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Crop Cultivation in a Greenhouse using IOT

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Abstract – Nowadays gardening has become a hobby for everyone. Everyone is showing interest in growing their own plants in their houses like terrace farming. So we have decided to do a project which can be useful for everyone even the farmers can be benefitted by our project. In our project we are preparing a greenhouse for cultivating different kinds of crops. Our greenhouse consists of arduino UNO, sensors like (temperature sensor, soil moisture sensor, colour sensor and light sensor), actuators. All these are used in sensing the outside environment and giving signals to arduino so that it sends the signal through GSM module and this GSM module will give us a message alert through our mobile phones like for example if the moisture is less in soil then we will get alert "your moisture has decreased water the plants" so that we can turn on our motor pumps to water. Here we are using thingspeak cloud for coding the arduino through IOT. Our project will also do its watering by itself when the moisture level decreases, this is done by soil moisture sensor. It is very reasonable and complete greenhouse can be constructed under Rs.10,000 which can save lots of money for the farmers. The crop yield will also be very good and this will be useful in increasing the economy of farming.

Keywords: Gardening, Greenhouse model, Thingspeak cloud, IOT, Arduino, Watering plants.

I. INTRODUCTION

Plants need enough water to grow taller in size. Sprinkling of water to stem is a duty that human beings should do and nature lover has soft hearted to stem of small tree. Sprinkling water to stem that has worthy liquid content has main so that can be immediate results on stem. Shortage of liquid or more liquid volume is produce plants dried /decayed. The action of sprinkling to stem that may be physically and also having automatic system. So testing is linked for plan of a system also pour liquid to stem and the system that performs a task spontaneously. So design of the system has been highlighted calculations of sand to manage the liquid moving such activity as sprinkling of stem. Design of study such as sprinkling to stem that can manage the liquid volume required to lawn based upon soil moisture. Studied about debate on naturally liquid system. Investigation debate about appeal of general thinking so that can need of controller i.e., microcontoller, sensor of temperature, plus sensor of soil moisture especially small stem. Investigation needs the Atmega8535 microcontroller and LM35 temperature sensor that can focused on sprinkling to stem. Research is same as a manual watering specification to workingin air with timer based RTC and Atmega16 microcontroller. Though study discussed that sprinkling plants that observed by the sensor and photo accuracy digit that uses sensor that has LM35, LDR, and microcontroller has shown and can't see in lawn. Thus said to manage device that control the tanker usingatmega8535, temperaturealso messaging, for need of liquid i.e., (water)that stores in tanker. Studies has the plan of stem watering by device, soil moisture sensor, switch, supplies water and connection device that get connected all to automatic device need to download by the human beings devices that can observed the digit of the soil moisture pH. So researches will concentrated in how to manage the operation that held for sprinkling plants and also there is nothing of action that together will work on platform of Internet of Things. Studied about Internet of Thingshas enlarge also applied many ways. Other than this it apply main latest steam controlling device small with software server and smartphone system using prototype that needs to person for controlling stem position of soil moisture, temperature senor, and photo specifications that requires water pore to stem.

A. IOT in the Field of Cultivation

IOT that has best on advanced path on universe in field such as kit machines or manual objects into each another through the net so that we can easily manage the machines placed away from us and can connect by the cloud or Internet. Internet of things include crystal clear plus logically a huge numberof many plus varying last machines, that consist in open access to selected subsets of data for the development of a plethora of online services. It expand because of many options of machines and connected layer automation. From device to device automation it the principal phase, but it flows best applicant and to overpass disparate technology by putting together physically things connected in pillar of talented talks. However, trending type theyuses below apparatus system in monitoring from nursery contains a controller of micro controller, raspberry pi, soil moisture sensors, switches are attach together with wires here every of the soil moisture sensors and switches and join for micro controller then also that connects to micro controller linked to the raspberry pi because they can give an original clock matter in customize

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devices for immediate. Principal of plan about design is that manual work are simple reached from web donor for join the platform matter. That web data finding to store the matter preparing also transmit from web to web system supplier. Technology is of storing and prepared that data and give to the human utilityin demand need. Such type of sensor network supplier can also has the matter content for technology.

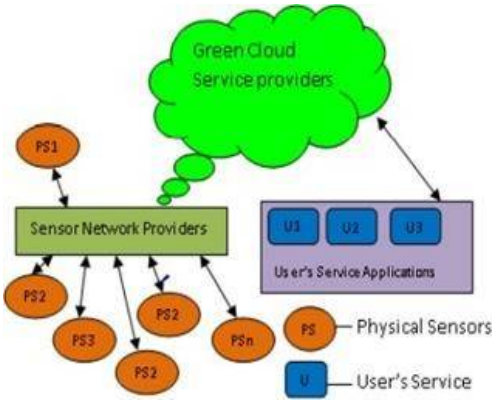

Fig. 1 IOT Application for Indian farming through cloud services

The above figure explains about how the sensors will work and in what way they will give information to the users. All the sensors are firstly connected to the arduino and this arduino is coded using Thingspeak cloud and connected to the GSM module. This GSM module is connected to our phones through the cloud(Thingspeak) so that we will get the message alert whenever required.

B. IOT Techniques in Agriculture

Agricultural action based on 3 class, namely farm monitoring, automatic irrigation.

1) *Farm Monitoring:* In many machines that supposed for controlling different surrounding factors and the detect details it can be examine from the switcher place. The farmers can control, examine and monitor machines along with mechanized platform.

2) *Automatic Irrigation System:* Mechanized sprinkling devices, classified based on surrounding factors, physically sprinkling the plants, Can help farmer's precious time, hard work and more water leakage. Potamitis et. al [7] designed latest traps, can helpful for farmers tocontrol farming place with in user's hand against buds. The main principal is latest track, that says photo reduction and a photo enters the signal sensor, together. Any time a buds get into kit that interrupt photo and current also constrain. In process, most of the buds get into the set up are counted. Different types of traps are to observe the buds, device can calculate number of buds that are bigger than six(mm). The buds can be calculated is moved to the web that uses gprs mode, that applies TCP and IP layer also httpspecifications. That matter in the web also source has examine through php scriptingcode.

II. LITERATURE SURVEY

"Internet of things: A survey and enabling technologies, protocols and applications" is a paper by Ala Al-Fuqaha, Mohsen Guizani, Mehdi Mohammadi. This paper provides an overview of the Internet of Things (IoT) with emphasis on enabling technologies, protocols, and application issues. The IoT is enabled by the latest developments in RFID, smart sensors, communication technologies, and Internet protocols. The basic premise is to have smart sensors collaborate directly without human involvement to deliver a new class of applications.

"A secured communication model for IOT" is a paper by Hosenkhan, Reza, and Binod Kumar Pattanayak. This paper provides an overview about how Internet of Things (IoT) enables global connectivity to remote smart devices. This technology involves sensing, communication, and processing of real time data received from billions of connected devices with minimal human intervention.

"Internet of things: Architecture, Security issues and Counter measures" a paper by Mayuri A. Bhabad and Sudhir T. Bagade, this paper is mainly focusing on the concept of IOT, architecture and security issues with suggested countermeasure and suggested further areas of research needed.

"IOT based smart greenhouse automation using arduino" a paper by D. O. Shirsath, Punam Kamble, Rohini Mane, Ashwini Kolap, R. S. More. In this paper the different papers have been reviewed and developed the proposed system based on the limitation in the present monitoring system. It also focuses on the Generic Architecture which can be applied for many other

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Automation Application. Greenhouse is a building where plants are grown in a controlled manner. With the advancement of technology we can control and monitor the multiple Greenhouses using IOT from the central location wirelessly.

"Greenhouse monitoring and control based on IOT using WSN" a paper by Remya Koshy, M. D. Yaseen, Fayis K, Nisil Shaji, Harish N. J, Ajay M. This paper presents a monitoring and control system for greenhouse through Internet of Things(IOT). The system will monitor the various environmental conditions such as humidity, soil moisture, temperature, presence of fire, etc. If any condition crosses certain limits, a message will be sent to the registered number through GSM module.

"Greenhouse automation using IOT" a paper by C. R. Dongarsane, Patil Pranav Balasaheb, Patil Nilesh Rangrao, Patil Pranit Ramesh. This paper proposes the automation using internet of things in green house environment by using the Netduino 3 and employing the sensors for the sensing the moisture, temperature, sunlight and humidity, to enhance the production rate and minimize the discomfort caused to the farmers.

III. WORKING

The basic limitation of the greenhouse is that it is secured with materials like glass fibre polythene and many more which will the effect the harvest with the weather conditions. In our project we have made our model completely automatic so the cost of the labour will reduced and the time taken will also be very low then other systems. In this we utilised some sensors that can feel the weather conditions whether they are suitable for growing upplants or not and then they transmit the signals to the MC and the signals that are received by the MCwill again send the signals to actuators so that they will utilise the way they want. The MC is connected to Raspberry Pi and GSM module, will later user subscriber identity module card like the way are mobile phone will have, by this connectionwe will obtain the information about our plants in our mobiles in the way we want.

To implement the greenhouse we have to to construct the structures which are normally madeup of wood, Steel,etc. There might be variety of structures according to the uses. In this project we built a frame with outlets connected with sensors to automatically be off and on base on our needs.The important aim of this project was to build an automated greenhouse with less cost, this is thereason we are using stainless steel for our construction. The outer shield after greenhouse should be made using plastic, fibre etc which will also be less in cost and will be long lasting compared to other things .We are also using a net to cover a Greenhouse so Insect will not enter into it. The outlets will be opened as usual for the sake of Sunlight and ventilation. The 1 difficulty that wehave is we need to change the plastic cover for every two years, elsewhere remaining things can be managed in this cultivation process.

Besides there are also other important equipment required in building a Greenhouse that is fans, lights, motor, heater and ac. In our project we are using drip irrigation system for giving water to the plants as this is the the most easiest way in cultivation and this will also help in saving thewater as it gives the water only to the roots and hence there is no huge wastage of water. In a project we are cultivating saffron which needs the weather conditions such as -5 to -10 degrees in winter that is the reason we have utilised AC in a Greenhouse so that accurate temperature is maintained. In our model sprinkler is attached to greenhouse to Sprinkle pesticides if there are insects. Later on we are having and Idea of using solar cells on the top of the roof of the greenhouse so that it will completely be operated by solar energy.

This process of using solar cells is one of the best approach for the construction of greenhouse. The cost will be little higher but once the solar cells are installed they can be used for lifetime and they have large number of benefits to the farmers. But after the installation of solar cells the maintenance cost will be very less. sometimes you may have some problems occurred in the solar cells but it if itis repaired then it can be solved. This solar cells do not need any maintenance. The above figure will give a glimpse of how how a greenhouse will look like after it is built in the farm. This solar cells do not need any maintenance. The above figure will give a glimpse of how how a greenhouse will look like after it is built in the farm.

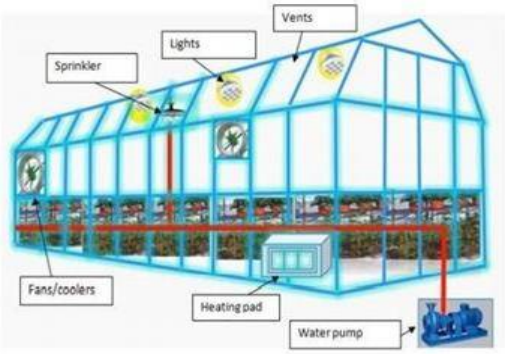

Fig. 2 Automated greenhouse technology

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The above figure gives us the glimpse about how the greenhouse will look after it is constructed. It consists of lights, vents for the sake of ventilation, fans, heating pad to consume the heat when it becomes too hot inside and lastly a water pump to water.

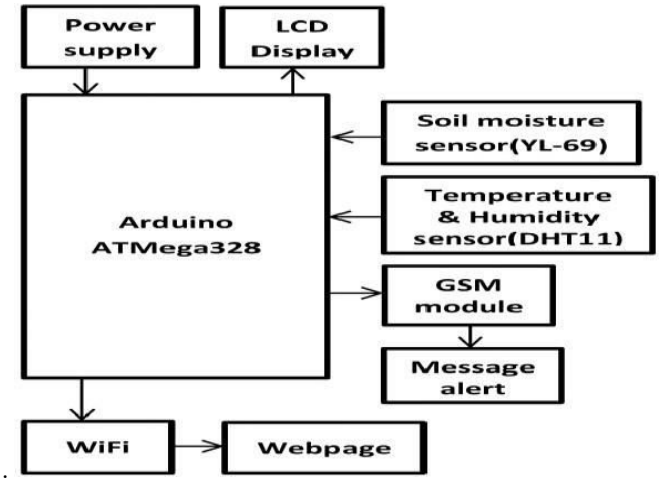

Fig. 3 Block diagram

This is the block diagram of the internal working of our model where we will be coding the "ARDUINO UNO" with the help of IOT using THINGSPEAK cloud and then connect to GSM module.

Here we're using IOT generation to get collective sensor records remotely through Thingspeak communicate open supplyIOT platform. The device encompass sensors,actuators, Arduino Uno and the connecting cables. The Arduino uno has been used to attach the sensors and actuators to feel the climatic situations from the indoorsurroundings and act accordingly. The threshold values of light, heat, humidity & soilmoisture are up to date at particular durations of time to mimic seasonal variations.

IV. RESULTS

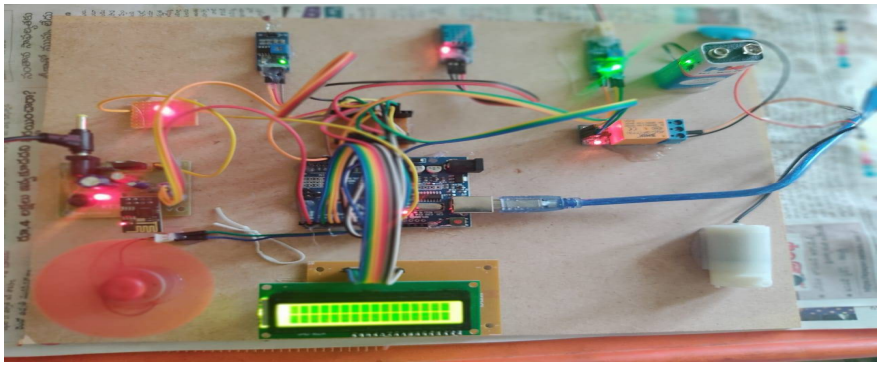

Fig. 4 Working of ARDUINO UNO and sensors

The above figure is our internal model of automated greenhouse which consists of ARDUINO UNO "which is the heart of the entire project", temperature sensor, soil moisture sensor, humidity sensor, GSM module, 16*2 LCD display to show whether wifi is connected or not, wifi module, fan which is used to cool the system when it gets heated up, adapter and a battery.

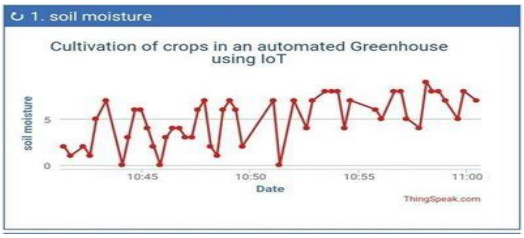

Fig.5 Soil moisture graph

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The above seen figure gives us the graph of the soil moisture when the soil moisture sensor is kept in the soil then it will sense whether the soil is having enough water and it also gives us the amount of moisture level present in the soil if the moisture is less then water pump will automatically start watering by itself to the plants.

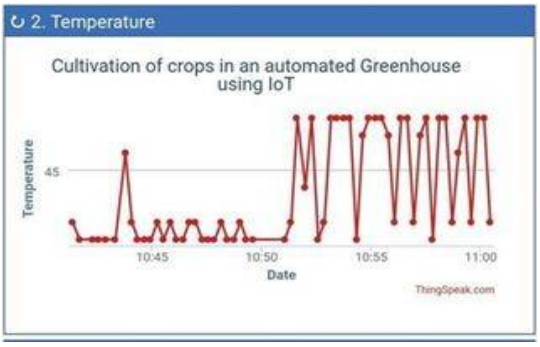

Fig. 6 Temperature graph

The above seen figure is the graph of the temperature sensor that gives us by sensing the outside environment and it will make itself prone to the temperature.

V. CONCLUSION AND FUTURE SCOPE

The computerized watering device included with IOT structures BLYNK andTHINGSPEAK should plays the capabilities of sprinkling the plants in step with the cause of the studies. Soil moisture sensor sensed the water moisture with inside the soil and send sign to WEMOS-D1 microcontrollers. The studying outcomes from sensors, processed via way of means of the microcontrollers to generate the watering characteristic automaticaly. The device sends notifications to BLYNK apps, while the tool activates or deactivates the sprinkling characteristic. The device has the tracking function to document the soil-moisture price through THING- SPEAK which show the records through graphs.

The device needed to linked to the net to plays the realtime tracking and notifications. When the device dis-connected from the net, tracking and notifications capabilities couldn't be proceeded, however the sprinkling tool will nonetheless carry out sprinkling characteristic. The preliminary price of the soil-moisture may be modify in step with the moisture wanted via way of means of the flowers. This may be achieved via way of means of re-programming the micro-controller. For this-studies,we set the preliminary price of the soil-moisture in variety of 30% to 35%. The checking out outcomes of the THING-SPEAK soil-moisture tracking primarily based totally at the experimenting scenario, calculated the common very last price of soil moisture is 68.2%. This way that, in a single cycle of sprinkling, the tool should carry out the system of nourishing the soil with common increment calculated 35,8%. For in addition studiesimprovement the device may be brought with extra soil-moisture sensors or every other sensor's whichincludes temperature and moisture sensors after which behavior distinct experimental situations to benefit the comparison. The watering pipe may be custom designed in step with the region of the flowers at the ground. This computerized watering device has the capacity to be used certainly forcultivating or carried out the sphere of farming.

In this greenhouse we've got applied the shading sensor that may distinguish simply three shades which are red, yellow and blue. But In future we will make use of the ARDUINO camara that may do picture processing and we visualize it effortlessly on our laptop screen.

Cultivation of plants in an automatic greenhouse the usage of IoT enables in keeping the appropriate climatic situations for cultivating plants and farmer can monitor the greenhouse from a far-flung place.Based at the test which have been conducted, the device is worthwhile because it optimizes the inexperienced residence parameters. Thewhole device is low price and is of low energy operation. People really want to get aware about cultivation of such plants and use of computerized layout and generation and with the aid of using imposing it of their every-day lives can assist them in addition to the country to enhance considerably each with the aid of using socially, economically and financially.

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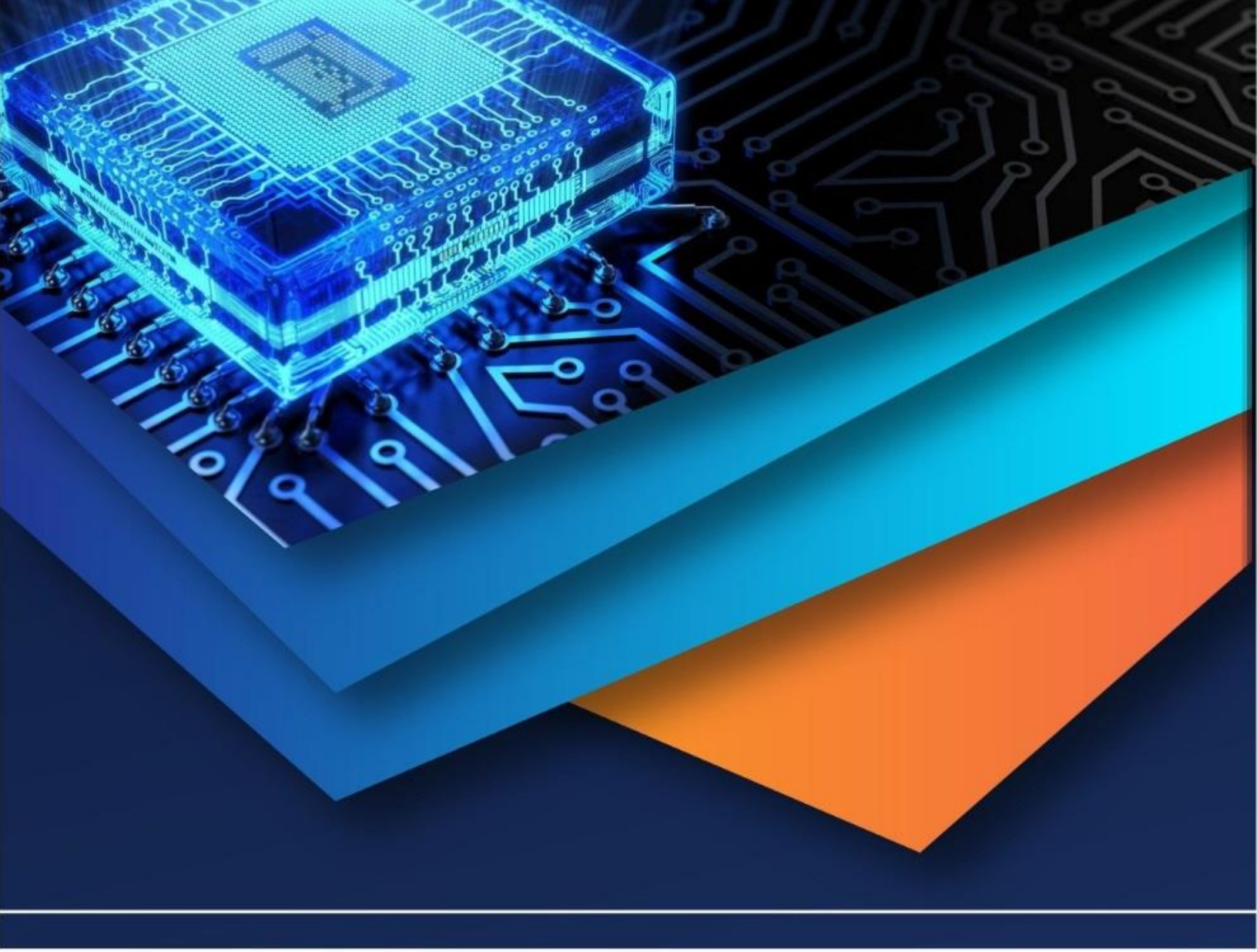

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