Elementary Requirements for Smart Devices Designs and Development inan Emerging Economy.

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ABSTRACT
Considering the growing need and applications of smart devices in our society today, the need to shift more focus on automation and smart devices designs has become so unarguable and glaring.This work tends to explore the affordable, easy and elementary rudiments of developing smart devices. Smart devices learning and development is a branch of mechatronics engineering technology, which is scantily practised in a developing economy like Nigeria that obviously lacks the advanced and modern technology to solve complex human problems. In this work, what is needed, the programing languages, circuit diagram drawing and some examples of useful smart devices are discussed. Furthermore, the applications and trainings firms for smart devices are also discussed.
Keywords: Smart device, programing language, circuit diagram, trainings, applications.

I. INTRODUCTION

Smart devices can be described as an electro-mechanical or mechatronics devices that interacts with other devices or networks through a wireless or remote control means. These gadgets are generally small simple and mobile though limited in range of operations depending on the programming. This is otherwise called intelligent devices that can interpret complex information and control complex objects timely and accurately. They have wide range of applications in homes, industries, hospitals, labs/workshops etc. helping to improve efficiency and optimization of operations.

This is often wired through electronic devices capable of performing and interpreting autonomous computing and connecting to other gadgets for data exchange and controls. It comprises of three main features, which includes connectivity, context-awareness and autonomous computing.

Nowadays, we have smart homes, workshops and laboratories, electro-mechanical systems like smart automobiles (self-driven), airplanes, trains, refrigerators, smart locks, security, smart phones etc. Smart home products like smart Thermostats; have been known to save its users an average of 20% in yearly warming and cooling costs. According to a study conducted by SafeAtLast, 57% (bioenergyconsults.com) of American smart homeowners save about 30 minutes per day. Automating your home will save you lots of time and effort in the process.

The evolution and high patronage that welcomed mechatronics devices has led to the wide application of smart devices. This also informs the reason why many developing countries are investing in the study and research of mechanical, electronics, embedded systems and computer integration.

Aim: The aim of this work is to break down simple steps involved in developing smart devices. This is mostly important for students, entrepreneurs, start-ups, and teachers. It is an abc steps to the developing of these devices for everyday uses and applications. It will also help students to design and construct smart devices in simple laboratories and workshops for project works and exhibitions.

II.   METHODOLOGY

This addresses some common salient questions as regards to the development of smart devices. The following main questions below are addressed:

- Basic needs for the development of smart devices.
- The programming language for the building of smart devices.
- How to draw the circuit diagrams for smart device designs. Etc.

The basic needs for the development of smart devices are as listed below.
  i.   Simple workshop or laboratory.
  ii.   Microcontroller/electronic components.
  iii. Arduino IDE software.

2.   Frequently used circuit symbols:

Cell   Battery   Wire   Resister   Switch 1P   Ammeter   Voltmeter   Motor   Lamp   Lamp 2

Definition of the terms above:

Cell: A cell stands for electrical energy supply. A single cell is often called a battery, but strictly, a battery is two or more cells joined together. A long and a short parallel line represent it.

Battery: A battery is more than one cell. The larger terminal (on the left) is positive (+). It is represented by a collection of long and short parallel lines.

Wire: Pass current from one part of the circuit to another. It is a connecting wire between two components.

Resister: A resister is used to restrict the flow of a current. It is represented by a zigzag line.

Switch: An on-off switch allows current to flow only when it is in the closed (on) position. It is generally represented by providing a break in a

The programming languages are:
  i.   Python language
  ii.   C++/C# language
  iii. Java.

To be able to draw a circuit diagram, one needs to understand the following below:

1.   **What is Circuit diagram**? Circuit diagrams illustrate how electrical circuits are composed. It consists of electrical connections, power sources, switches, wire joints, etc. Professionals, teachers use circuit diagram to design, construct, and maintain circuits in electrical devices, rooms or structures. Students are also taught how to use electrical diagrams to understand basic principles of power and electricity.

straight line by lifting a portion of the line upward at a diagonal.

Ammeter: An ammeter is used to measure current. It is represented by a letter 'A' in a circle.

Voltmeter: A voltmeter is used to measure voltage. It is represented by a letter 'V' in a circle.

Motor: A transducer converts electrical energy to kinetic energy. It is represented by a letter 'M' in a circle.

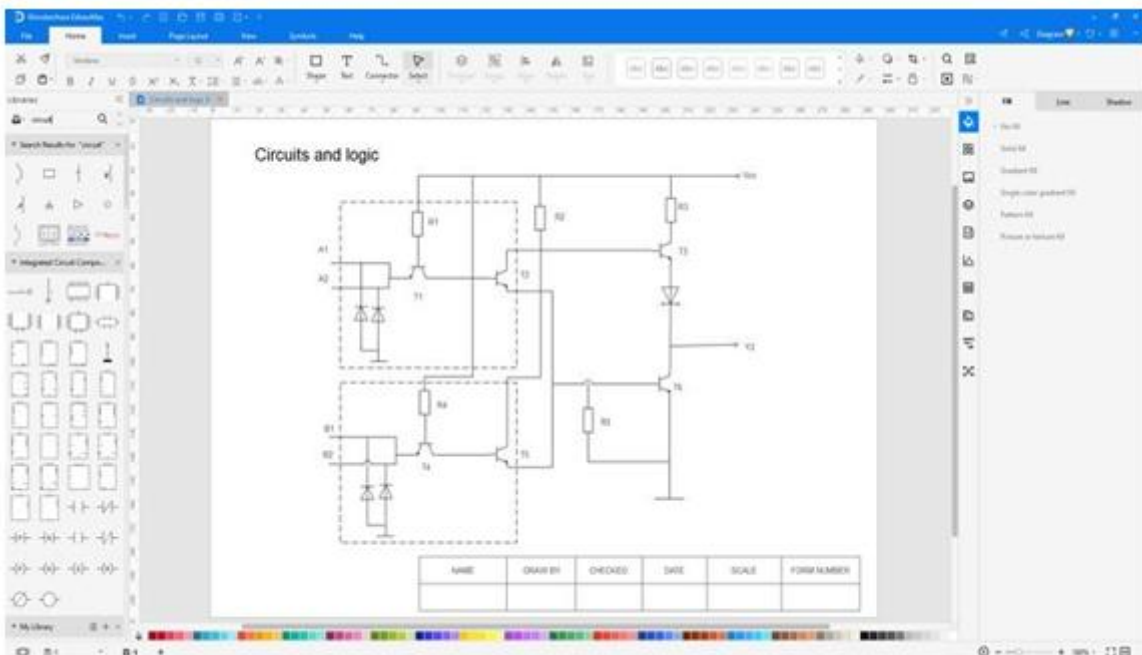**Lamp**: A transducer, which converts electrical energy to light.

3.   The following easy steps below can help one effortlessly make or draw a circuit diagram.
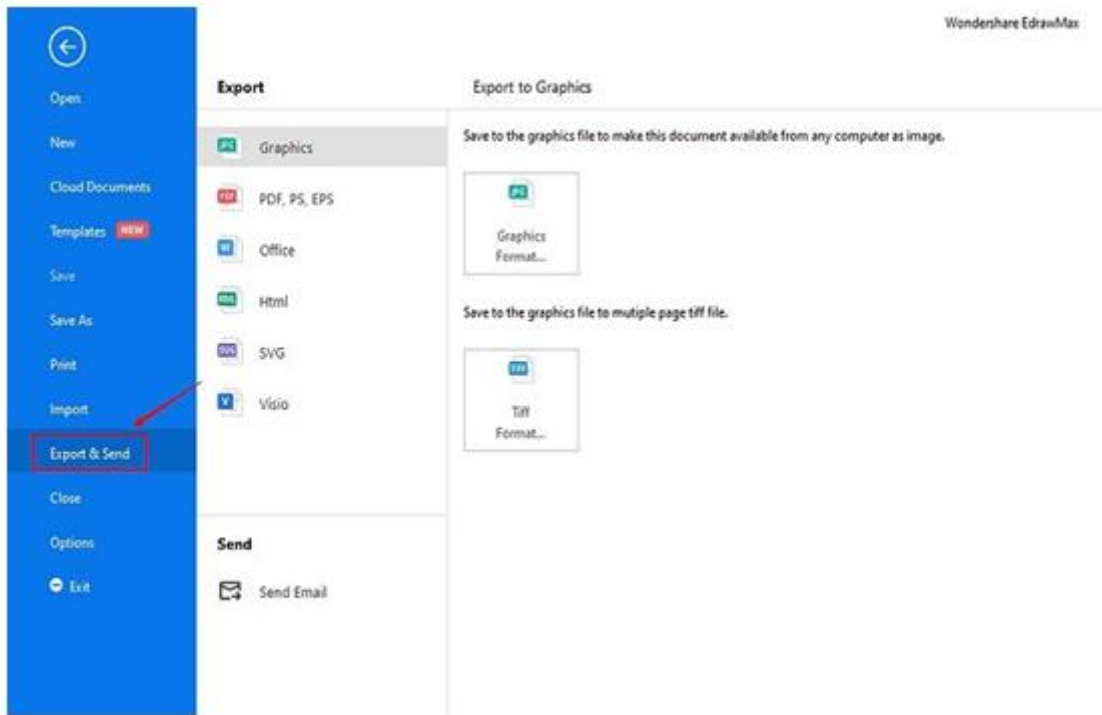Step 1: Download EddrawMax
Step 2: Start EdrawMax ; Navigate to [New] > [Electrical Engineering] > [Circuits and Logic.
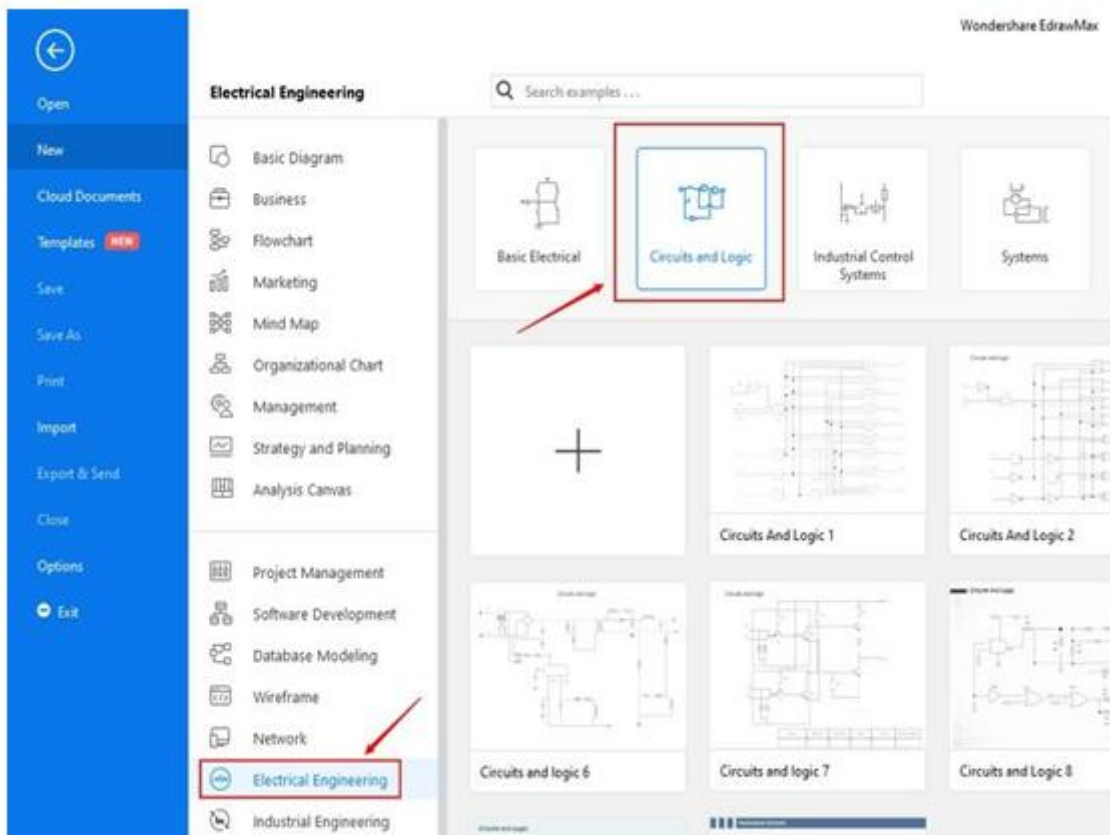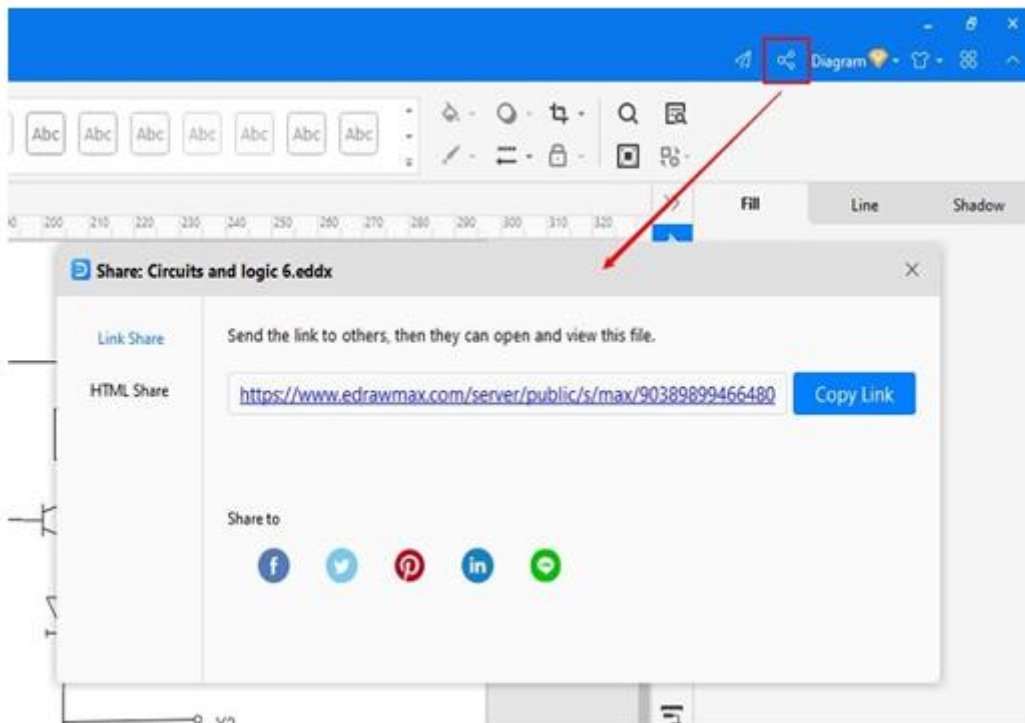
Step 3: Select one circuit diagram template to edit on it or click the [+] sign to start from scratch.
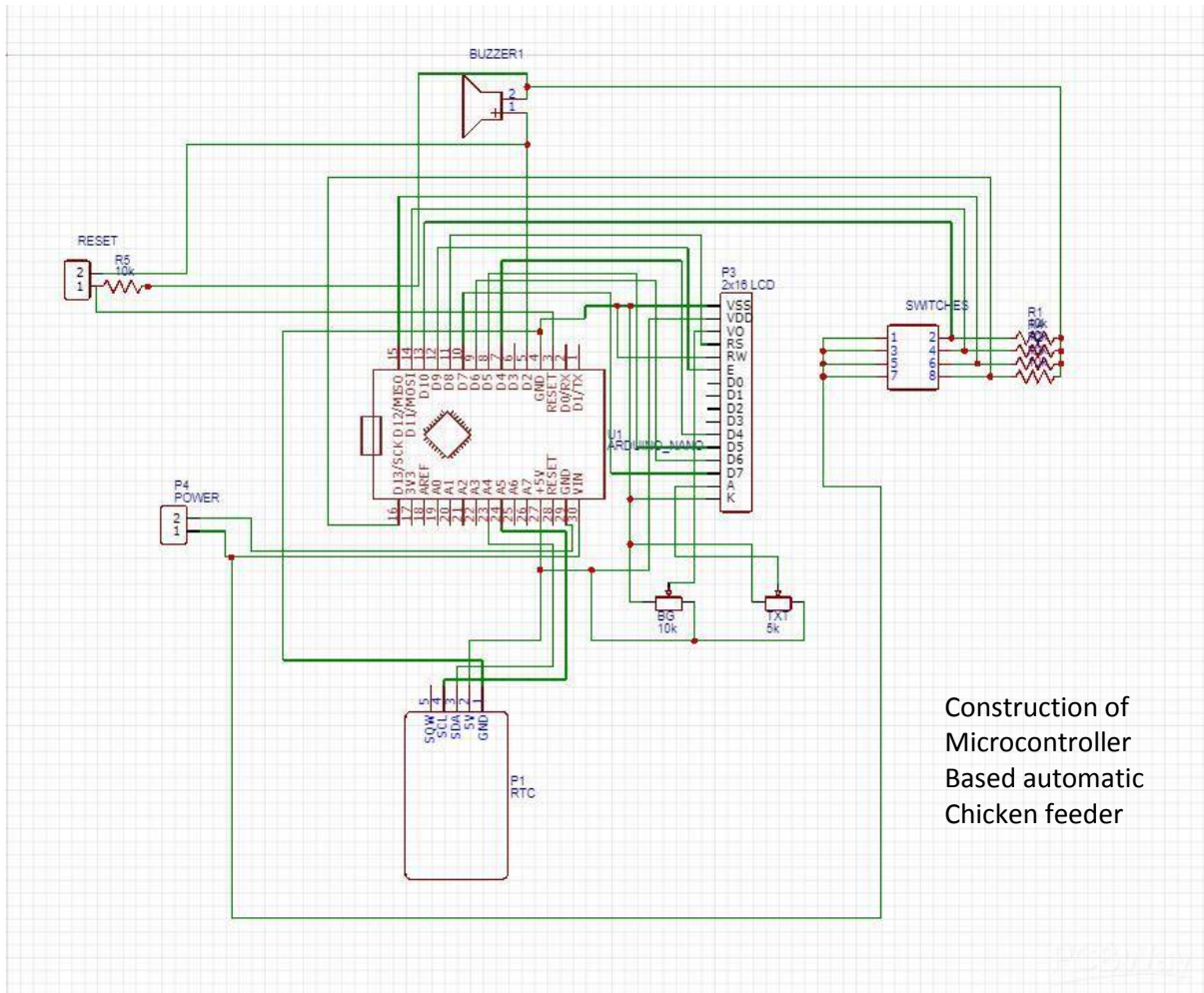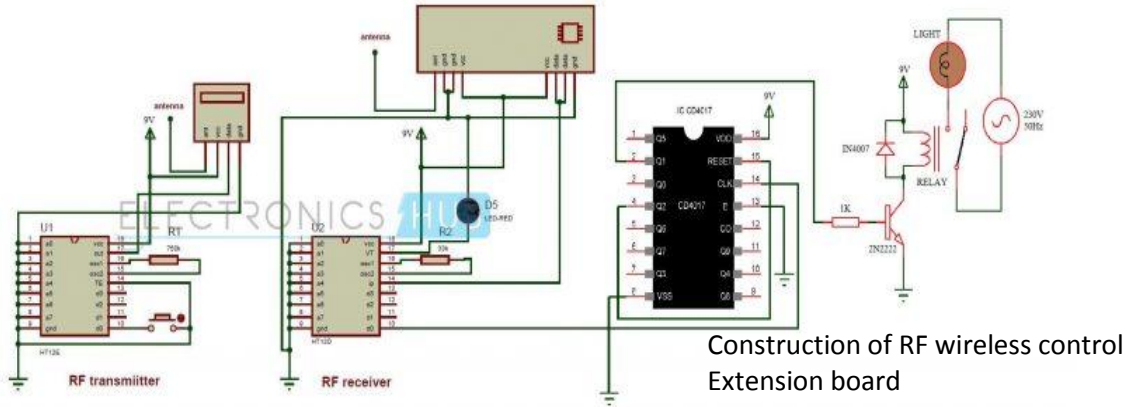
Step 4: You can export the file to Graphics, PDF, editable MS Office file, SVG and Visio vsdx file.
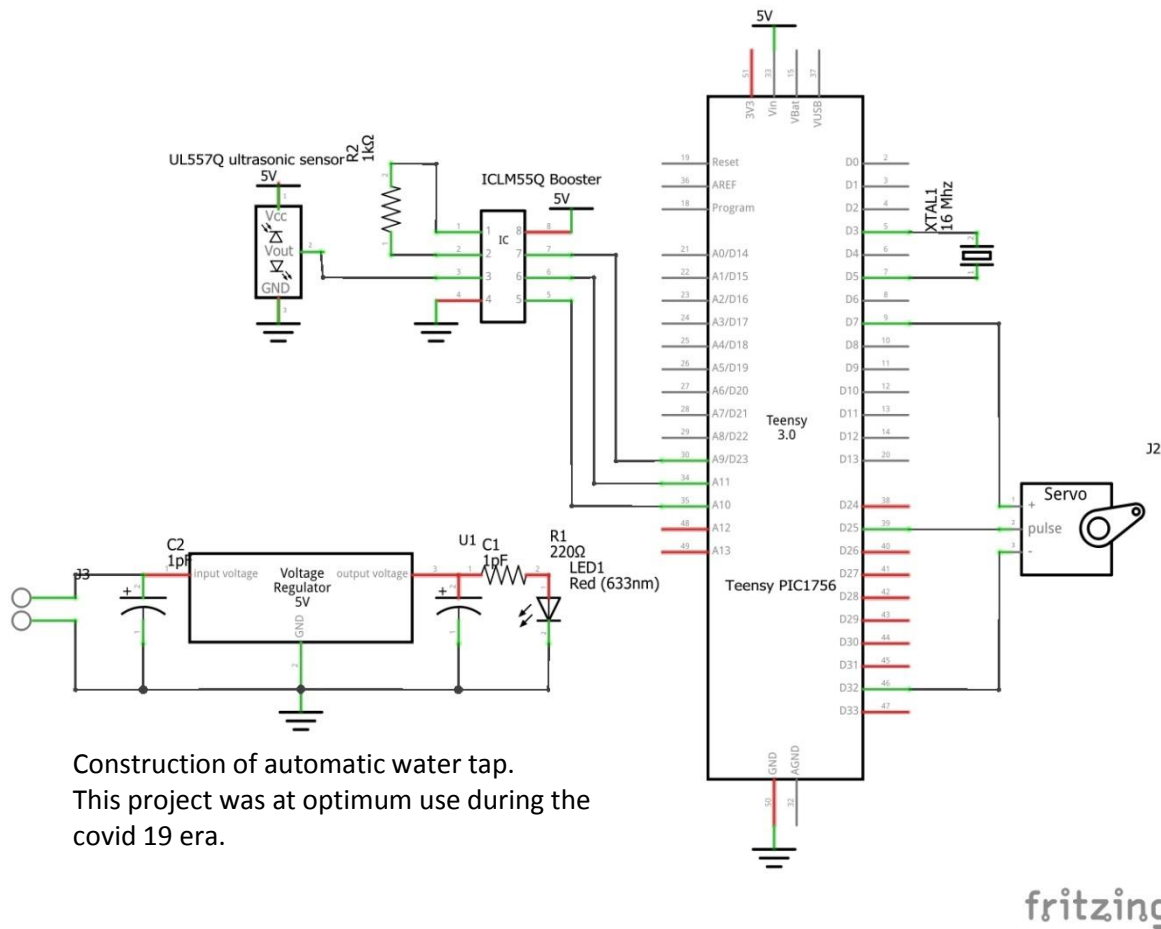

Step 5: And you can share your diagram with others via social media and online website page.

The followings below are some examples of circuit diagrams of some smart devices.

Construction of RF wireless control
Extension board

Construction of
Microcontroller
Based automatic
Chicken feeder

Construction of automatic water tap.
This project was at optimum use during the covid 19 era.

Examples of some mechatronics projects: this can be classified into three basic classes namely automatic control systems, robotics and smart security systems.

Automatic control systems: some examples of automatic control systems are as follows below:
- ✓ Construction of Traffic Light System
- ✓ Construction Automatic Street Light System
- ✓ Construction of Automatic Based Triggering Timing System
- ✓ Construction of Light Sensor Control System
- ✓ Construction of Dark Sensor Control System
- ✓ Construction of Automatic Smoke/Gas Alarming System
- ✓ Construction of Automatic Knock Lock Door System
- ✓ Construction of Automatic Based Water Tap
- ✓ Construction of Mind/Brain Control System
- ✓ Construction of Automatic Door Opening System
- ✓ Construction of Finger Print Access Door System
- ✓ Construction of Keypad Button Door Access System

- ✓ Construction of Card Tag Door Access System
- ✓ Construction of Multi Access Security Door System
- ✓ Construction of Automatic Dust Alarming System
- ✓ Construction of Live Temperature and Humidity Monitoring System
- ✓ Construction of Egg Incubator System
- ✓ Construction of Microcontroller Text Display Board
- ✓ Construction of Plant Moisture Monitoring System
- ✓ Construction of Automatic Water pump and Levelling System
- ✓ Construction of Ultrasonic Based Distance Measuring System
- ✓ Construction of Rain Detecting System
- ✓ Construction of Bluetooth Based Text Scroller Board
- ✓ Construction of Wireless Weather Station
- ✓ Construction of Colour Sorting Machine
- ✓ Construction of Automatic Product Counting Machine
- ✓ Construction of Voice Control Home Automation System

- ✓ Construction of Smart GSM Home Appliance Control
- ✓ Construction of GSM Based Irrigation Automation System
- ✓ Construction of Heart Beat Monitoring System

Robotics: some examples of robotics projects and designs are as follows below:
- ✓ Construction of Colour Detector Robot
- ✓ Construction of Industrial Arm Robot
- ✓ Construction of Wireless Controlled Robot Human Hand
- ✓ Construction of Wireless Control Drone
- ✓ Construction of Automatic Following Wheeled Robot
- ✓ Construction of Spider Walking Robot
- ✓ Construction of Smartphone Control Robot Spider
- ✓ Construction of Radio Frequency Based Control Wheeled Robot
- ✓ Construction of Gesture Motion Controlled Wheeled Robot
- ✓ Construction of Smartphone Control Arm Robot
- ✓ Construction of TV/DVD Remote Control Wheeled Robot
- ✓ Construction of Line Following Wheeled Robot
- ✓ Construction of Obstacle Avoiding Wheeled Robot
- ✓ Construction of Obstacle Avoiding/Line Following Wheeled Robot
- ✓ Construction of Automatic Solar Tracking Robot
- ✓ Construction of Colour Sorting Robot

Smart security systems: some examples of smart security system projects are as follows below:
- ✓ Construction of GSM Based Motion Security System
- ✓ Construction of PIR Based Security System
- ✓ Construction of RFID Card Tag Access Security Door System
- ✓ Construction of Finger Print Access Door Security System.

Training Firms: Apart from conventional higher institution trainings in the areas of mechatronics engineering technology, it is so important to seek more knowledge and exposure in industrial based studies. This will help trainees and students to gain more practical knowledge in the design and applications of thess systems. Considering the nature of African societies and technological markets which is characterised by poor infrastructure, funding, experts and hi-tech companies, the knowledge of smart device designs

can be cheaply gotten from the following channels below.
- • Books on circuit designing (5 easy steps to a smart home by jeff ward)
- • Online course i.e. (EDX.org, Youtube)
- • Arduino website (arduino.cc)

III. RECCOMMENDATIONS
This work is highly simplified for beginners in mechatronics systems. It contains easy steps for designs and construction of smart and other simple mechatronics devices. This is work is recommended for students, trainers, trainees, teachers and professionals in the areas of electronics, mechanical, automation system designs.

IV. APPLICATIONS AND CONCLUSION
Smart devices have wide applications in security units, hospitals, labs, industries, homes, churches and high risk areas.
The prospect of smart devices and development is high in the emerging economy and society, therefore, the government and other interest groups especially in Africa and other developing economies should increase funding in this area. Awareness should increase while more should be encouraged to go into it considering the easy steps of learning it this work has been able to achieve.

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