ROBOTICS AND AUTOMATION FOR AGRICULTURE
BASED ON INTERNET OF THINGS (IOT)

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ABSTRACT
The Internet of things (IoT) is changing the techniques and methods of the agriculture industry. Qualities of IoT like accuracy and sustainability are formulating the ways to face challenges. On-time information on weather, water level, humidity, temperature, and quality of soil is available on the screen of the smartphone due to IoT. The control of various works is achieved without being present on the field. Information about unknown grass, insects, fungus, and weed is available all the time. The proper actions for every upcoming event related to farming can be taken through the control device. The technology makes the agribusiness the time saving and cost-effective. Most of the backlogs of traditional farming are eliminated by IoT.

Keywords- IoT, Automation, Robotics, Drones, Agriculture.

I. INTRODUCTION
Farming is the oldest and most important thing for humans. Humans are cultivating for thousands of years. Development in traditional farming was limited due to a lack of technology. Advanced technologies like IoT, Robotics, automation changed the traditional loss-making ways of farming. Farming is the oldest and most important thing for humans. Humans are cultivating for thousands of years. The objective of this paper is to review available technologies and add ways to implement them for better profit-making agribusiness. Robotics, automation are well-known technologies in well-known production. Use of high-tech devices Increased industrialization and productivity. Still, the unstructured and complex nature of the farming business did not allow automation. The GPS, drones, sensors and artificial intelligence can make traditional farming far better. Information collected from sensors, artificial intelligence, weather forecasting, and processed by control units can operate the robots in difficult weather where direct human interference is impossible [1].

II. LITERATURE SURVEY
Every sector having human activity started automation decades ago. Automation in manufacturing, security agencies, household, construction, communication proved the capability of automation for safety and accuracy. The smart analysis of available data generates a controlled, precise, accurate output of robots [2].

a) Monitoring system
Temperature, atmospheric gases level, moisture, sunlight are important factors for growth, yield, and productivity of crops. The design of smart monitoring system connected to the control unit increases productivity without continuous manual observation. When change occurs in one or many measurements the mail or test alert is sent to the farmer. The suggestions from the experts and the internet help the farmer to take prior decisions. Better management and accurate analysis are achieved from continuous watching over crops and environment [3].

The distance between farmers and farms are mostly short. The technology for short-range wireless transmission is ZigBee. ZigBee is a cheap, short-range, low power consumption with high power output, high security, and reliability system. ZigBee is the wireless sensor system. It is an advantage to greenhouse monitoring. Experimental results proved the usability and accuracy of a wireless sensor system [4].

ZigBee technology also monitors for greenhouse effects. The monitoring system remotely monitors farms in real-time. The data collected from the monitoring system is analyzed and processed by the central control system having high-performance ARM microcontrollers, Data is transferred through GPRS modules and computers make the decision strategy by analyzing data [5].

The growth in devices connected to the Internet is very high. The interconnection of smart objects forms the Internet of Things.

b) Robots
A multipurpose robot is proposed for performing multiple activities at a time. Multiple arms of the robot assigned for performing berry thinning, spraying, bagging, and harvesting.
Lack of labor power is worldwide wide. Labor availability is less for fruit collection and supply. To overcome this problem the robotics is used. Robotics is used in farming for picking fruits and vegetables, spray pesticides, cutting. Canopy shaking, truck shaking, mechanical penetration, raking are the methods used for fruit collection before robotics. These methods used machines but those machines are completely had manual controls. The robotics used for cultivation and collection of citrus fruit is explained is this paper. Key challenges in fruit picking robotics are to teach them to identify the fruit and collect it without damaging fruits and trees. The robot inspired by the mechanism ‘frog tongue’ is designed for picking citrus. The cutting tool connected at the end of flexible tubes of robot working on pneumatic actuation is used for citrus collection. Cameras acts as feedback for robot [6].

In cattle farming robotics is used for cleaning, milking, feeding cattle. The path for robots is easily decided by using MATLAB.

In 2013 the robot scrapers were used to clean the cattle walkways. Clean walkways for cattle prevent Infectious hoof disorders to cattle. The decrease in disorders resulted in an increase in the profit of the farming industry [7].
c) Drones

Drones navigated by GPS or remotely controlled by the control unit are increasing the yield of the crop with minimum use of resources and the least manual interception. Drones are referred to as UAV (Unmanned Aerial Vehicle). The use of drones in security forces and armies are for decades. Drones were unavailable for common or industrial use a decade ago. The development in digital electronics made the drones available to common use. Drones are now used commonly for delivery, video shooting, monitoring, and entertainment. In farming also the drones are used. But the use of drones is very limited.

The drones developed these days uses open source technology, fast and accurate sensors, better integration. These advancements make drones operate for a long time, perform accurately. The use of drones developed these days are increasing yield and productivity of farming. Smart and advanced drones are available for farming [9].

![Spraying Drone](image1)

**Figure 3:** Spraying Drone

Drones use GPD and Big data to Increase and production. Drones can observe analyze every individual leaf, measure water holding capacity of soil from the height of 120 meters. Examining the water capacity of soil helps to generate data about soil water holding capacity. Lack of research in drones for farming. The air above farms is not available for free-flying. Permission for individual flying is not yet given to farmers from authorities [10].

![Monitoring Drone](image2)

**Figure 4:** Monitoring Drone

Drones are used for 360 monitoring. Spraying pesticides, keeping watch, tracing the wild animals in farmland is done easily by drones. The use of drones doesn’t need a manual presence these days. Good quality cameras, high capacity blades, long-range flying capacity makes the drones very useful. Proper development and guidance from companies to farmers helping to increase yield.
III. CONCLUSIONS

Automation, robotics in agribusiness is very limited. The technology currently used in farming is at a very low stage than industrial production. Machinery used for farming is mostly used for harvesting, terrain leveling, dispersal. Machinery used for the above activities is manually controlled and having no connection to automation.

The smart machines controlled by digital controllers like drones, robots, and parts of IoT are the future of farming. Development in IoT, automation, robotics in the agriculture industry of the overall world will bring the cost of production down. High efficiency, cheap technology, high yield, easier control are the characteristics of new emerging IoT and automation technology. Traditional problems of traditional farming methods will be eliminated by new technologies.

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IV. REFERENCES


