# SIMULATION FOR POWER CABLE MONITORING ROBOT

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**Abstract -** *Preventive maintenance of the system can solve many fore coming problem. This same condition applies for the power cable. Power cable are life line of the any developing nation it support it critical infrastructure. Power line is so important is some remote area that the entire economic and daily life of that region is depend on that single line. Hence to provide it security and safety the preventive maintenance play an important part in system. Due to this resign this robotic system is design so that it can ensure the preventive maintenance of the system. This robotic system is manly included with the number of sensor and the two joint robotic arms which can operate in harsh environments for the measurements of the power cable. This robotic system mainly have the compact size and multiple robotic arm so that the detail and independent observation can be done by the system. It will not only provide with the real time data but also help greatly in preventive maintenance. Due to it single wheel assembly and two independent robotic arm it has less dynamic limitation and observe freely. This system also has the independent remote controlling system so that the maximum amount of protection provide to the operator.*

***Key Words*: Robotic arm, Sensor box, Independent wheel assembly, Multiple, Real time data, Independent remote controlling system.**

## 1. INTRODUCTION

Power cable monitoring system mainly includes the mechanical assembly system and electrical system, which are mainly simulated in the end results. This end simulation system mainly represent the amount of net operation perform by the system and the parameter which are places in the system.

## 2. MECHANICAL ASSEMBLYOF SYSTEM

Following are the some of the main elements of the robotic system.

### 2.1 MECHANICAL FRAME

Mechanical frame the main supporting system. This mechanical frame is design such as the system should have the less amount of the weight. And the system should be providing the maximum amount of surface for system to provide the detail attachment of various components.

### 2.2 INTERNAL WHEEL SYSTEM

Internal wheel system mainly consists on the internal wheel which is mainly connected to the Dc motor. The common shaft system is providing in the system where the Dc motor is mainly provide the torque for the motion of the system.

### 2.3 ROBOTIC ARM SYSTEM

This system is mainly providing the two robotic arm which is the three joint robotic arm. Where due to number of joint system and the design of system each robotic system can operated in the all directions.

Following are the main mechanical assembly of the system.

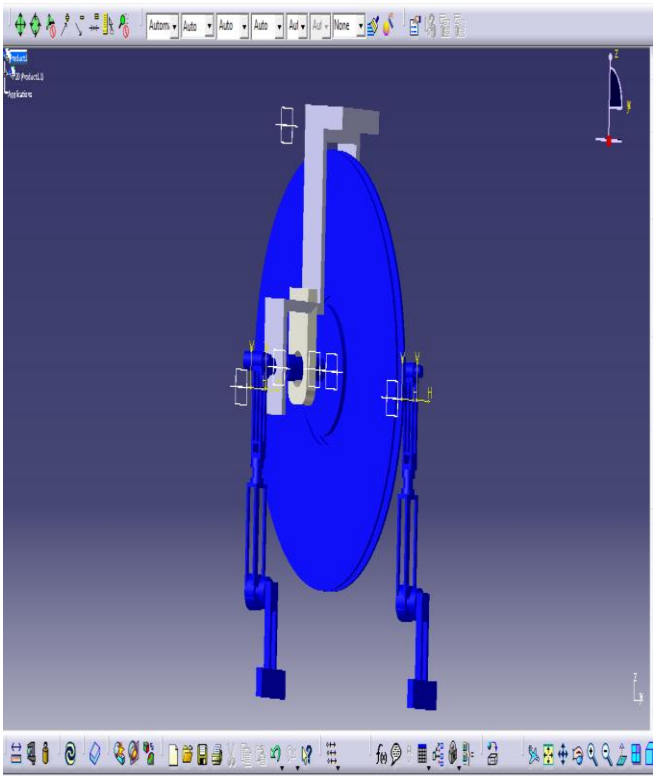

Fig- 1 Mechanical system

## 3. ELECTRICAL ASSEMBLY OF SYSTEM

Following are the main elements of the electrical system.

### 3.1CONTROLLING UNIT FOR THE ROBOTIC ARM

Controlling unit for robotic arm system mainly control the two different robotic arm system. This system mainly consists of the controller and the communication devices and the net amount of motor system which is mainly connected in the robotic arm joint.

### 3.2 CONTROLLING UNIT FOR THE INTERNAL WHEEL SYSTEM.

Controlling unit for the internal wheel mainly consists the Main controller which is mainly connected in the communication devices and the Dc motor .This dc motor is mainly responsible for the motion of the system.

### 3.3 CONTROLLING UNIT FOR THE SENSOR BOX SYSTEM

Sensor box mainly consists of the four main types of the sensor which are the heat, ultraviolet, ultra meter and the smoke sensor. This system provide the real time data of the Power cable system.

Following is the net circuit diagram of system.

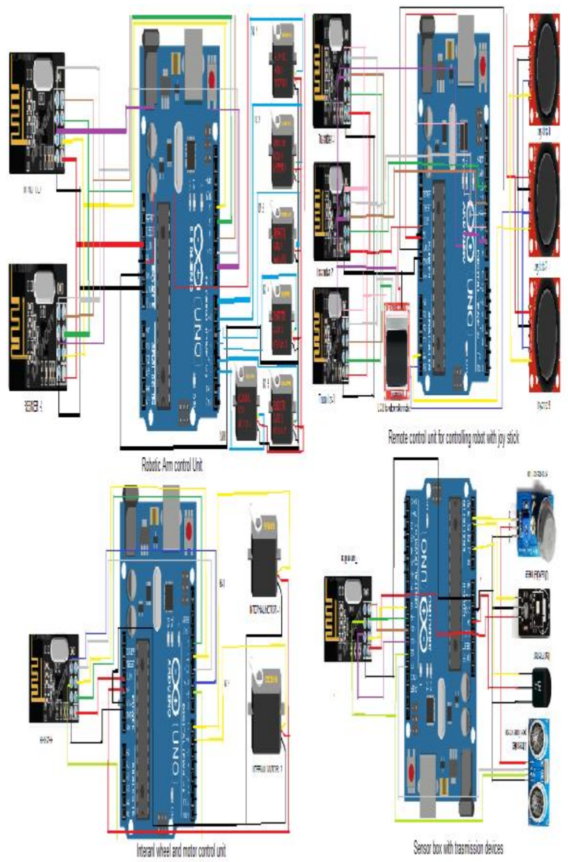


Fig 2-circuite diagram of system

## 4. SIMULATION AND RESULTS OF SYSTEM

Following are the main system simulation.

### 4.1 SIMULATION FOR THE ROBOTIC ARM SYSTEM OF X AXIS MOTOR

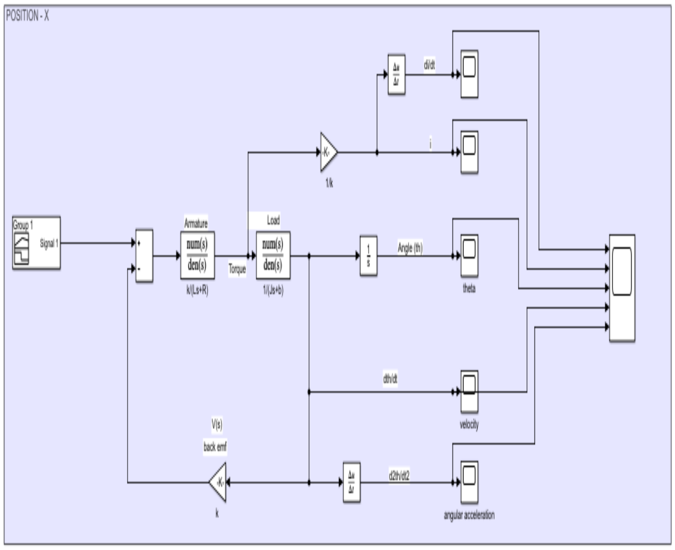


Fig 3 Simulation of the X axis motor of robotic arm system.

This system is mainly a close loop feedback system where the net amount of value provided to the armature and load block is mainly decide by the input signal system. As shown in the system the Armature winding is mainly represent by the following equation,

Armature current value = k (Ls +R)

In this equation the Ls represent the Inductances value of the armature winding and the R is represent the net amount of resistances present in the armature winding of the servo motor.

Now the net amount of torque is provide to the load system which is represent by the

Load= 1/( Js+ b)

Now in this system the mainly Js represent the net amount of length of the link and the represent the angle for the motion of link system. As the system is mainly the close loop system so that the feedback for the system is mainly Vs which is denoted in the –K because the direction is in the backward direction.

Now to obtain the net amount of total angle of Theta which is the angle of operation for the motor system then there in the integral vale is provide in the system which is denoted by the 1/S. Hence by providing the integral factor to the load output of the system it will denote the angle of operation for the link for each signal.

For obtain the Angular velocity of the system the net Derivate factor is provide to the load output system. Hence it wills given by the dTh/dT which mainly represent the net amount of angular acceleration.

Which is

Velocity = (d Th/dT)

Where the Th-angle of theta

T –amount of time

And angular acceleration of the system is

(d velocity/dT)

Where the velocity is (d Th/dT) putting vale in equation

(d 2Th/d2T)

Hence by providing the different signal input and output of the system it will show the net amount of angular acceleration for the motor. The net result of the system is following diagram.

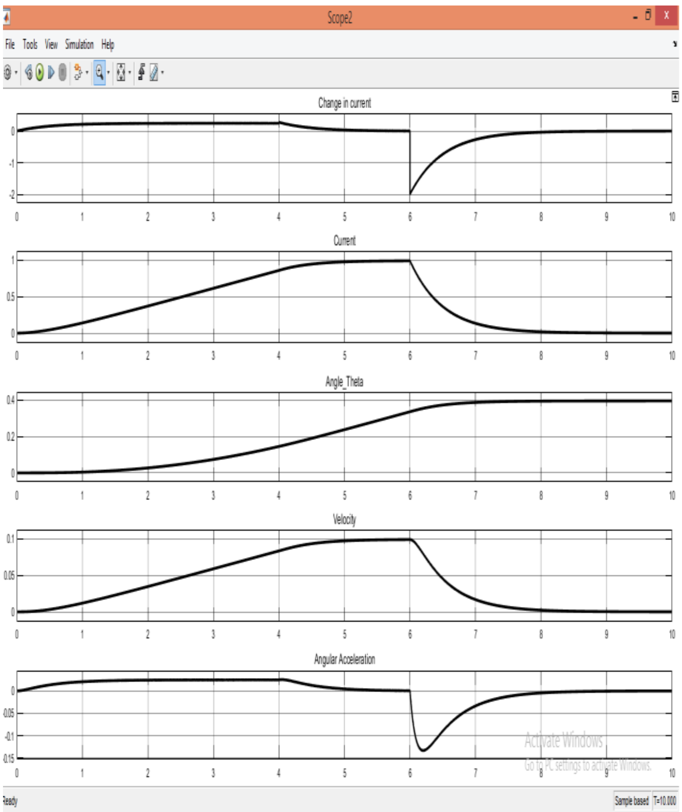


Fig 4 Simulation result of X axis motor of robotic arm

### 4.2 SIMULATION FOR THE ROBOTIC ARM SYSTEM OF Y AXIS MOTOR

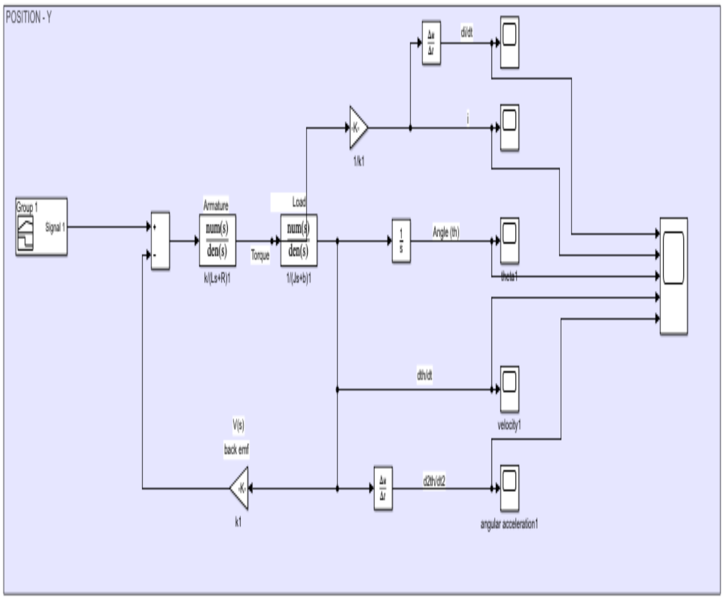


Fig 5 Simulation of the Y axis motor of robotic arm system.

This system mainly represents the servo motor system which is places in the second joint of the robotic arm system. This system is mainly a close loop feedback system where the net amount of value provided to the armature and load block is mainly decide by the input signal system. As shown in the system the Armature winding is mainly represent by the following equation,

Armature current value = k (Ls +R)1

In this equation the Ls represent the Inductances value of the armature winding and the R is represent the net amount of resistances present in the armature winding of the servo motor.

Now the net amount of torque is provide to the load system which is represent by the

Load= 1/( Js+ b)1

Now in this system the mainly Js represent the net amount of length of the link and the represent the angle for the motion of link system. As the system is mainly the close loop system so that the feedback for the system is mainly Vs which is denoted in the –K because the direction is in the backward direction.

For obtain the Angular velocity of the system the net Derivate factor is provide to the load output system. Hence it wills given by the dTh/dT which mainly represent the net amount of

Angular Theta with the net amount of time. Hence by adding the derivative factor for the load output system the velocity of the each signal can be obtained. For the angular acceleration of the system the double derivate block is provide to the output of the load system.

Which is

Velocity = (d Th/dT)

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Hence by providing the different signal input and output of the system it will show the net amount of angular acceleration for the motor Following are the net output of the system.

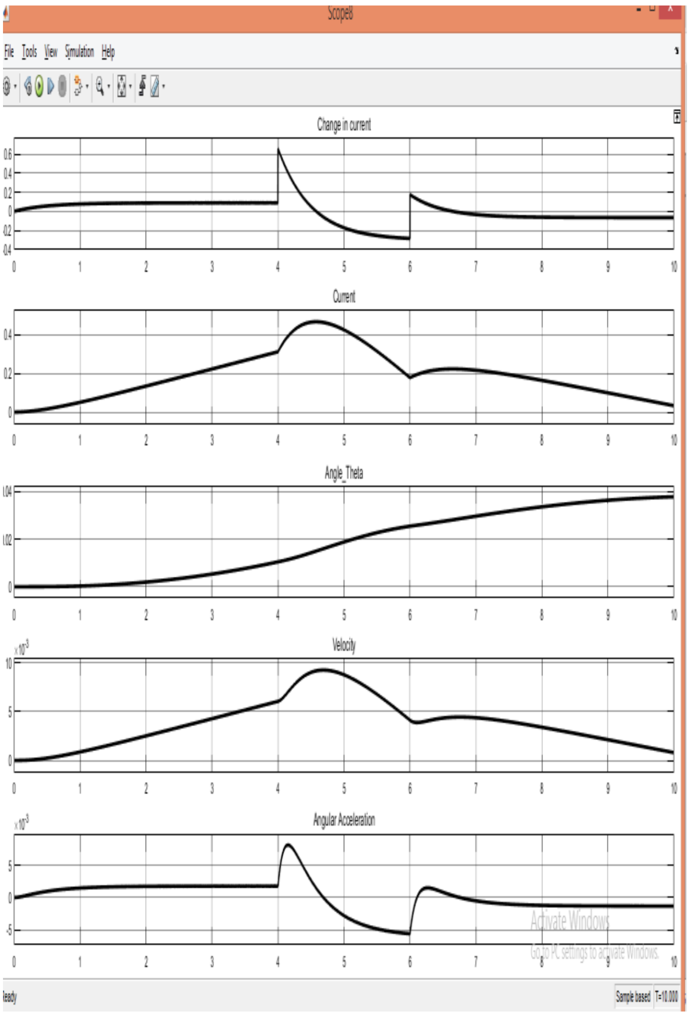


Fig 6 Simulation result of Y axis motor of robotic arm

### 4.3 SIMULATION FOR THE ROBOTIC ARM SYSTEM OF Z AXIS MOTOR

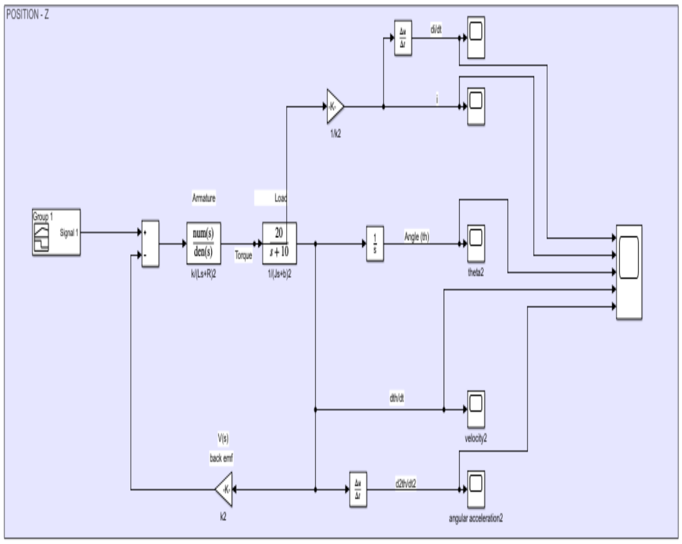


Fig 7 Simulation of the Z axis motor of robotic arm system.

This system mainly represents the servo motor system which is places in the second joint of the robotic arm system. This system is mainly a close loop feedback system where the net amount of value provided to the armature and load block is mainly decide by the input signal system. As shown in the system the Armature winding is mainly represent by the following equation,

Armature current value = k (Ls +R)2

In this equation the Ls represent the Inductances value of the armature winding and the R is represent the net amount of resistances present in the armature winding of the servo motor.

Now the net amount of torque is provide to the load system which is represent by the

Load= 1/( Js+ b)2

Now in this system the mainly Js represent the net amount of length of the link and the represent the angle for the motion of link system. As the system is mainly the close loop system so that the feedback for the system is mainly Vs which is denoted in the –K because the direction is in the backward direction.

Now to obtain the net amount of total angle of Theta which is the angle of operation for the motor system then there in the integral vale is provide in the system which is denoted by the 1/S. Hence by providing the integral factor to the load output of the system it will denote the angle of operation for the link for each signal.

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Which is

Velocity = (d Th/dT)

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Hence by providing the different signal input and output of the system it will show the net amount of angular acceleration for the motor Following are the net output of the system.

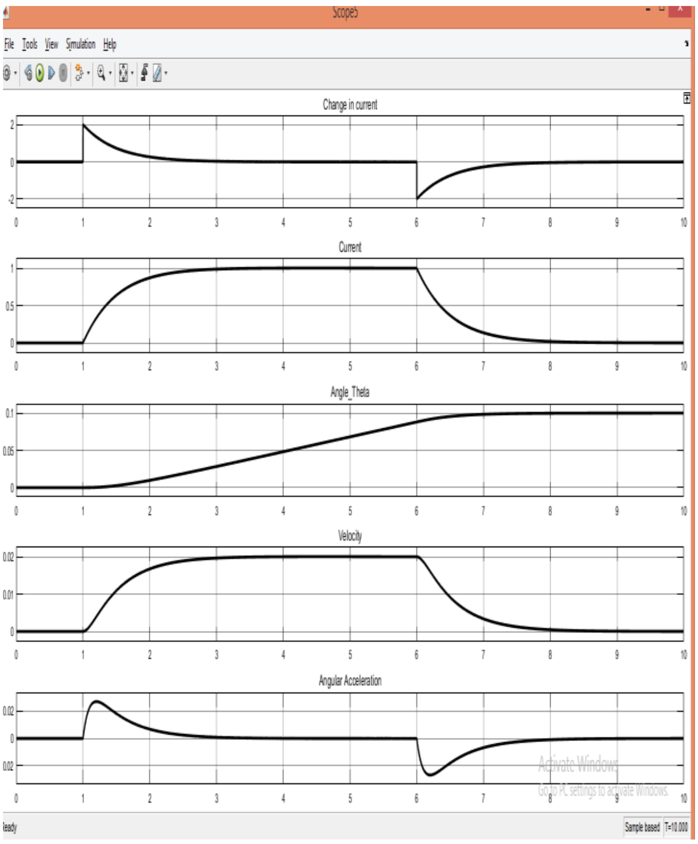


Fig 8 Simulation result of Z axis motor of robotic arm

### 4.4 SIMULATION FOR THE INTERNAL WHEEL SYSTEM

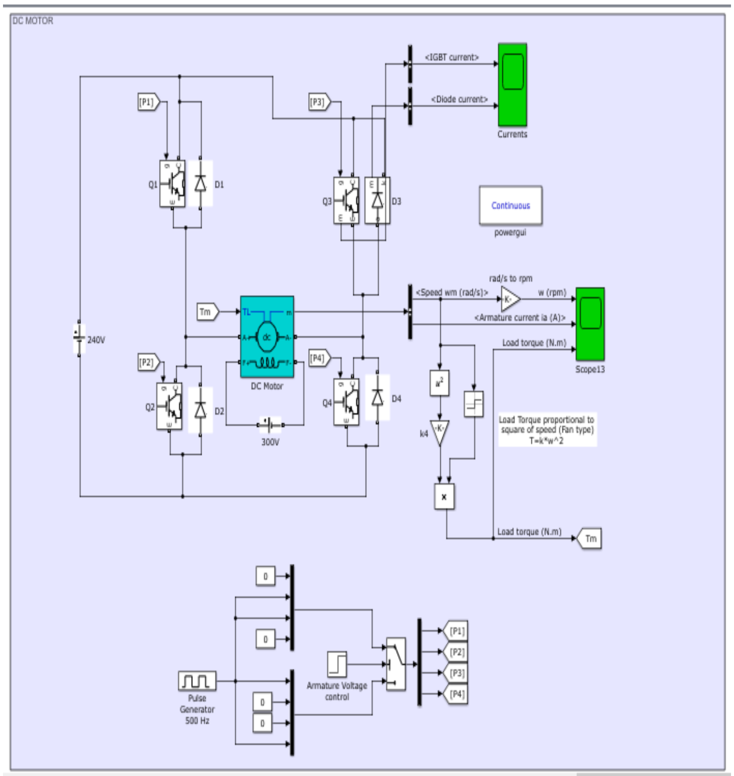


Fig 9 simulation of the internal wheels system.

The motion of the system mainly control by the IGBT provide to the system which are mainly place in the system in the H bridge configuration system. As shown in the system there are mainly four main IGBT system are provided which are set P1,P2, P3,P4. For the control of the motion of system. The mainly two pair of IGBT will operate in the same format in this case the pairs are The P1 ,P4and the P2,P3 this are the two pairs which will operate in the same manner so that the net amount of current direction for the system can be control.

For the forward motion for system the mainly P1and P4 IGBT will operate it will create the current flow in the upward direction which will result in the forward motion for the system. Whereas the P2and P3 will opera for the backward motion of system. Following table will denoted the operation system for the motor.

| Condition of motor | P1 and P4 | P2 and P3 | Direction of motion |
|---|---|---|---|
| A | 1 | 0 | Forward |
| B | 0 | 1 | Backward |
| C | 1 | 1 | Still position. |
| D | 0 | 0 | Stationery |

For the operation of A condition which is the forward motion of the system where the IGBT P1and P4 are active system will act in the forward direction. For the condition B where the IGBT p2and P3 will be active and the system will act in the backward direction. The condition C where both system are active will the system remain in no movement but this condition is dangers for the motor because the over current can damage the system. Where in the D condition the system where the both system are in the enactive condition the system will be at the constant position.

Following are the simulation results for the internal motor system.

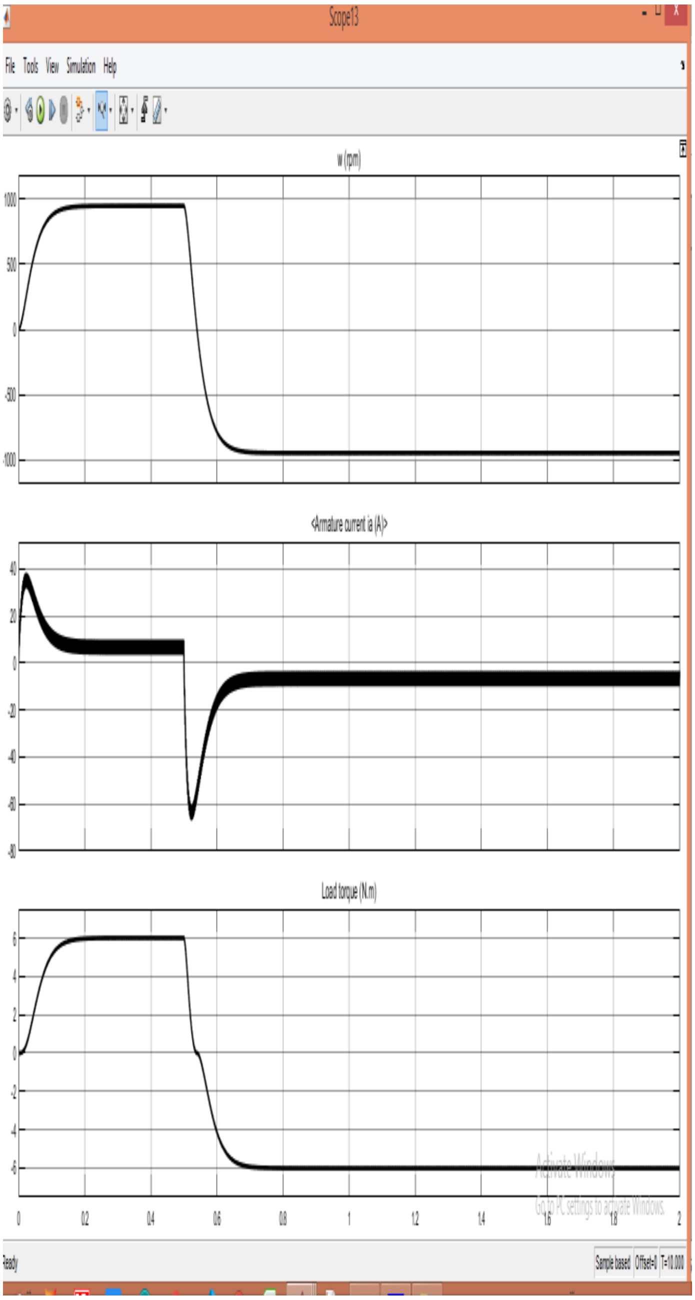


Fig 10 simulation results of the internal wheels system

### 4.5 SIMULATION FOR THE SENSOR BOX SYSTEM

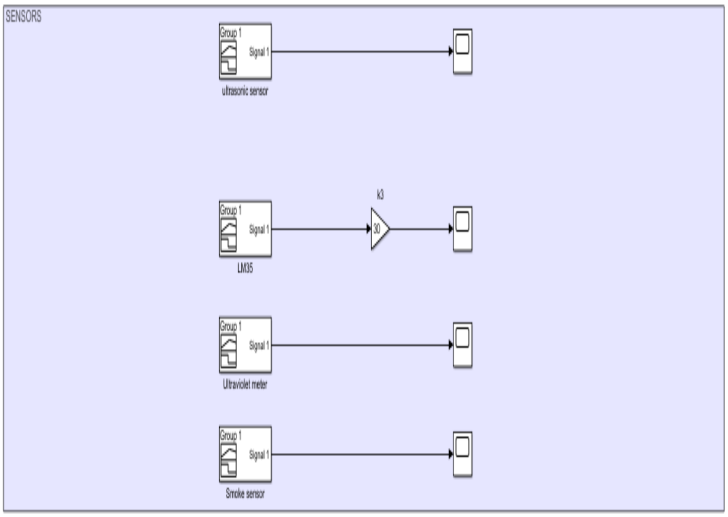


Fig 11 simulation of the sensor box system.

As the diagram show there are mainly four sensors are provided in the system where this sensor are places in the sensor box which will provide the detail information of the parameter. Ultraviolet sensor mainly provides the information of the heat and the ultraviolet signal produces by the cable system. Whereas the heat sensor will provide the heat detail of the cable system. Smoke sensor will provide the detail of the smoke factor which is produces in the power cable system. Following are the simulation result of the system.

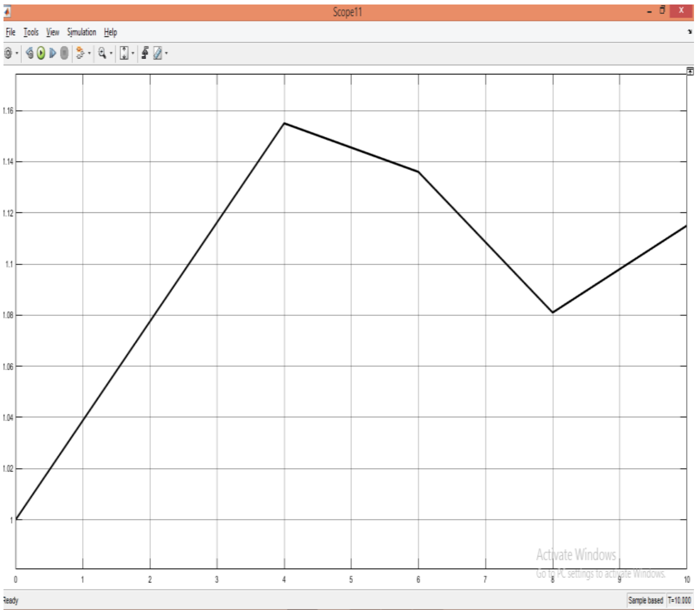


Fig 12 simulation results of Ultraviolet sensor system

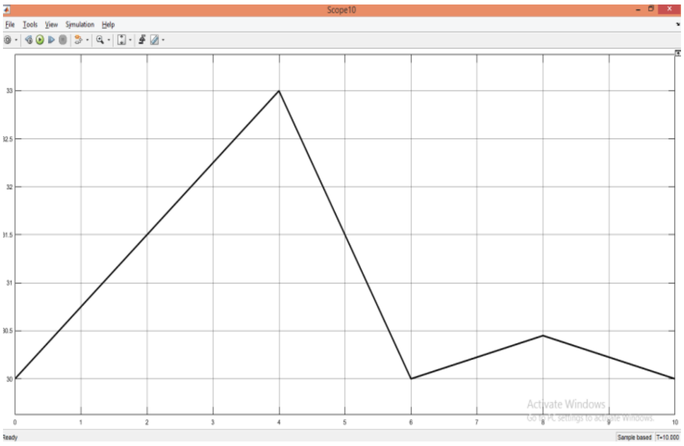

Fig 13 Simulation results of Heat sensor system

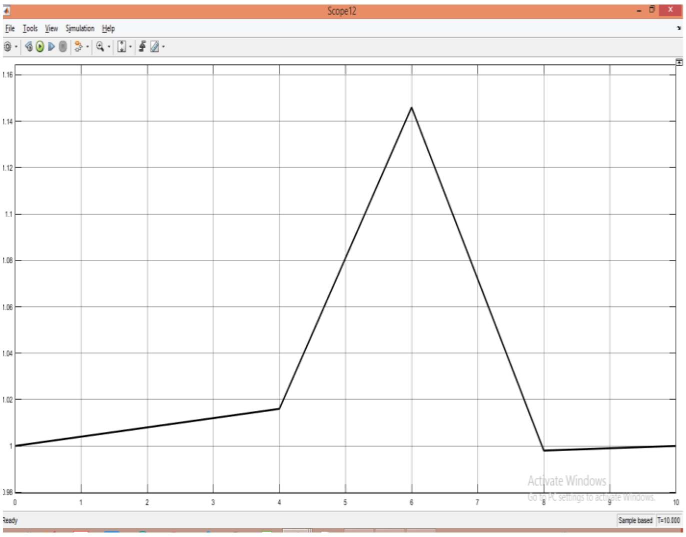

Fig 14 Simulation results of Smoke sensor system

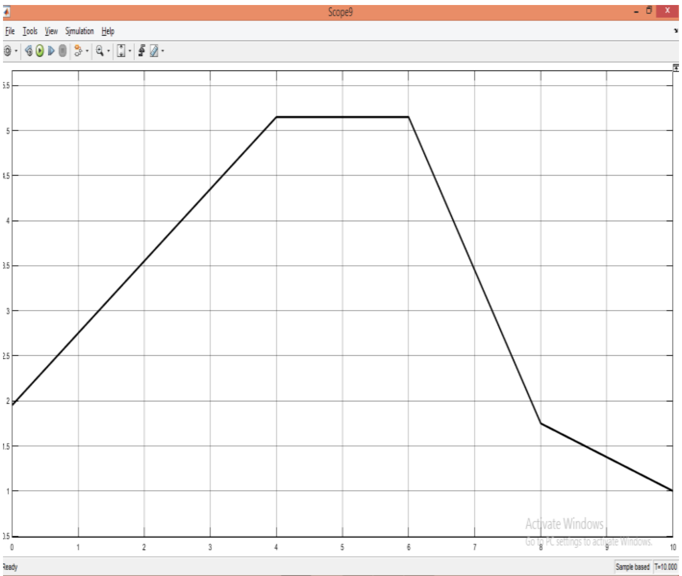

Fig 15 Simulation results of Ultrasonic sensor system

## 5. CONCLUSION

As the results and the simulation system show the net parameter set for the system has be achieved .where as the Robotic system has the three independent motor system s that the each simulation system provide the detail function of the each link where as the net end result of system represent the movement of the robotic arm system.

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## BIOGRAPHIES

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