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### Survey on Potato Disease Identification System IOT Application

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**ABSTRACT:** Informatization is the sign and key of agricultural modernization. Agricultural information can significantly change small scale of agricultural production, great temporal and spatial variation, low scale merit and other industrial weakness. Moreover, it plays an important role in the development of agriculture and the full realization of a well-off society. The Internet of Things (IoT) is defined as things connected to things in the Internet. The agricultural Internet of Things and agricultural production. Existing literature lists several algorithms that can be used in detection, classification, and quantification of crop diseases by analysis images. However, the evaluation process is tedious, time consuming and more over very much subjective. Infrastructure for image acquisition, communication, and processing is lacking in rural areas owing to lesser technological penetration. In this work, we will develop a user-friendly IoT reference architecture to provide on-field disease detection and prediction using cloud analytics.

#### KEYWORDS: - IOT, Image Processing, Potato Crops, Disease

#### I. INTRODUCTION

The Internet of things (IoT) is the network of devices such as vehicles, and home appliances that contain electronics, software, sensors, actuators, and connectivity which allows these things to connect, interact and exchange data. The IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled [1].

The idea of inter-connected is devices where the devices are smart enough to share information with us, to cloud based applications and to each other (device to device) [2].

Smart devices or "Connected devices" as commonly called as, are designed in such a way that they capture and utilize every bit of data which you share or use in everyday life. And these devices will use this data to interact with you on daily basis and complete tasks.

The Internet of Things refers to the ever-growing network of physical objects that feature an <u>IP</u> <u>address</u> for <u>internet</u> connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems [3].

With the continuous increase in world's population, demand for food supply is extremely raised. Governments are helping farmers to use advanced techniques and research to increase food production. Smart farming is one of the fastest growing field in IoT. Farmers are using meaningful insights from the data to yield better return on investment. Sensing for soil moisture and nutrients, controlling water usage for plant growth and determining custom fertilizer are some simple uses of IoT. If you are curious, the video below explains further about this concept [4].

Thus, it is only logical that IoT, connected devices, and automation would find its application in agriculture, and as such, tremendously improve nearly every facet of it. Farming has seen a number of technological transformations in the last decades, becoming more industrialized and technology-driven. By using various smart agriculture gadgets, farmers have gained better control over the process of raising livestock and growing crops, making it more predictable and improving its efficiency.

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#### **II. LITERATURE REVIEW**

**K. Shafique et al. [1],** security and privacy are one of the major open issues in IoT architecture as end-user data should be protected from eavesdropping and interference. Data should be authenticated, and its integrity must be maintained at the user end. Various cryptographic algorithms are proposed for data authentication, but it possesses serious energy and bandwidth consumption issues. Hence, key cryptographic schemes are proposed and presented.

**Q.** Awais et al. [2], another challenge facing IoT successful deployment is the lack of a universal platform, protocol, and a programming language. Today, all connected devices follow a different set of protocols and platforms. The need of the time is to have collaboration among the connecting devices. For this, large enterprises such as LG, Samsung and Philips etc. should join hands and make a consortium for the development of universal coding language and platform. The proposed solution can solve the compatibility issues of IoT up to a significant extent.

**D.** Niyato et al. [3], the IoT must be suitable for all the applications having elastic traffic and in-elastic traffic [16]. The former (elastic traffic) focusses on applications that are delay tolerant, which includes monitoring applications; network scheduling etc. While the latter (in-elastic) requires a prompt response from the network, such as video streaming. Hence, IoT must satisfy both the traffics having different key performance indicators with the high QoS. Keeping in mind the above open issues, a set of starting guidelines are provided in the IoT architecture reference model (ARM).

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**S. Rani, S et al. [5],** a vision of the all-communicating world is stated as the system that provides per area data volume to be increased by 1000 times, the number of connected devices and the user data-rate is to be increased by 10 to 100 times. Furthermore, the extended battery life up to 10 times for massive machine communication devices and end-to-end latency to be reduced by 5 times [6]. Hence, recent trends show researchers huge interests towards the amalgam of various technologies such as integration of sensors and embedded systems with cyberphysical systems (CPS), device-to-device communications (D2D) and 5G wireless systems with IoT as a centre.

**X. Krasniqi et al. [6]**,internet has drastically changed the ways of communication over the years. We can communicate with anyone at any time, irrespective of any geographical or chronological constraints. This would have not been possible without the parallel and simultaneous advancements in the fields of hardware such as processors, sensors, transmitters and receivers. During the recent few years, in the area of wireless communication and networking, an emerging technology called the Internet of Things (IoT), has gained a lot of attention. This is primarily because IoT broadens the range of communication by expanding the interaction to anything and everything around us. The expression is composed by two words and concepts: "Internet" and "Thing", where "Internet" can be defined as "The world-wide network of interconnected computer networks, based on a standard communication protocol", while "Thing" is "a virtual, real, mobile or steady object that continuously relays information to other objects" Therefore, semantically, "Internet of Things" means "a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols". Another reason to include IoT in our day to day lives is its easy implementation. With the help of few mobile transceivers one can easily establish an interconnected network and lay down the foundation for interaction between people and things, and between things themselves.

**Cellular Networks [7]**, the main strength of the IoT vision is the tremendous impact it will have on several aspects of every-day life as well as the behavior of its potential users. For a Private user, IoT can prove to be most useful in working and domestic fields. This involves smart homes and offices, e-health and assisted living. However in the context of Business users, the most apparent implementation can be witnessed in the fields of automation and industrial manufacturing, logistics and intelligent transportation of goods and people.

**W.** Ejaz et al. [8], moreover, intelligent home systems can help in reducing the carbon footprint by conserving energy. Maintaining a comfort temperature and heating of water are the most energy consuming tasks of the house with huge potentials for energy conservation, and as a consequence a significant positive impact on the environment. There can be

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robots taking care of the house, performing routine works such as cleaning or maintenance. These will collaborate autonomously with the house sensors, and the house control. The intelligent appliances will collaborate to conserve energy, and to signal need for new supplies of food, detergents, maintenance, etc. Some of which may be satisfied automatically by the maintenance robot. This will take away some of today's tedious housekeeping activities.

#### **III. POTATO DISEASE IDENTIFICATION**

Alternaria: - Alternaria, also known as early blight, is a mainly soil-borne fungal pathogen that affects potato crops. It is a global disease that has been present in GB crops for many years. Warm and wet periods favour the disease, and if not controlled, it can cause dramatic leaf loss, leading to yield reductions of up to 30%.



Fig. 1: Potato Alternaria Disease

**Black dot:**-Black dot is caused by the fungus Colletotrichumcoccodes and although a mild disease it is one of the most problematic blemish diseases of washed, pre-packed potatoes. It takes its name from the tiny jet black microsclerotia that are just visible to the naked eye both on the blemish and on stem and stolen lesions late in the season.



Fig. 2: Potato Black Dot Disease

**Brown rot:** - Potato brown rot poses a serious threat to GB potato production and vigilance is required to prevent its introduction and spread. Several isolated cases have occurred linked to the presence of the causative bacterium (Ralstoniasolanacearum) in certain watercourses and it is a notifiable disease.



Fig. 3: Potato BrownRot Disease

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**Black scurf and stem canker:** -Rhizoctoniasolani is a fungal disease causing stem canker, damping off, black scurf, skin netting and tuber growth distortions. Black scurf can be soil and seed borne and survives a long time in soil and on volunteers or crop debris. There is no significant proliferation during storage.



Fig. 4: Potato Black scurf and stem canker Disease

#### **IV. METHODOLOGY**

In Image processing section, initially the image is captured from the camera and further the image is processed using k means clustering for segmenting the image. The processed image is then edge detected using three different edge detection techniques. The edge detection techniques used are sobel, prewitt and canny algorithm. The diseased sample banana leaf has been taken for the edge detection analysis. Amongst the three edges detection methods used, canny edge detection algorithm gives the better and reliable detection. Owing to its optimality to meet with the three criteria for edge detection and the simplicity of process for implementation, it became one of the most popular algorithms for edge detection method.

As discussed earlier, IoT and Image processing are combined together in agricultural field in order to increase product yield and to reduce the crop failure. We focused on plant failure due to environmental factors through IoT technology. IoT system includes sensors, Arduino and a camera that regularly captures the plant. The color, texture, shape and area of the leaf are the parameters also considered in this work. After examine the conditions of the plants we go for image processing. The initial test is done by using MATLAB software. In addition to the environmental factors, the plant with a diseased leaf can also be identified using Image processing. Based on the output and constraints the pesticides will be sprayed for the crop/plant where the disease is identified. If there is any change that corresponds to the deterioration in the plants growth, the farmer is immediately informed. Early diagnosis will thus help in taking the necessary actions to increase the produce and reduce failure of crops.



Fig, 5: Block diagram

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#### Image Segmentation

Image segmentation is probably the most important task in image understanding. It is the parceling of an image into a ton of non-covering areas whose affiliation is the entire picture. The purpose behind picture division is to disintegrate the image into parts that are essential concerning a particular application. Without great picture division, it is preposterous to expect to process the picture properly and, therefore, to understand what it represents.

It is very difficult to define what constitutes a "meaningful" segmentation of an image within a computer algorithm. Haralick and Shapiro suggest that the following rules are usually obeyed.

- Segmented regions ought to be uniform and homogeneous regarding some trademark, for example, dim dimension or surface.
- Region insides ought to be basic and without numerous little gaps.
- Adjacent sectioned locales ought to have essentially extraordinary qualities concerning the trademark on which they are viewed as uniform.
- Boundaries of each section ought to be straightforward, not worn out, and should be spatially precise.

However, achieving these desired properties is very difficult since applying strictly uniform and homogeneous measures to segmentation produces regions full of small holes (due to intensity variation or compression artifacts in images) which have ragged boundaries. Furthermore, trying to create regions with large differences in values of the measured properties can cause highly similar regions to merge and boundaries to be lost.

#### V. CONCLUSION

There is a huge potential in IoT based systems and it is evident from already implemented applications. There are many other applications that still require development and analysis. The future of IoT is very bright. In the next few years, everything from our coffee to transport mode will be governed by IoT. There are various opportunities for IoT in day to day lives of people due to current socio-economic conditions. IoT based applications also help in reducing the ecological impact of mankind. Moreover, IoT is not a fantasy anymore. It is under implementation and within the next few years will be seen implemented all across the world.

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