution”**
- **“Jack of all trades, master of none”** has been changed by the advent of mechatronics revolution to **“Jack²⁴ of all trades, master of all”**.

ORIGIN OF MECHATRONICS

**Mechatronics :
Mechanism + Electronics**

In the usage, Mechanism refers to machines that *'move'*.



WHAT IS MECHATRONICS?

1 “Mechatronics enables the creation, design, and support of new concepts for realizing intelligent human-oriented machines that coordinate and cooperate intelligently with their human users” [26]

2 “The union between Electrical Engineering, Mechanical Engineering, Computer Engineering and Applied Control Engineering” [23]

3 “Mechatronics represents a unifying interdisciplinary and intelligent engineering science paradigm that fuses, permeates, and comprehends modern engineering science and technologies” [26]

4 **“Mechatronics is regarded as a philosophy that supports new ways of thinking, innovations, design methodologies (synthesis and analysis), and practices in the design of new intelligent products and engineering systems” [26]**



WHAT IS MECHATRONICS?

5

“Mechatronics can be regarded as a “holistic, concurrent, and interdisciplinary engineering science discipline that concentrates on achieving optimum functional synergy from the earliest conceptual stages of the design process” [26]

6

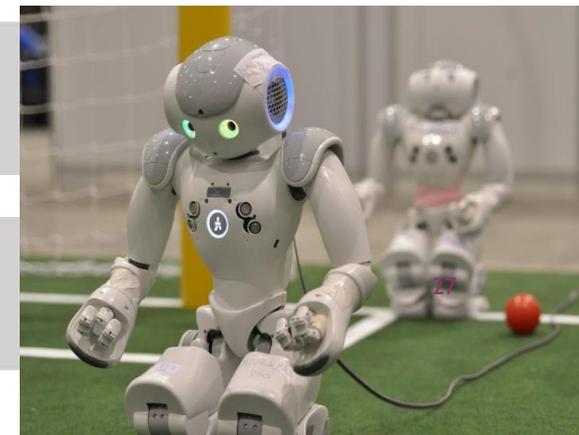
“Mechatronics enables the creation, design, and support of new concepts for realizing intelligent human-oriented machines that coordinate and cooperate intelligently with their human users” [26]

7

“Mechatronics system is nothing but synergistic combination of computer, mechanical, electronics and electrical engineering” [29]

8

“Mechatronics is a natural stage in the evolutionary process of modern engineering design “ [36]



WHAT IS MECHATRONICS?

9

“A mechatronic system is not just a marriage of electrical and mechanical systems and is more than just a control system; it is a complete integration of all of them” [19].

10

“The addition of intelligence to a mechanical design or replacing mechanical designs with an intelligent electronic solution” [23]

11

“The integration of mechanical engineering with electronics and intelligent computer control” [21]

12

“The use of a synergistic integration of mechanics, electronics, and computer technology to produce enhanced products or systems” [22]



SUMMARILY:

- Mechatronics Engineering “is the addition of **intelligence** to a mechanical design or replacing mechanical designs with an **intelligent** electronic solution” [39]



MECHATRONICS ENGINEERING AT FUT, MINNA



- The Idea behind the establishment of DOME in FUT Minna was first conceived in 2010
- DOME officially took off during the 2014/2015 academic session after passing NUC and COREN accreditation and approval process
- We currently have over a hundred students in the department and we should be graduating our first set of students in the year 2020.³⁰

Cross Section of Student during the LET'S CHAT 2016 with the HOD

COMPETENCIES OF OUR GRADUATES



- Possess the ability to design Complex systems that include both hardware and software required in solving engineering problems.
- Have a breadth of knowledge in mathematics and engineering sciences, associated with the broader scope of engineering and beyond that narrowly required for the field.
- Have the ability to work with other team members.
- Possess entrepreneurship skills
- Acquire and maintain a preparation for professional practice in engineering.

TEACHING KIDS/TEENS ABOUT MECHATRONICS



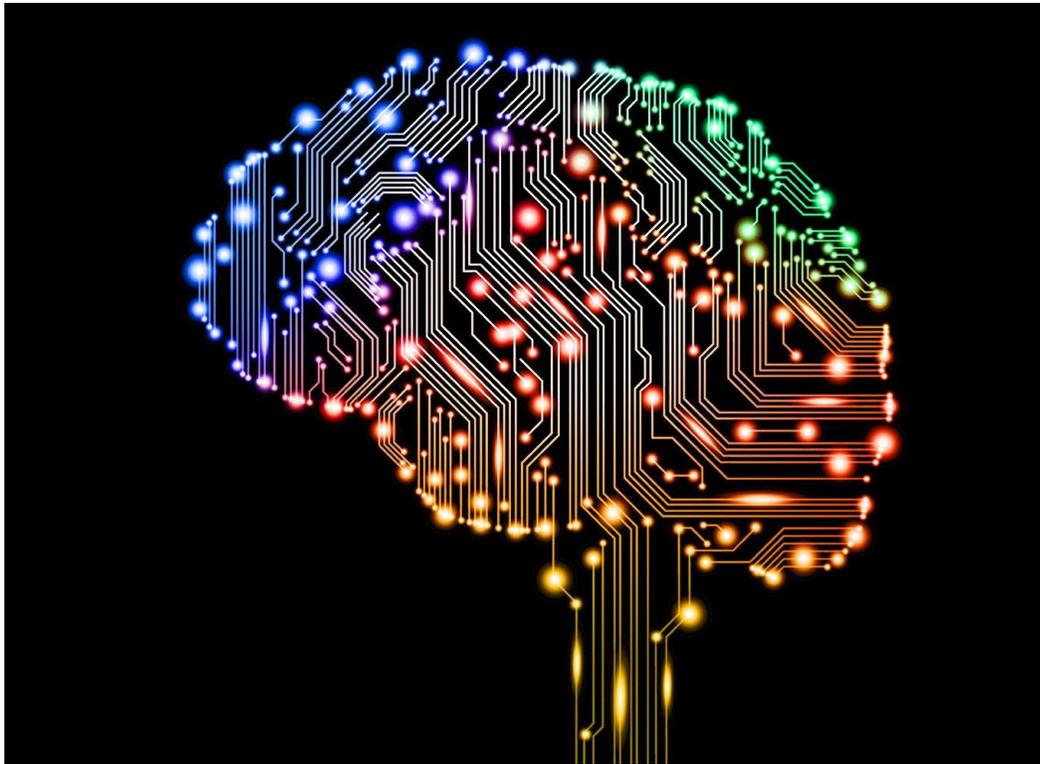
ARTIFICIAL INTELLIGENCE: MOTIVATION



- In an attempt to answer the question, **“Can a machine think and behave like humans do?”**, man came up with the concept of **Artificial Intelligence**.

TEACHING: ARTIFICIAL INTELLIGENCE ?

INTRODUCTION TO ARTIFICIAL INTELLIGENCE



- Why are you behaving like a machine? Can't you think? Can't you use your brain? Can't you comprehend what I have been telling you?
- The question is then, **Why often do we question our intelligence, especially when the person in question is performing below expectation?**

ARTIFICIAL INTELLIGENCE: DEFINITIONS

- “The science of creating machines capable of performing activities that require intelligence when they are done by people”. [38, 43]
- **“Systems which attempt to mimic the way humans think” [38, 44]**
- **“A way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think” [39]**
- “The art of creating machines that perform functions that require intelligence when performed by people.” [41, 45]
- “The study of how to make computers do things at which, at the moment, people are better at.” [41]

ARTIFICIAL INTELLIGENCE: DEFINITIONS AND ENGINEERING GOAL

AI is simply meant to make the existing machines intelligent by transferring intelligence in man to machine.

The engineering goal of AI is to solve real societal-problems

The engineering goal of AI also include the development of intelligent systems which evolved from the technological evolution of the last three centuries.

ARTIFICIAL INTELLIGENCE: SOME OF THE KNOWN TECHNIQUES

Artificial
Neural
Network

Fuzzy Logic

Ant Colony

Hill
Climbing

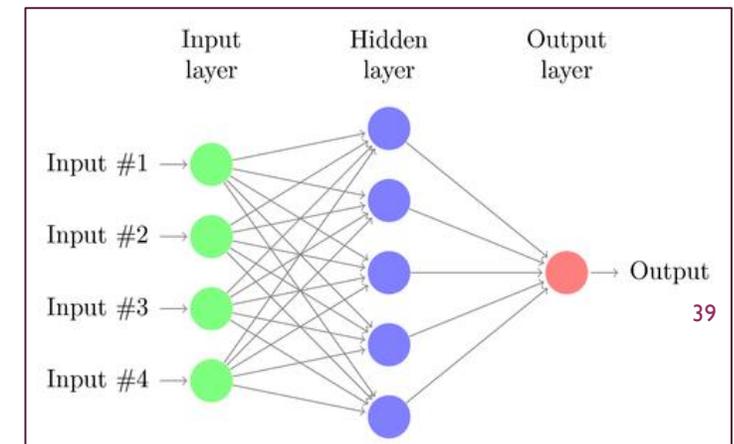
Genetic
Algorithm

Particle
Swamp
Optimization

Bee Colony

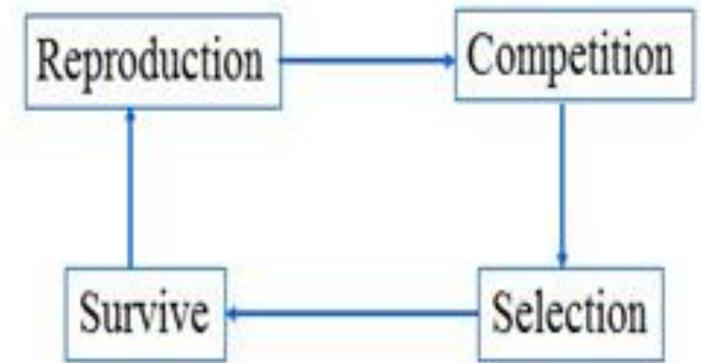
INTRODUCTION TO ARTIFICIAL NEURAL NETWORK (ANN)

- **ANN has been developed to emulate the structure, processing methods and the learning ability of the physical biological neurons of the human brain.**
- ANN can learn, adapt, predict and classify just like man and in some cases, we can say far better than man
- The fundamental principle of ANN is based on finding coefficients between the inputs and outputs of a problem, thus making connections between input and output layers and performing operations on a learning system



INTRODUCTION TO GENETIC ALGORITHM (GA)

- Genetic Algorithm (GA) is a type of evolutionary algorithms (EA) that is based on the principles of biological evolution process.
- GA also emulates nature in the search for the optimal solution of a given problem by using the biological natural evolution process [14].
- GA is an effective and robust search algorithm that allows the quick location of high quality solutions areas in a large and complex search space



Darwins Evolution principle



WHAT I HAVE BEEN DOING

2. RESEARCH

MY RESEARCH INTEREST

My research interest:

Digital Image Processing

Digital Signal Processing

Artificial Intelligence

Mechatronics System Development.



MY HUMBLE CONTRIBUTIONS IN RESEARCH, INNOVATION AND DEVELOPMENT

MY CONTRIBUTIONS IN R & D

ARTIFICIAL INTELLIGENCE (SEE FIGURE 5 FOR DETAILS)

DSP/DIP

INSTRUMENTATION/ ELECTRONICS DESIGN

DIP

DSP

DIABETICS
RETINOPATHY

BIOMETRIC

ROAD ANOMALIES DETECTION
AND ACCIDENT PREVENTION

DINARY/DIRHAM
EXPERT SYSTEM

FRUIT SORTING AND
GRADING SYSTEM

MRI
RECONSTRUCTION

ROAD ANOMALIES DETECTION
AND ACCIDENT PREVENTION

SCORPION
DETECTION

DIABETICS

INTELLIGENCE
WALKING STICK

COGNITIVE PHONE WITH
INTELLIGENCE HANDOVER
ALGORITHM

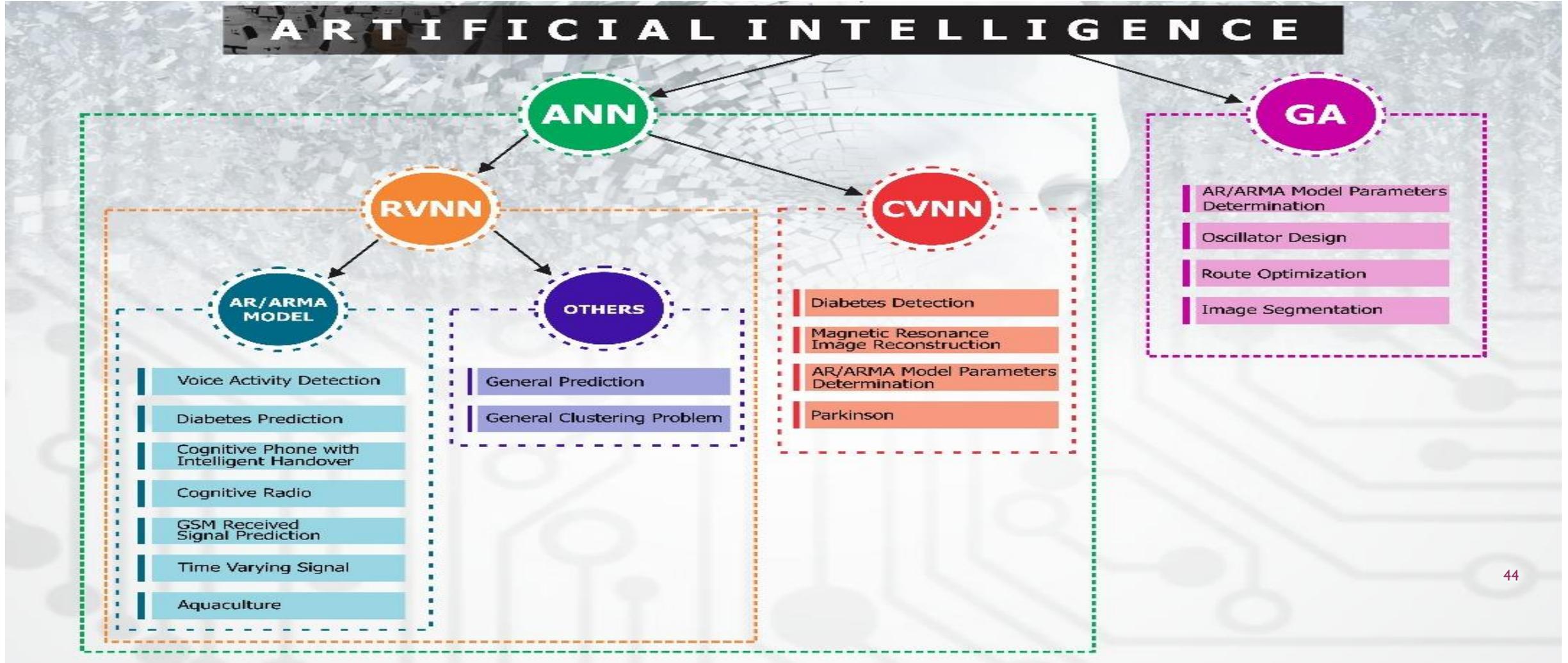
FRUIT SORTING AND
GRADING SYSTEM

DINARY/DIRHAM
ATM MACHINE

DONATION
BOX

SAVING
BOX

MY CONTRIBUTIONS IN ARTIFICIAL INTELLIGENCE



MY EFFORTS IN RESEARCH

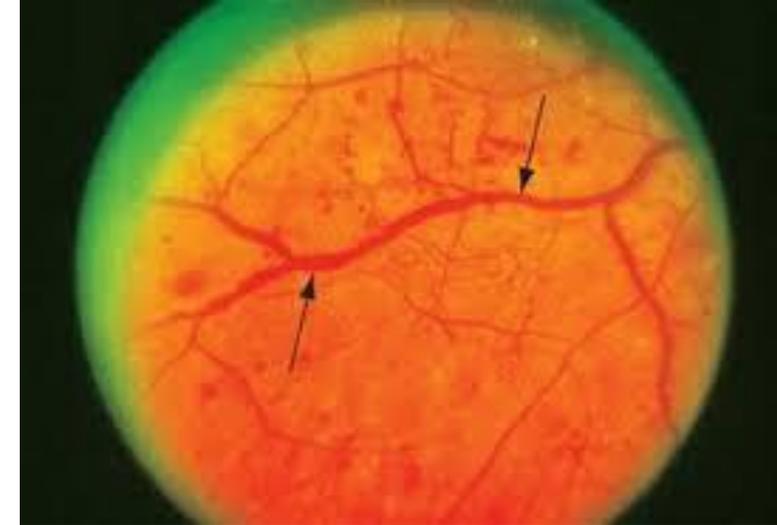
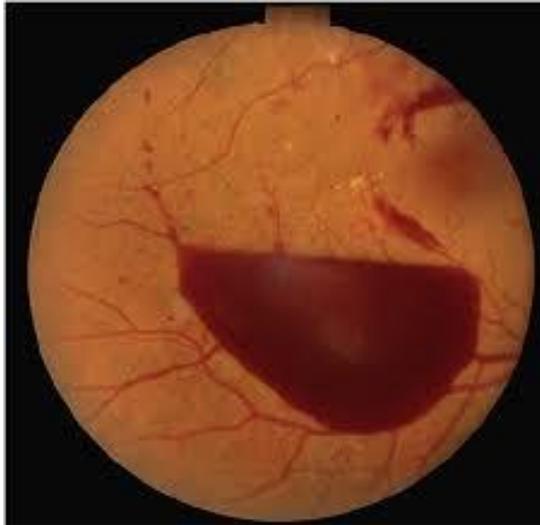
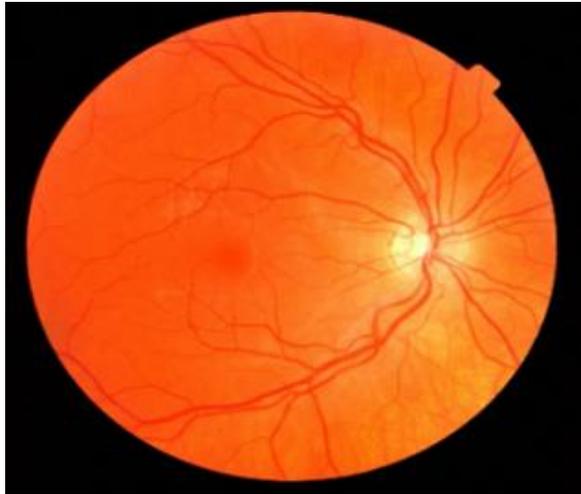
I. INTELLIGENT SYSTEM FOR EARLY DETECTION, DIAGNOSIS AND MONITORING OF DIABETES

INTELLIGENT SYSTEM FOR EARLY DETECTION, DIAGNOSIS AND MONITORING OF DIABETES

- The diagnosis of **diabetes** from acquired digital fundus image.
- Diabetes is a metabolism disorder in the body [8-10].
- Uncontrolled diabetes can be extremely dangerous and can harm the eyes by damaging the blood vessels of the retina, which in turn can cause **loss of vision**



INTELLIGENT SYSTEM FOR EARLY DETECTION, DIAGNOSIS AND MONITORING OF DIABETES



PROBLEMS TO BE SOLVED !

Uneven Illumination

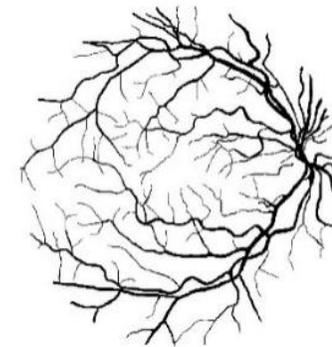
developing an algorithm to solve the problem of uneven illumination in captured Retina Fundus Images (RFIs).

Neovascularisation

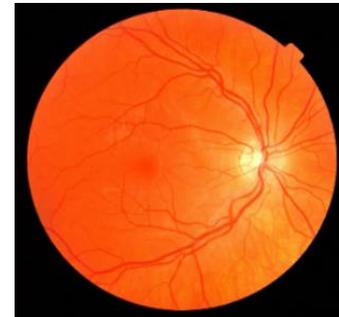
the development of an intelligent approach for detection, localization, monitoring and counting of BP and CP in RFIs.

Intelligent system development

the determination of an appropriate framework, artefacts and AI techniques to be used for intelligent DR diagnostic systems with high TPR, low FPR and high sensitivity [9].



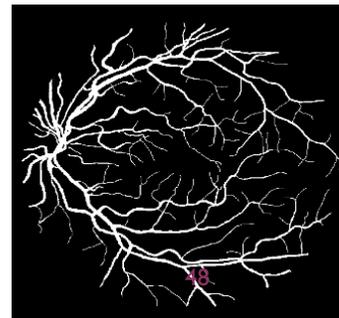
(a)



(b)



(c)



(d)

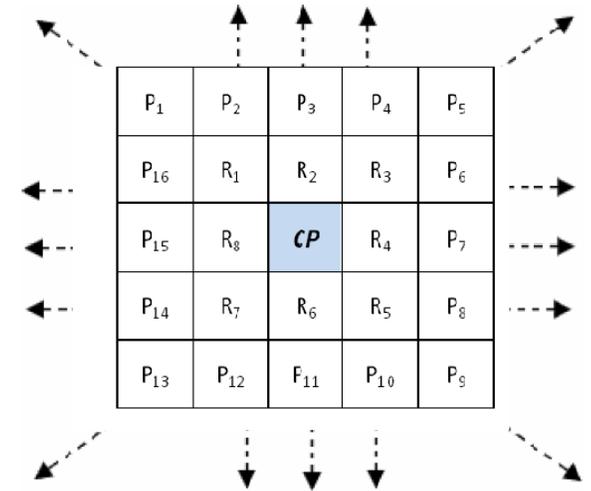
WHAT WE INTEND TO ACHIEVE

- Applying DSP, DIP and AI techniques to reduce the time and stress undergone by the ophthalmologists and other members of the DR screening team.
- Infusing enough intelligence into the developed system and accurately diagnose, monitor and treat DR with little or no human intervention.
- Developing an intelligent handheld device that should be able to assist patients in this regard.



OUR APPROACH AND HOW FAR WE HAVE GONE.

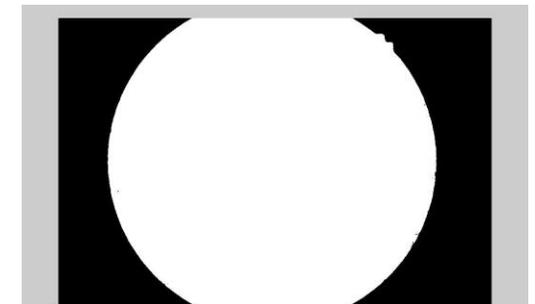
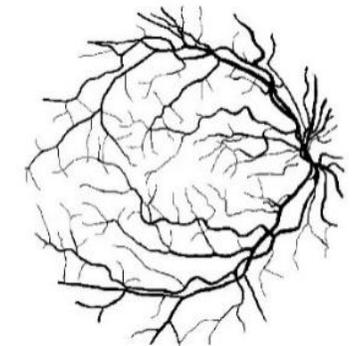
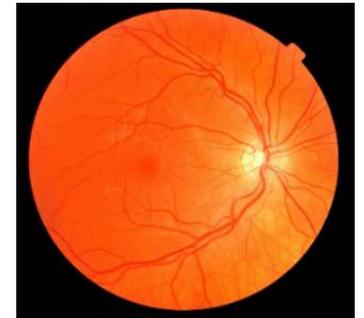
- **Stage I: 2006-2010- Development of Automatic DR Diagnosis System**
 - Solution to Problem 1- Uneven illumination
 - Solution to Problem 2-Neovascularisation
 - Solution to Problem 3-Disease Identification and Classification
 - Solution to Problem 4: Other related problems and contributions



OUR APPROACH AND HOW FAR WE HAVE GONE.

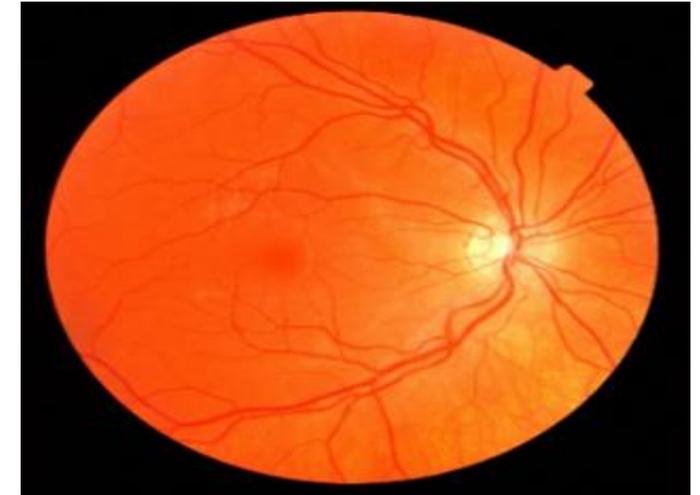
■ Stage 2- 2010 to Date- Development of Intelligent DR Diagnosis System

- Use of ANN and Fuzzy logic techniques developed in the form of MCN approach
- Method of vascular point detection using only artificial neural network.
- Various modeling techniques to VP detection in RFI
- Use of modeling technique to generate RFI mask
- Development of a handheld device



MOTIVATING OTHER RESEARCHERS

- Mr Chairman, it will interest you to know that this little effort has continuously been cited by other researchers
- It has inspired more contributions from other researchers.
- I ask you, what is more inspiring and rewarding than one's works and contributions to his/her own field being referenced by other international scholars and researchers? I will therefore end this sub-unit by quoting from [52], where he wrote
- “Here, we inspired from [15] and the steps involved in the K-means algorithm are as follows...” It is good to note that the reference being mentioned is one of our papers (One of our notable contributions).



RESEARCH FUNDING

- Initially, sponsorship was from BTH, Sweden;- Enabling environment and laboratories facilities were made available to us.
- Our industrial liaison officer from Optimum Biometric Labs also contributed in no small measure in ensuring the successful take off the project.
- Efforts of the consultant ophthalmologist.
- Funding from the Malaysian Government in 2012 under Fundamental Research Grant Scheme (FRGS) through International Islamic University Malaysia (IIUM), via research grant number FRGS12-080-0229.
- In 2014, we also received funding from the Nigerian Government via TETFUND under the Institutional Research Grant Scheme from the Federal University of Technology, Minna, Nigeria.



RESEARCH SUPERVISION AND AWARDS

- The work has been used to train over 14 students in Sweden, Malaysia and Nigeria at both undergraduate and post graduate levels.
- In addition, we have exhibited the work at various fora and have won several awards. We can find the list of awards won so far at www.aibinu.com.ng.
- Mr. Chairman, in this sub-unit, the development of a novel technique for detecting vascular intersection in Retinal Fundus Images has been succinctly presented.



MY EFFORTS IN RESEARCH

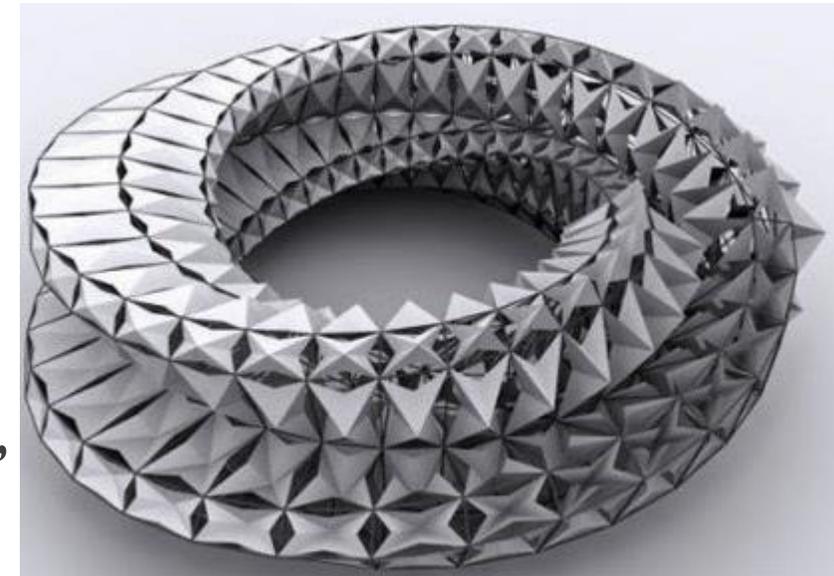
2. DEVELOPMENT OF AI BASED AUTOREGRESSIVE AND AUTOREGRESSIVE MOVING AVERAGE PARAMETERS ESTIMATION

PREDICTION OR FORECASTING USING PARAMETRIC MODELING



DEVELOPMENT OF AI BASED AUTOREGRESSIVE AND AUTOREGRESSIVE MOVING AVERAGE PARAMETERS ESTIMATION

- Parametric modeling can be used to:
 - i. Determine an unknown system by the knowledge of the input and output data (system modeling and identification);
 - ii. Predict the future values based on past output values (linear prediction);
 - iii. Filter (signal filtering); and to find the frequency content or response of a system (spectral estimation), etc.
- Some of the widely used parametric models are **Autoregressive** (AR); **Moving Average** (MA); and **Autoregressive Moving Average** (ARMA).

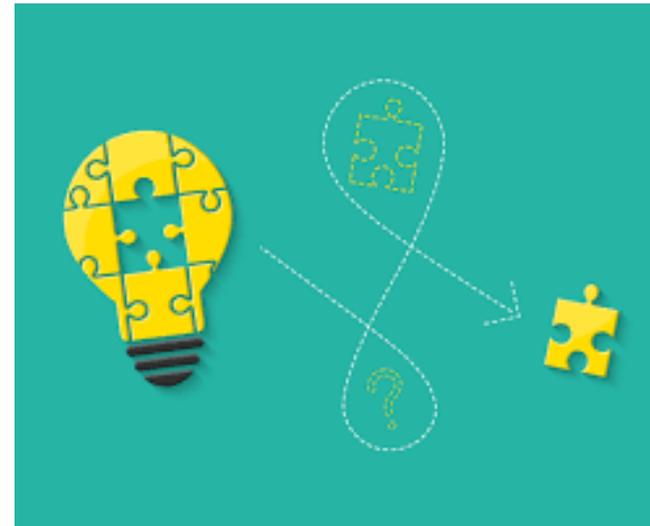


PROBLEMS TO BE SOLVED

Complexity,
associated with the
determination of
model coefficients

Difficulty in
estimating the
model order.

Limitations in MRI
reconstruction



WHAT WE INTEND TO ACHIEVE

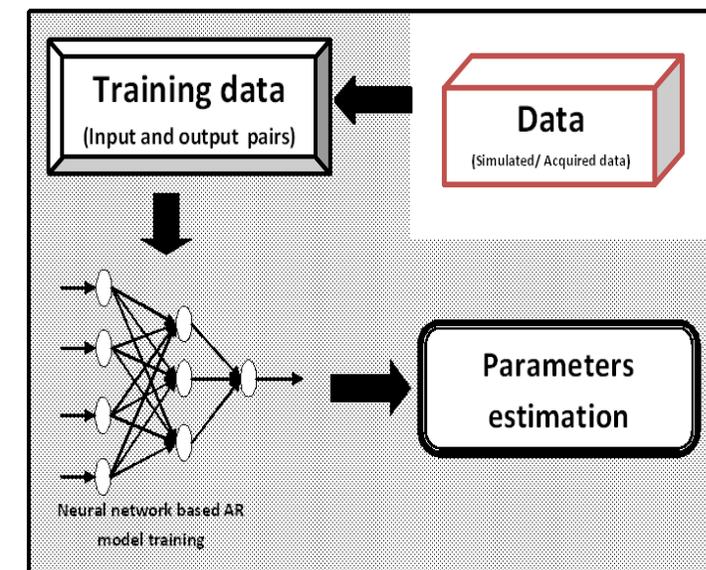
- To adopt the use of AI based approach in solving these problems.



OUR APPROACH AND HOW FAR WE HAVE GONE.

■ Solution to Problem -I:

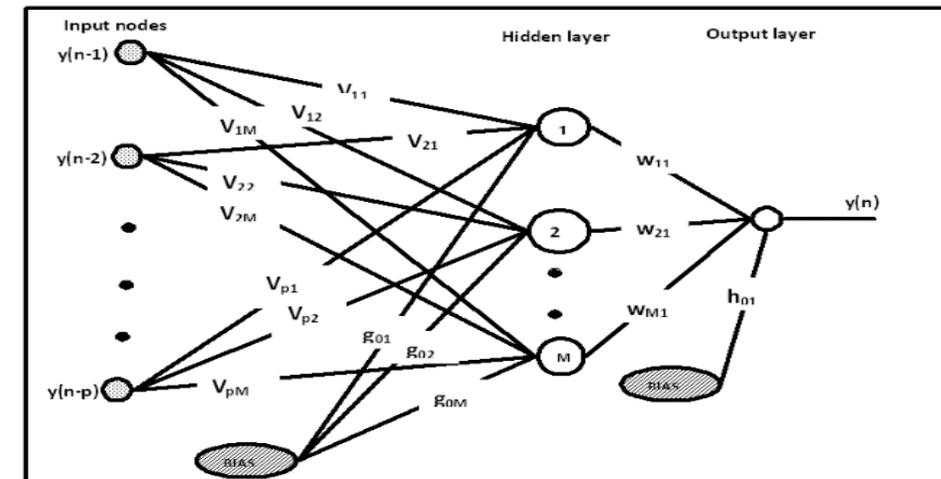
- It is conjectured that an ANN-based technique for the determination of the coefficients of both AR and ARMA models would be most appropriate. Upon satisfactory learning, the weights and coefficients of the activation functions were then used to estimate the model coefficients [56].



OUR APPROACH AND HOW FAR WE HAVE GONE.

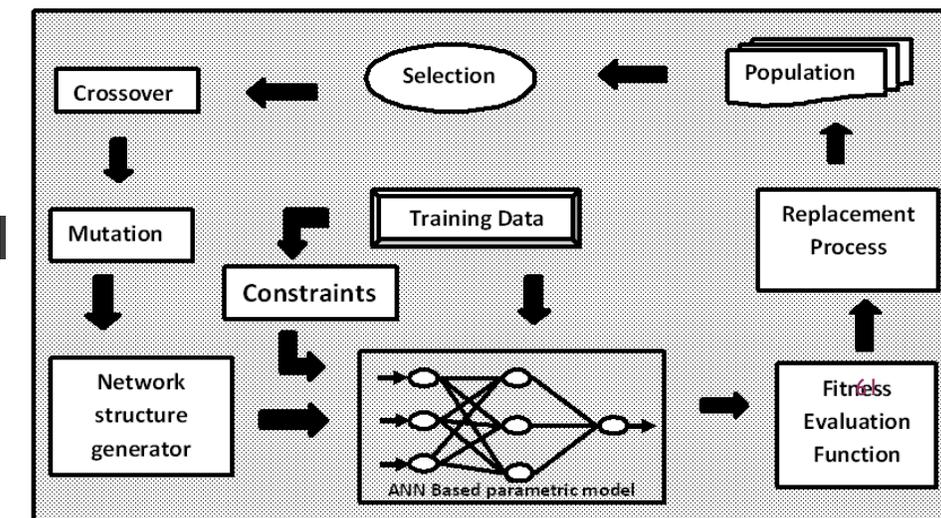
■ Solution to Problem 2: Model Order Determination

- In using AI to solve this problem, we adopted the use of GA and ANN.



■ Our Solution to Problem 3 - Other Related Works

- In the course of our ANN-based parametric model training, the traditional back-propagation algorithm was replaced by GA.



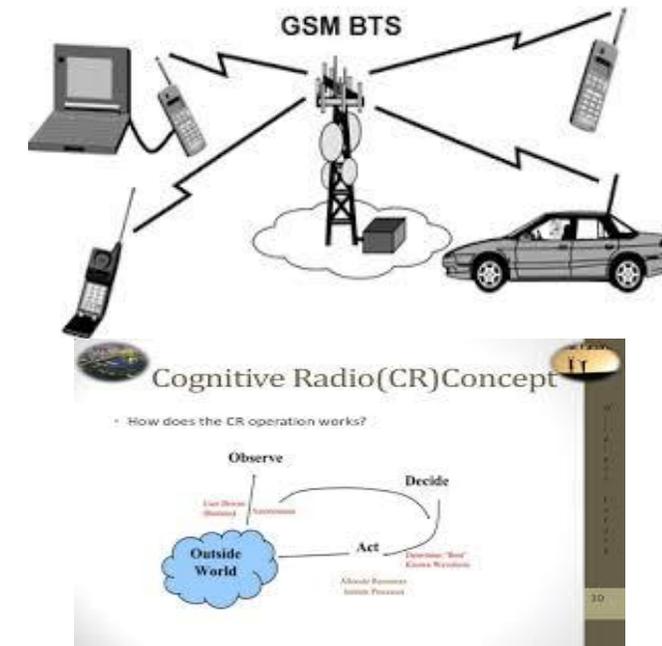
WHAT WE HAVE DONE WITH THE DEVELOPED APPROACHES

- In 2010, we applied the proposed approach to **MRI images reconstruction problem using Transient Error Reconstruction Algorithm.**
- In 2011, we applied the approach to biomedical signal classification using the complex-valued pseudo autoregressive (CAR) modeling approach.
- In 2012, we examined the performance of the system on sinusoidal data and recorded speech to examine the spectral resolution and line splitting and its ability to detect voiced and unvoiced data section from a recorded speech.



WHAT WE HAVE DONE WITH THE DEVELOPED APPROACHES

- Between 2014 and 2017, we applied the developed approach to the design of an Energy Detector (ED) for use in Cognitive Radio (CR) related applications.
- In 2016, the approach was applied to GSM pathloss model prediction via a three-stage approach using some selected and easily measurable atmospheric parameters such as atmospheric temperature, relative humidity and dew point
- We have applied this approach to solve problems in such areas as Parkinson classification; time varying signals; Skin detection problem; Aquaculture; Dinar price prediction; etc.



RESEARCH FUNDING

- In 2008, the Malaysian Government under E-Science Research Grant Scheme (E-Science), through International Islamic University Malaysia (IIUM), with research grant number Quote 01-01-08-SF0083 provided the first major funding for the work.
- This is in addition to the institutional grants provided by IIUM via grant number EDW B0701-07.
- Fund was also received from the Ministry of Higher Education, Malaysia with grant number FRGS12-065-0214



RESEARCH SUPERVISION AND AWARDS

- This work has been used to train over 10 students in Malaysia and Nigeria at both undergraduate and post graduate levels and we have exhibited the work at various fora and have won several awards.



MY EFFORTS IN RESEARCH

3. DEVELOPMENT OF COGNITIVE PHONES AND MOES CARD

COGNITIVE PHONE AND MULTIPLE OPERATORS ENABLED SIM CARDS

- Another contribution to the field of mobile wireless communication systems.
- The work is presently in the filing processing stage and we hope to complete the patent filing stage soon so as to produce a market-ready mobile phone.
- This phone will have AI incorporated for taking necessary decisions especially as it concerns switching Quality of Service (QoS) from one Mobile Network Operator (MNO) to another.



THE PROBLEMS TO BE SOLVED

- The increasing poor QoS experienced by subscribers which manifest itself in the forms of Call failure, call drops, and low received signal strength.
- The increase in the number of Base Transceiver Stations (BTS.)
- The use of mobile phones with multiple SIM slots in providing temporary solution to these non-abating problems.



WHAT WE INTEND TO ACHIEVE

- The development of an AI based portable device, in form of mobile phones, capable of providing seamless data and voice connections over the existing MNOs
- The proposed device is expected to provide subscribers with the privilege of enjoying good services from available operators without the added expenses of having more than one phone or a phone with multiple SIM slots.
- The proposed cognitive phone is expected to guarantee all time access to networks with the best available signal strength and QoS, even while on transit on Nigerian highways and roads.



OUR APPROACH AND HOW FAR WE HAVE GONE

**Stage I
(2013- 2014)**

**Development
of SIM Card
Information
Extraction
Software and
Switching
Interface
System**

**Stage 2
(2014 – 2017)**

**Development
of Hybrid AI
System for
Handover in
MOES
System and
Cognitive
Phone**

**Stage 3
(2015 - Till
Date)**

**Fabrication of
Cognitive
Mobile Phone
and
Evaluation of
its
Performance**



RESEARCH FUNDING, SUPERVISION AND AWARDS

- Financial funding from the Nigerian Communications Commission (NCC), under research funding NCC/CS/007/15/C/040 of 2014.
- Won the Best research award at the Federal University of Technology, Minna 26th Convocation Research and Development (R&D) Exhibition in 2017.
- Till date, the work has been used to train over 16 students in Nigeria at both undergraduate and post graduate levels.

 Nigerian Communications Commission



**NCC**
NIGERIAN
COMMUNICATIONS
COMMISSION

MY EFFORTS IN RESEARCH

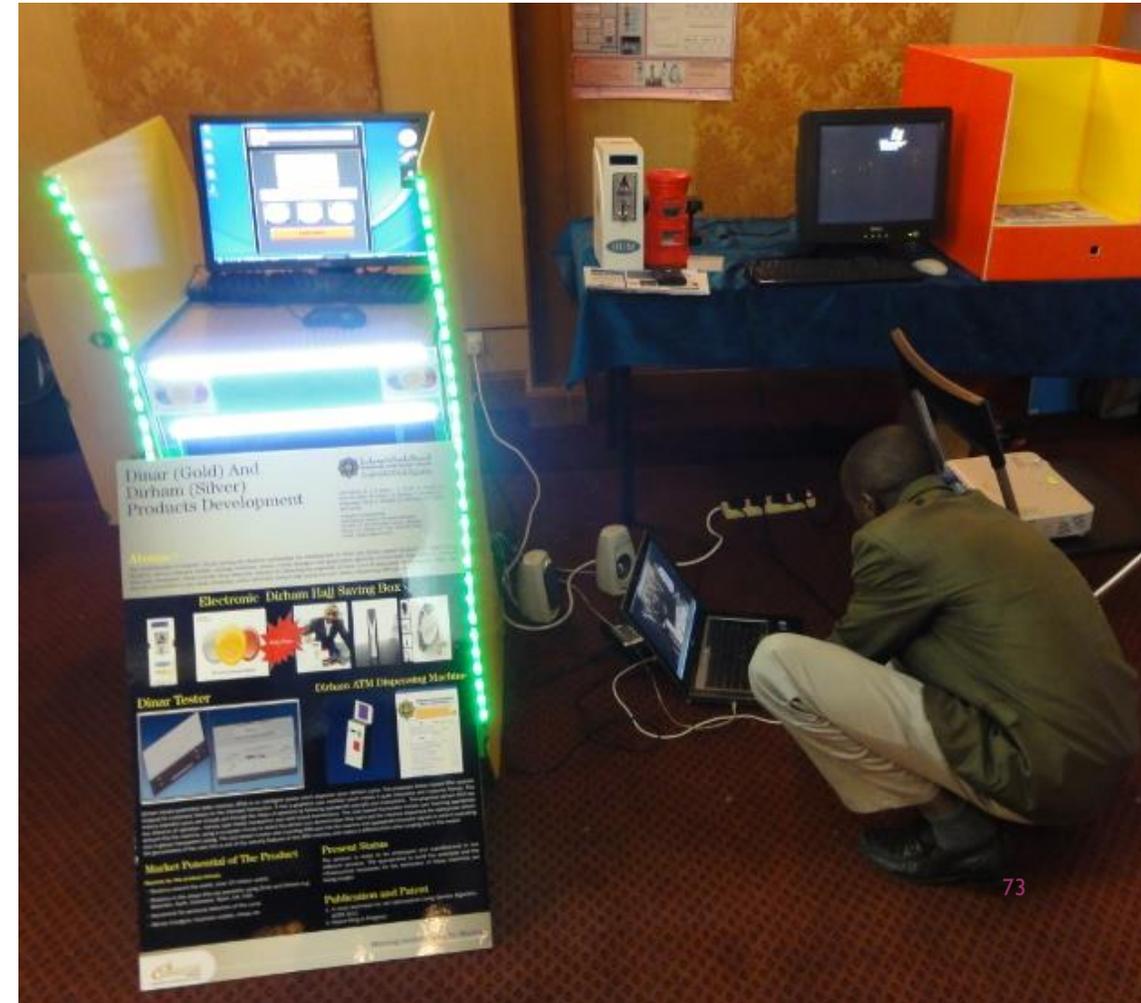
2. DEVELOPMENT OF MECHATRONICS SYSTEMS

MY CONTRIBUTIONS IN MECHATRONICS SYSTEM DEVELOPMENT

Dinar (gold) and Dirham (silver) ATM Machine

The machine was infused with contactless Biometric AI based algorithms for recognition and authentication purposes.

The work won the Gold medal award at IIUM exhibition in 2011 and funding opportunity came in 2011 with research grant number EDW A11-100-0891



MY CONTRIBUTIONS IN MECHATRONICS SYSTEM DEVELOPMENT

Intelligent Robotic Donation Box (IRDB)

The developed IRDB system has capability of collecting donation from people in an organized assembly or gathering.

The system can make audible sound, gesture recognition as well as avoiding any obstacles in its path.



MY CONTRIBUTIONS IN MECHATRONICS SYSTEM DEVELOPMENT

NIGERIAN COMMUNICATIONS COMMISSION FUNDED RESEARCH PROJECT



Title Development of GSM Communication Based Walking Cane Robot (GWCR) for Enhancing Ambulation

About the Project

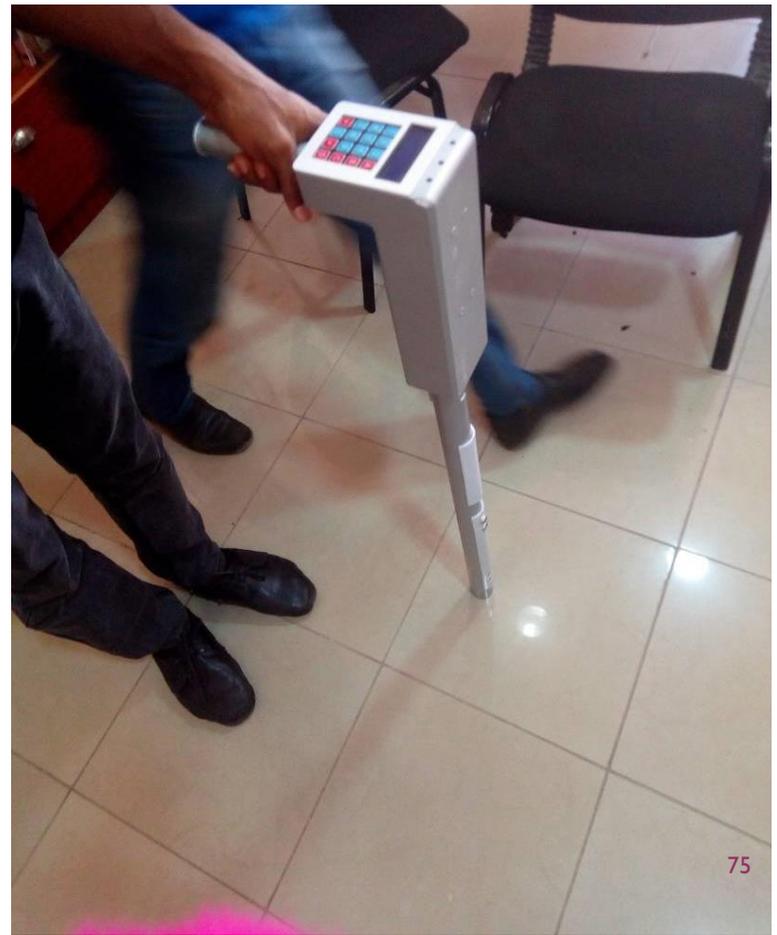
One of the major reasons identified recently for increase in number of fall by the aged, senior citizen and people with disability is the use of mobile phone device. Imbalances do arise sometimes in attempt to receive or initiate phone calls or send or read sms while still holding on the support for or during locomotion. Thus leading to increase in fatality experienced by the aged and disable people.

This work is aimed at developing intelligent walking communicating cane robot for assisting the aged, persons with disability, and persons lacking the ability for autonomous ambulation. Apart from providing basic walking aid support, this project seeks to address the following three technical issues: (1) Communication Enabled system; (2) Intelligent fall detection and (3) Obstacle detection. Upon detection of a fall, the system will use embedded GSM communication module to initiate calls to predefined care-givers or health centres. SMS will also be initiated and send to pre-assigned number in case of detection of serious fatality situation. Furthermore, the GSM unit will be designed for real time transmission of vital signs to remote health workers. Obstacles in a user's path will be detected using ultrasonic sensors, which radiate pulse signals to objects ahead and then use the reflected signal to compute the distance between target and sensor. Such information will be relayed to pressure sensors, which will vibrate in accordance with measured distance. A buzzer and programmed audio system will be incorporated to warn users about approaching impediments.

This project will provide potentials for extending the advantages of telecommunication, telemedicine, long term support for the aging population, and providing revenue for technology developers.



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MY CONTRIBUTIONS IN MECHATRONICS SYSTEM DEVELOPMENT

RM1.01

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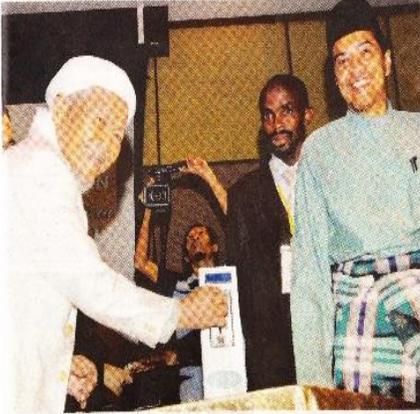
DINAR BAYAR ZAKAT

Kelantan negeri pertama benarkan bayaran zakat guna mata wang alternatif, dinar dan dirham

“Kajian mengenai penggunaan dinar dan dirham dalam urusan perniagaan di negeri ini dilakukan bagi pastikan tidak bercanggah dengan peraturan Bank Negara Malaysia. Insya-Allah... kita ikut laluan betul dan kalau ada apa-apa, kita boleh runding”

Menteri Besar, Datuk Nik Abdul Aziz Nik Mat

Nik Abdul Aziz memasukkan emas dinar ke dalam mesin tabung emas dinar dan perak dirham pada Majlis Pelancaran Matawang Syariah Emas Dinar dan Perak, semalam. Turut hadir: Exco Kerajaan Negeri, Datuk Husam Musa (kanan).



UIAM cipta tabung dinar emas elektronik

Oleh Rosniza Mohd Taha
yosniza@ibharian.com.my

KESOHORAN dinar sebagai mata wang rasmi sektor ekonomi dibuktikan sejarah tamadun Islam dan kini semakin banyak pihak mencanangkan komoditi itu digunakan semula secara meluas termasuk sebagai simpanan bernilai tinggi dan stabil berbanding duit kertas yang terdedah kepada ketidakpastian krisis semasa.

Selain di Aceh, Indonesia; Sepanyol dan Afrika Selatan, baru-baru ini, Kelantan melancarkan penggunaan Dinar Emas dan Dirham Perak untuk aktiviti jualan beli di lebih 1,000 rangkaian kedai negeri Cik Siti Wan Kembang itu termasuk Pasar Khadījah.

Peka dengan perkem-

angunan semasa sistem kewangan ini, sekumpulan penyelidik Universiti Islam Antarabangsa Malaysia (UIAM); Abiodun Musa Aibinu, Mimi Aminah Wan Nordin dan Saima Arai, mencipta Tabung Dinar Emas Elektronik bagi kemudahan orang ramai menyimpan menggunakan komoditi itu.

Abiodun Musa berkata, tabung itu mempunyai tiga ciri utama bagi kemudahan pengguna iaitu keselamatan, sensor dan pengiraan jumlah simpanan secara automatik. Bagi tujuan keselamatan, pengguna boleh menetapkan kod kata kunci dan sistem amaran akan berbunyi apabila tabung dibuka.

Fungsi sensor pula, katanya, bagi memastikan hanya Dinar Emas dan Dirham Perak dimasukkan dalam tabung itu dan jumlah simpanan



Abiodun Musa Aibinu
Penyelidik UIAM

“Ia sesuai digunakan di rumah termasuk bagi kemudahan umat Islam yang mengumpul wang untuk menunaikan haji”

akan dipaparkan serta merta pada skrin paparan LCD.

“Terdapat lima nilai Dinar Emas diterima tabung ini iaitu setengah (RM300), satu (RM600), dua (RM1,200), lima (RM3,000) dan lapan (RM4,800).

“Dirham Perak diterima pula ialah satu (RM14), dua (RM28), lima (RM70), 10

(RM140) dan 20 (RM280),” katanya ketika ditemui pada Pameran Inovasi Islam Kebangsaan di Putrajaya, baru-baru ini.

Abiodun Musa berkata, tabung itu sesuai digunakan di rumah termasuk bagi kemudahan umat Islam yang mengumpul wang untuk menunaikan haji kerana nilai

simpanan Dinar Emas lebih stabil dan semakin meningkat berbanding simpanan wang kertas.

“Tabung ini berpotensi dikomersialkan untuk kegunaan domestik dan jika mendapat sokongan penajaan dana penyelidikan tambahan, rupa bentuknya boleh diperbaiki menjadi lebih nipis dan mudah alih serta pelbagai bentuk supaya mudah disimpan di sebarang ruang dalam rumah,” katanya.

TABUNG Dinar Emas memudahkan pengguna menyimpan Dinar Emas dan Dirham Perak dengan lebih selamat di rumah.



MY EFFORTS IN MENTORING

1. TECHNICAL MENTORING
2. ACADEMIC MENTORING

WHY MENTORING

- Mentoring can be described as one of the most effective tools in people development and I have been exposed to it over the years.
- I have also learnt from great mentors.



TECHNICAL MENTORING

- Introducing ways of enhancing the personal development of the mentees with a view to improving their technical and general performances over time.
- Ensuring increase in mentees' personal effectiveness and encouraging them to think about career planning/mapping for the future and at the same time, to solve societal problems.
- Mostly, mentees come in on a six-month or a three-month internship programme and are allocated different tasks and projects under my watchful eyes.
- Three layers of mentoring are available in the programme.



ACADEMIC MENTORING

Ph.D. Clinic

- **Aim:** providing support mechanism to Ph.D. candidates, during their period of study at FUT Minna.
- **Impact:** Within the last three years, the Clinic has been able to publish over 7 ISI journal papers and over 12 conference papers.

ACADEMIC MENTORING

At
DOME

- We have setup a mentors and mentees programme for students and members of staff with an online system for monitoring mentors and mentees activities.



GIVING BACK TO THE SOCIETY: MY INVOLVEMENT AND COMMUNITY SOCIAL RESPONSIBILITY



CSR TO MILITARY ESTABLISHMENTS

- Research and Development in military establishments.
- Participation in the repair and development of military hardware and software
- Working as a part of a team towards the actualization of the memorandum of understanding between FUT Minna on the one hand, and the Nigerian Air Force and the Nigerian Army on the other.

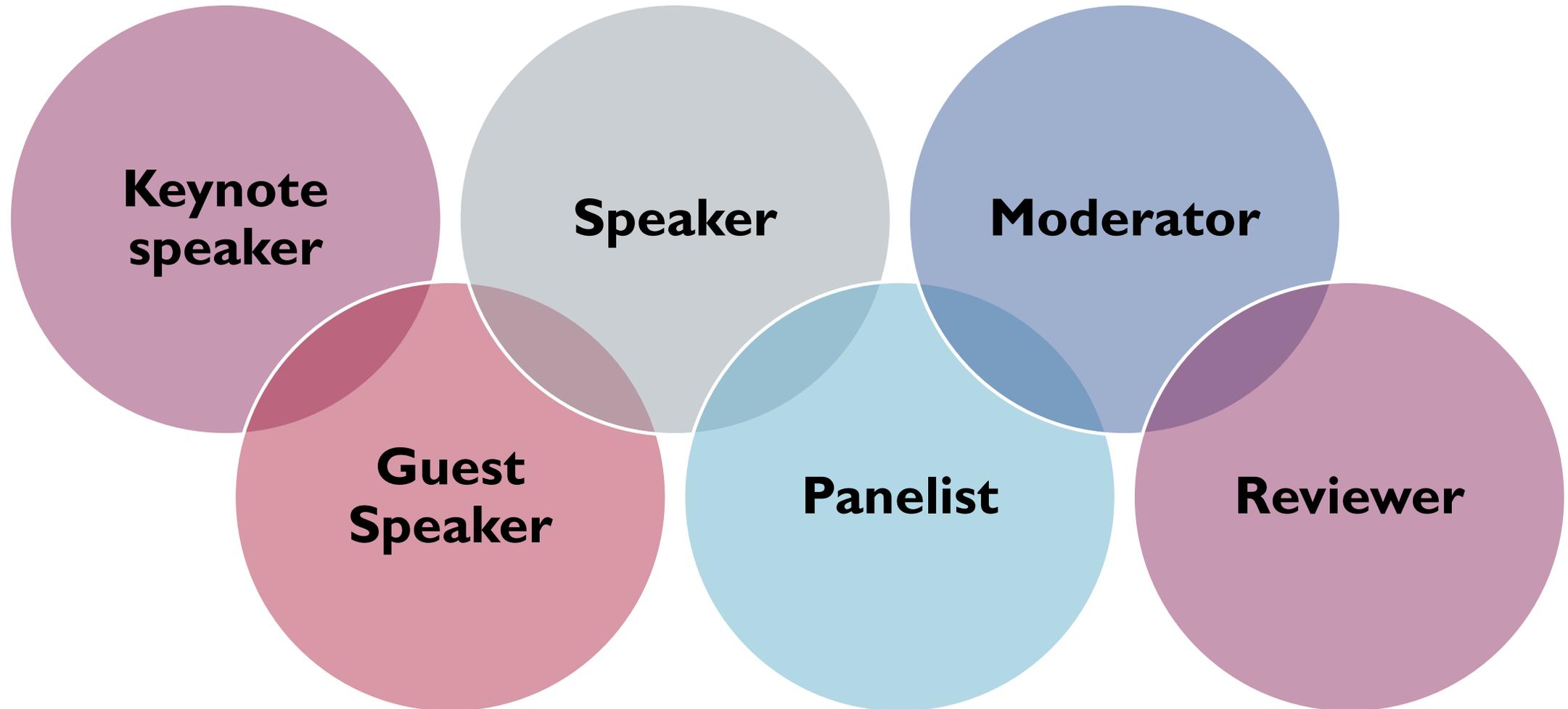


THE NIGERIAN ROBOTICS CHAMPIONSHIP (NIROC)

- Organized in 2013.
- Over 500 students from various secondary and primary schools in Niger state participated at the event.
- Some of these students have started representing Nigeria in Robotics competitions outside the country.
- Some that are now in secondary schools are looking forward to come and join us here at FUT Minna.



PUBLIC SPEAKING





WHAT
NEXT?

OUR DREAM: MECHATRONICS ENGINEERING INNOVATION CENTRE

- The Advanced Engineering Innovation Research Group (AEIRG) is an industry-oriented, multi-disciplinary research group that specializes in the design, development and production of Intelligent Mechatronics Systems.
- The research group's activities range from basic and applied research to commercialization through partnership with industries and other stakeholders.
- The research group also provides training and consultancy services to all sectors and strata of the society.



Facilities Available at MEIC

- 12 Laboratories
- 2 Workshops
- 24 Standard Research Offices
- Business and Technology Incubation Centre
- Technology Museum and Gallery
- Conference and Discussion Rooms
- Exhibition and Event Hall
- Restaurant and Guest House

Contact Us

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MECHATRONICS ENGINEERING CURRICULUM, TEXTBOOKS AND EQUIPMENT

- My efforts for the next few years will include
 - a. Address anomalies observed in the present MCE curriculum.
 - b. Producing Mechatronics Engineering textbooks
 - c. Developing laboratory equipment



MANPOWER DEVELOPMENT IN MECHATRONICS ENGINEERING

- Young, able and willing academia will be trained along our major areas of expertise as this will assist in developing adequate manpower for the field.
- Collaborations will be established with partners across the globe with the view of cross pollinating ideas between colleagues.



MY FUTURE RESEARCH DIRECTION

- In the short term, my research efforts will be geared towards developing market ready prototypes for all the completed research works.
- Also, efforts will be made to complete all ongoing projects.

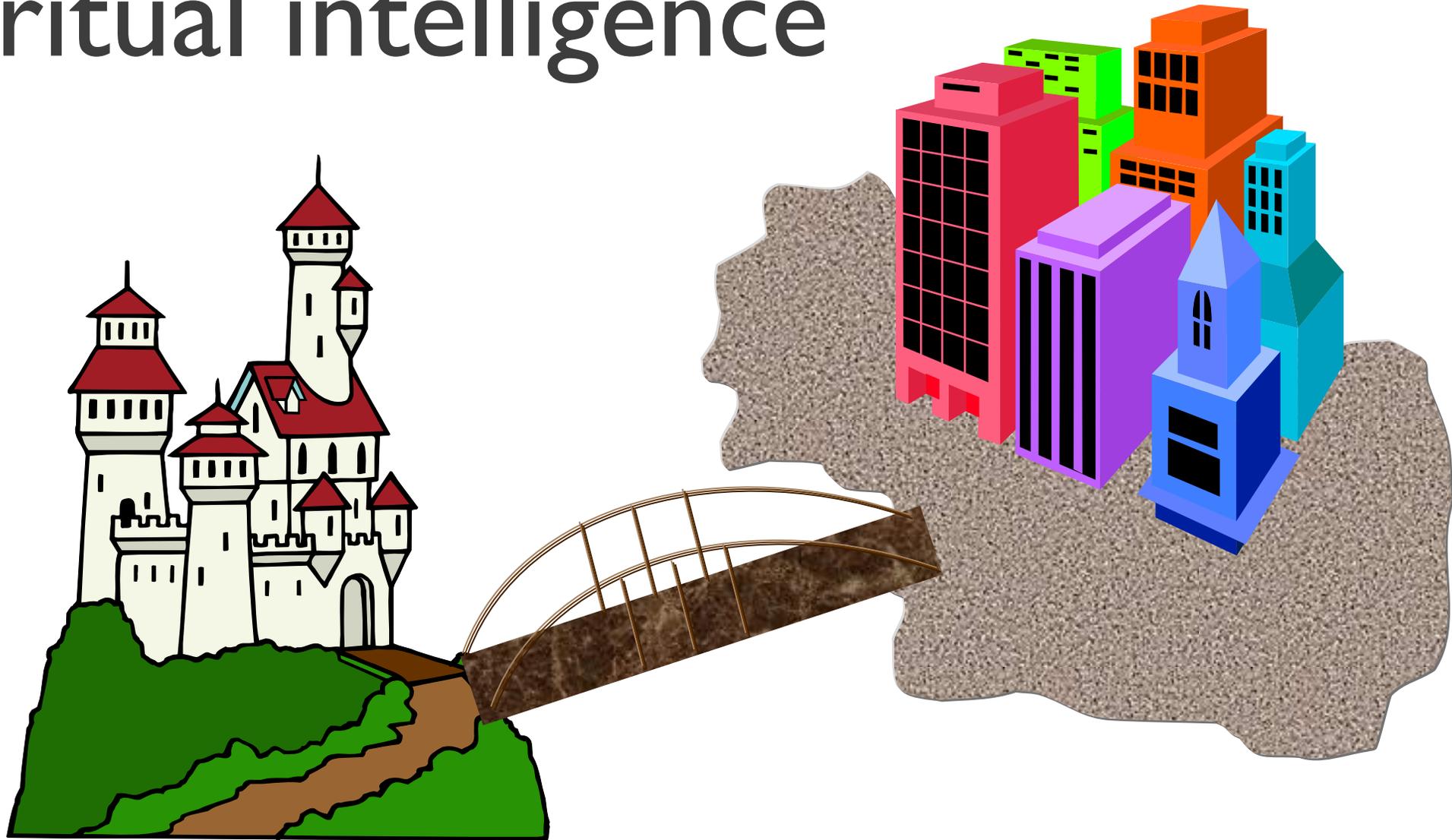
■ Focus on Spiritual Intelligence



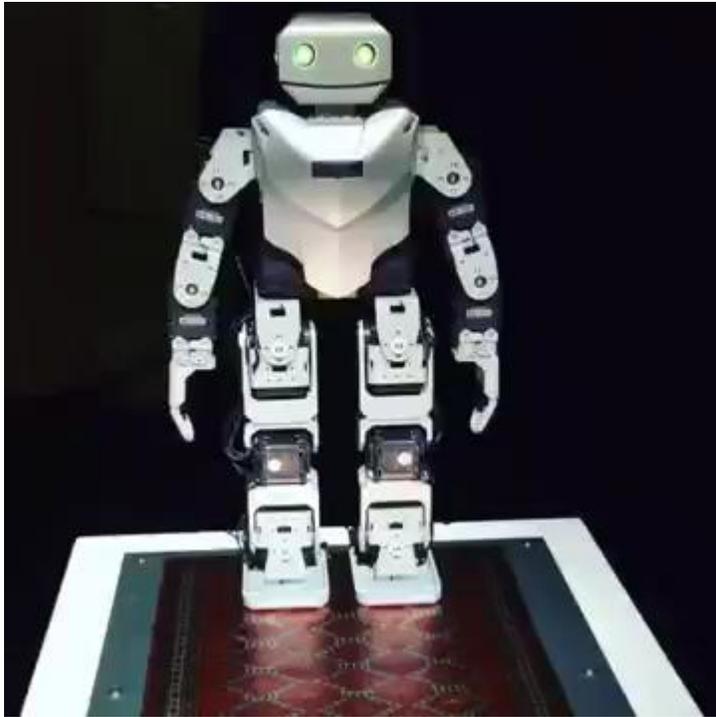


SPIRITUAL INTELLIGENCE

Spiritual intelligence

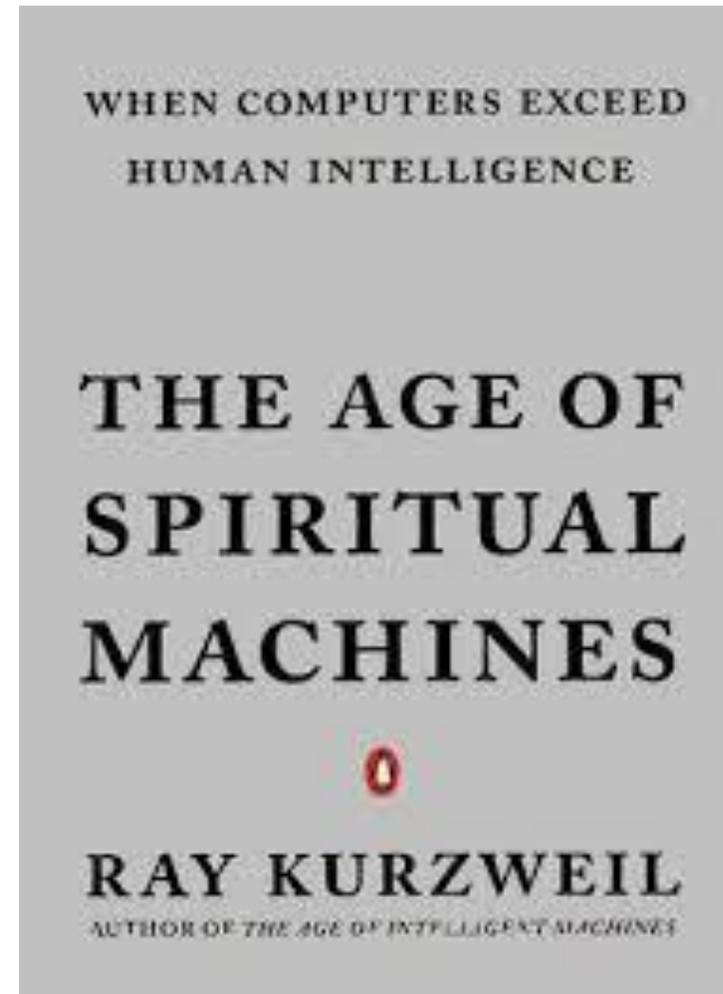


Spiritual intelligence

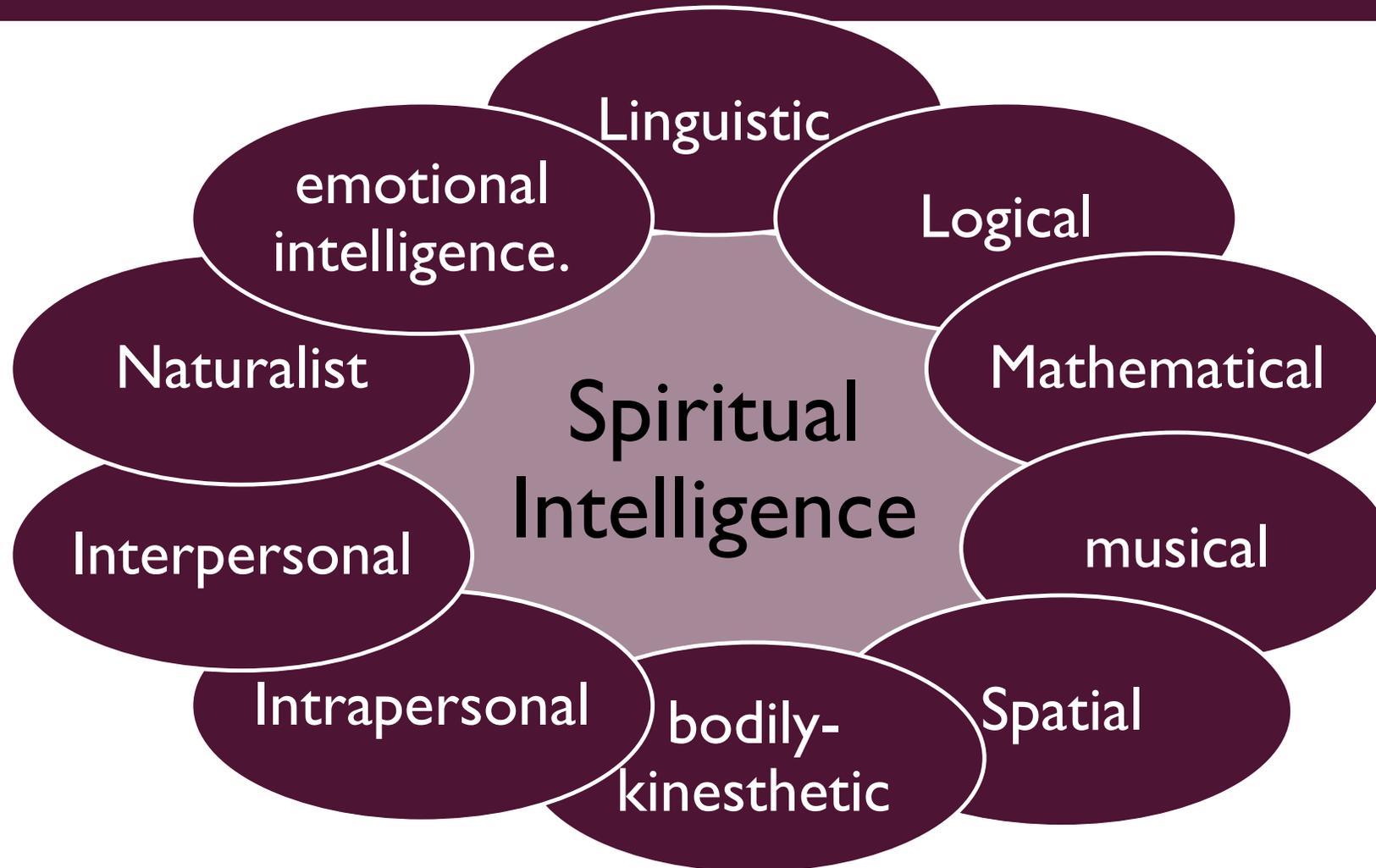


LET US START...

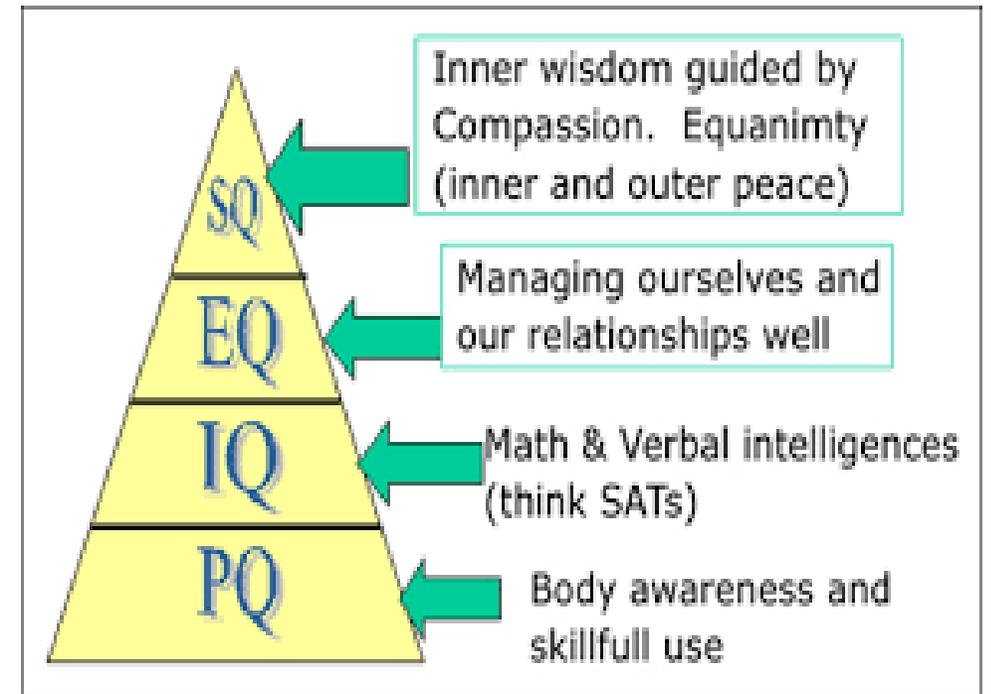
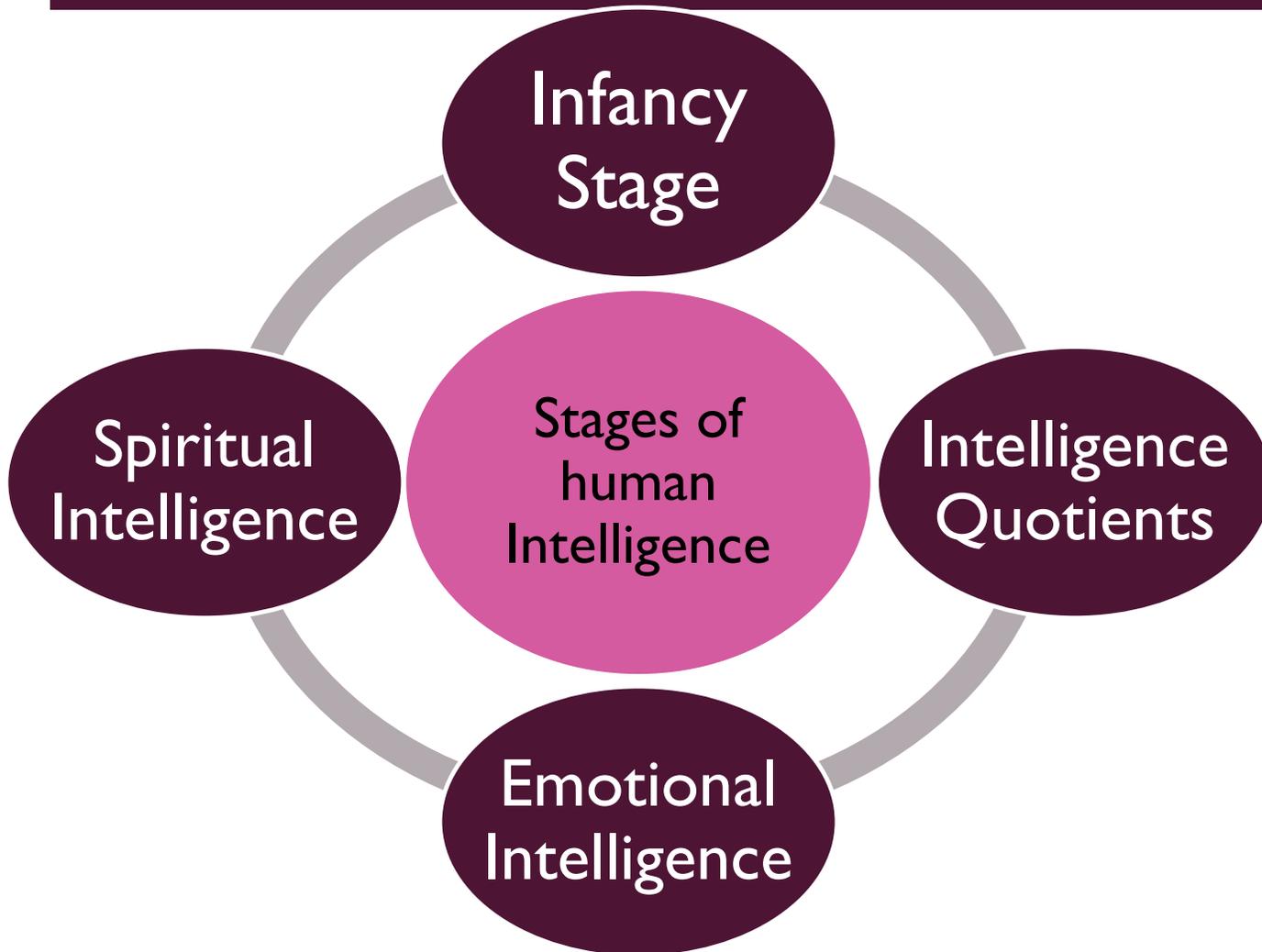
- Are you spiritually intelligent ???
- Can we have Artificial Intelligence ‘god’ ?



INTELLIGENCE IN MAN



EVOLUTION OF INTELLIGENCE IN MAN



WHAT IS SPIRITUAL INTELLIGENCE?

1 • **Spiritual Intelligence can be described as "the adaptive use of spiritual information to facilitate everyday problem solving and goal attainment" [78-79].**

2 • "Spiritual Intelligence is the set of abilities that individuals apply, manifest and embody as spiritual resources, values and qualities in ways that enhance their daily functioning and well-being" [77].

3 • Spiritual Intelligence can be described as "the ability of individuals to behave with wisdom and compassion, while maintaining inner and outer peace, regardless of the situation" [82].

WHAT IS SPIRITUAL INTELLIGENCE?

4

- **“Spiritual intelligence is an individual’s ability to utilize spiritual talents to know more; searching for meaning and analyzing existential, spiritual and practical issues” [83].**

5

- Spiritual Intelligence is “being concerned with the inner life of mind and spirit and its relationship to being in the world”. Thus creating a capacity for a deep understanding of existential questions and insight into multiple levels of consciousness [84].

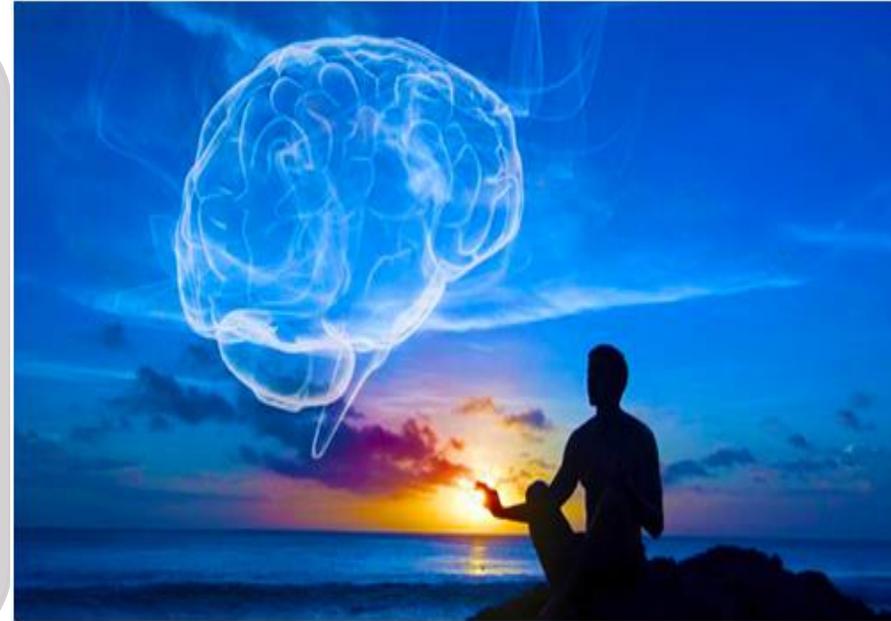
6

- “Spiritual intelligence can be described as a deep self-awareness in which one becomes more and more aware of the dimensions of self, not simply as a body, but as a mind, body and spirit” [42]

WHAT IS SPIRITUAL INTELLIGENCE?

Spiritual
Intelligence
involves:

- Inner knowing
- Deep intuition
- Oneness with nature and universe
- **Problem solving**



BENEFITS OF SPIRITUAL INTELLIGENCE

Increase in marital satisfaction

Increase in ability to tolerate others despite differences in beliefs and consciousness

Increase in entrepreneurial success

Allowing for individual motivation, intrinsically instead of extrinsically



DIFFERENCES BETWEEN SPIRITUALITY, RELIGIOSITY AND SPIRITUAL INTELLIGENCE

- **Spirituality is like searching for something sacred. It is a search for an experience that is meaningful within itself.**
- Intelligence, as we all know, is when we use a set of tools to arrive at a more productive, effective, happier, and ultimately more meaningful life.



DIFFERENCES AMONG SPIRITUALITY, RELIGIOSITY AND SPIRITUAL INTELLIGENCE

- A religious person is by all means different from a spiritual person.
- **We define a religious person as an individual who believe in God or gods to be worshipped, usually expressed in conduct and ritual.**
- In other words, such individual believes in many specific system of belief, worship, etc., often involving a code of ethics. In short, a religious person is an individual who believe in a set of beliefs and rituals that claim to get a person in a right relationship with God.
- A spiritual person can be described as a person who believe in the quality or fact of being spiritual, nonphysical or predominantly spiritual character as shown in thought, life, etc.; spiritual tendency or tone.
- **In a nutshell, a spiritual person is an individual who focus on spiritual things and the spiritual world instead of physical/earthly things.**



DEVELOPING SPIRITUAL INTELLIGENCE

1

- **Think about your goals, desires and how to bring your life into perspective and balance, and identify your values.**

2

- Access your inner processes and use visualization to see your goals, desires and wants fulfilled; and experience the emotion connected with this fulfillment.

3

- Integrate your personal and universal vision and recognize your connectedness to others, to nature, to the world and to the universe.

DEVELOPING SPIRITUAL INTELLIGENCE

4

- **Take responsibility for your goals, desires and wants.**

5

- Develop a sense of community by letting more people into your life.

6

- Focus on love and compassion.

7

- When chance knocks at your door, let it in and take advantage of coincidences”.



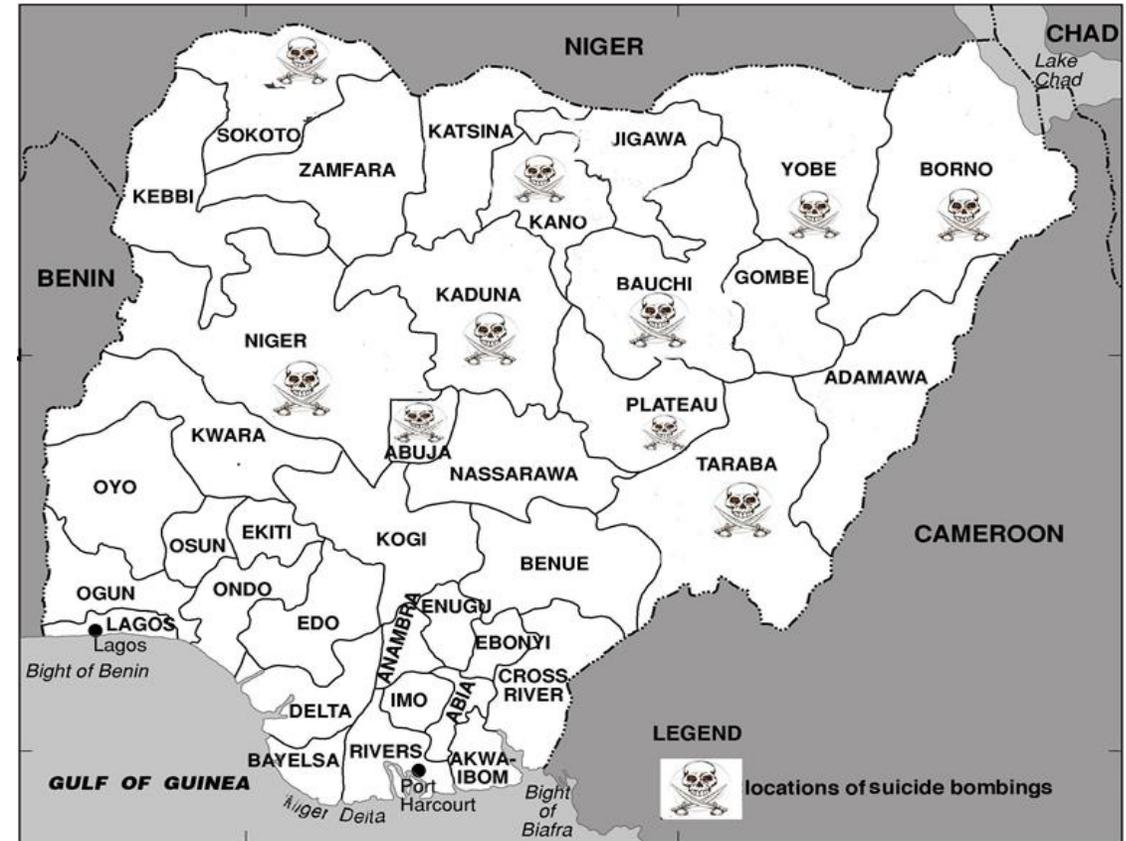
SPIRITUAL INTELLIGENCE: BEYOND MECHATRONICS ENGINEERING AND ARTIFICIAL INTELLIGENCE

- Spiritual Intelligence is based on the human emotion and conscious mental state while AI has to do with the ability to give human intelligence to machine.
- We will not be able to achieve AI if we are not in a good state of mind. **Hence, no innovation without inclusion of SI in our research**



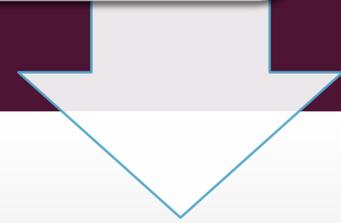
WHY THE FOCUS ON SPIRITUAL INTELLIGENCE?

- Spiritual Intelligence for National Integration and National Resource Control**



CONCLUSION

Everybody has a role to play in making this society a better place to live, technologically and spiritually.



There is need to be Mechatronically focused on what we bring to our society as the much-desired development around us.

RECOMMENDATIONS

Parents, You and Me

Management Team and members of staff of FUT Minna

Private Sector

Government



RECOMMENDATIONS

Parents, You and Me

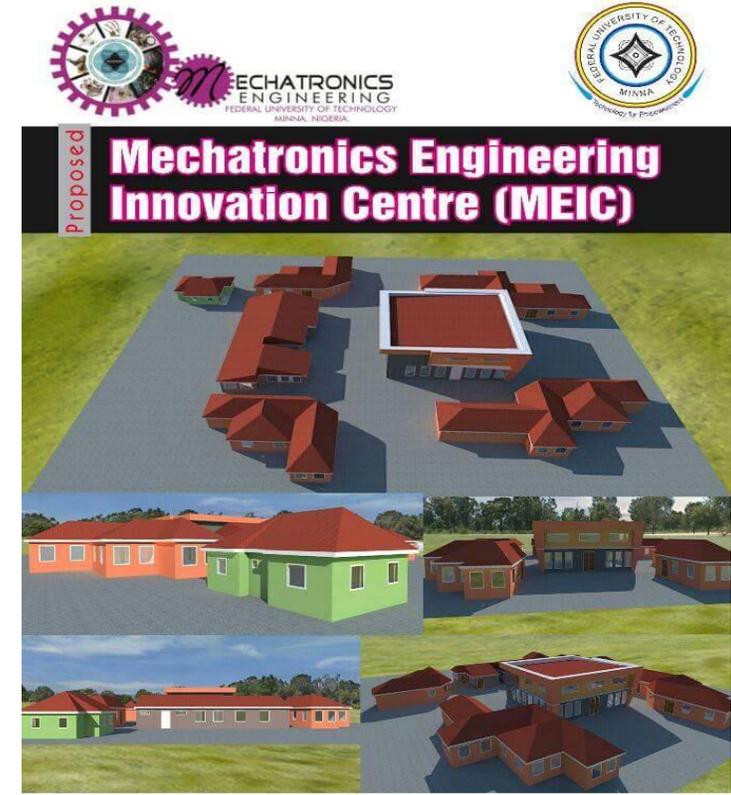
We can take advantage of children's love to play by buying educational toys that can contribute to the spirit of invention and creativity in them. However, let me put a caveat on the above statement. We should note that there are numerous ways of sparking creativity in our children, besides purchase of toys. For this reason, I will like to advocate the use of specialized toys or mechatronics devices in our various homes. In other words, we should not throw away those old or damaged appliances in our houses. Instead, let us use them to enhance the creativity and ingenuity in our children.



RECOMMENDATIONS

Management Team and members of staff of FUT Minna

Now, time has come for us to support the realisation of Mechatronics Engineering Innovation Centre (MEIC). The realisation of which will assist, within a period of five years, in transforming the proposed Mechatronics Engineering Innovation Centre to a School of Mechatronics Engineering and Technology (SMET), with the following departments:
Department of Autotronics; Department of Robotics;
Department of Signal Processing Engineering and
Department of Artificial Intelligence and Engineering.



Proposed Mechatronics Engineering Innovation Centre (MEIC)

Facilities Available at MEIC

- 12 Laboratories
- 2 Workshops
- 24 Standard Research Offices
- Business and Technology Incubation Centre
- Technology Museum and Gallery
- Conference and Discussion Rooms
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RECOMMENDATIONS

Private Sector

Private sector can take the lead in the field of Spiritual and Artificial Intelligence. Sponsoring of research activities in these areas should be likened to oil-exploration. However, unlike oil exploration where there is no certainty of success, in these two areas, success is staring at you in the face. You just need to take the first step and you are there.



RECOMMENDATIONS

Government:

There is urgent need for us to tame the duo of religious intolerance and technology decadence in this country. And there is no better way of doing this than the inclusion of Artificial Intelligence (AI) and Spiritual Intelligence (SI) in our educational agenda. This is only achievable when Government stops focusing on Science Technology Engineering and Mathematics (STEM). Rather we should start advocating for Spiritual Intelligence Technology Engineering Artificial Intelligence Mathematics and Science (STEAMS). With this, the problems of religious intolerance and technology decadence would be put to a final stop once and for all, and the much-desired technological advancement would then begin.



ACKNOWLEDGEMENT

Father Mother Foster Father Coach/Mentor Siblings Maternal Families In-Laws

SEET 2-ICs Pas Teachers Supervisors Professional Mentors Paternal Families

Research Groups Spiritual Mentors Omowunmi Togetherness My students

FUT Minna Families Bright Future Club MCE Spiritual Organizations Codel Family

Tech Cabal Colleagues Neighbours Ph.D Clinic IIUM Families Malaysia Families

School/Class Mates Dinarists NAF/NA Elders at FUT Minna

Present FUT Minna Management Past FUT Minna Management

Daughters

Wife



THANK
YOU

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