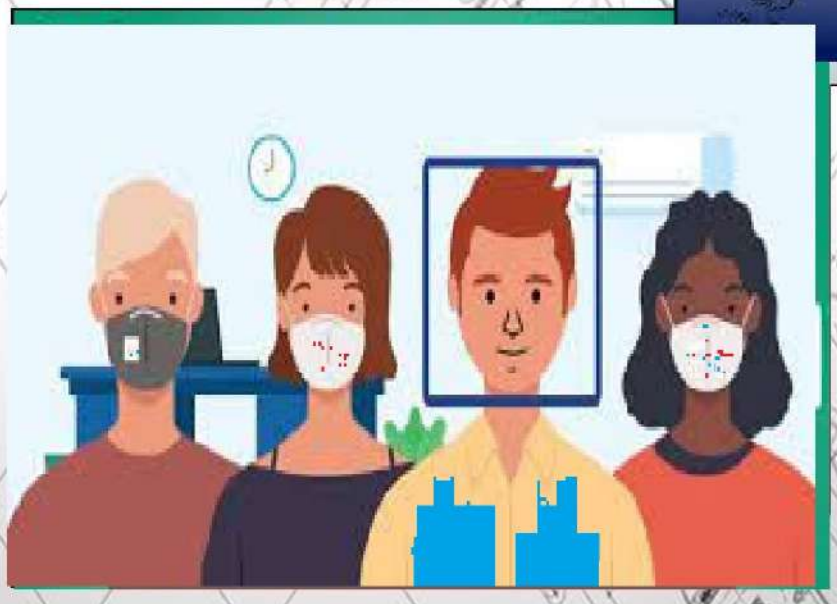
ELECTRONICS & COMMUNICATION ENGINEERING

TECH CONNECT

December,2020



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Contents

1. Indoor Safety system

In the current wake of the COVID-19 pandemic, preventing and/or limiting the community unfold of the virus is also a mammoth task, with governments and administrations across the world applying completely other ways to limit population movement and social interaction. A result has been serious socio-economic impacts. Common symptoms of coronavirus illness embody fever, tiredness, pharyngitis, nasal congestion, loss of style and smell. In most cases, it's transmitted directly (person to person) through metabolism droplets, however conjointly indirectly via surfaces. Time period might be quite long and varies (between fourteen and twenty seven days in extreme cases). What's more, even well persons (almost forty fifth of cases) will unfold the illness creating true even worse. Therefore, the usage of face masks and sanitizers has shown positive results once it involves illness unfold reduction.

However, the crucial downside is that the lack of approved immunogen and drugs. Due to these facts, several protection and safety measures were taken by governments so as to cut back the illness unfold, like obligatory indoor mask carrying, social distancing, quarantine, self-isolation, limiting citizens' movement among country boarders and abroad, typically along side prohibition and cancellation of giant public events and gatherings. Despite the actual fact that the pandemic appeared weaker at some points, most of safety laws area unit still applied thanks to unstable scenario. From geographical point behaviour to social relations, sport and diversion, coronavirus illness poses several changes to our everyday routine, habits and activities.

we tend to specialize in most typical indoor measures – people with high vital sign ought to lodge in home, carrying mask is obligatory, pulse and oxygen levels are not normal should stay at home. We tend to determined to use these devices thanks to their tiny size and affordability.

Internet of Things (IOT) :

In simple words, Internet of Things (IOT) is an ecosystem of connected physical objects that are accessible through internet. Internet of Things can connect devices embedded in various systems to the internet. When device/ objects represent themselves digitally, they can be controlled from anywhere. The connectivity then helps us capture more data from more places, ensuring more ways of increasing efficiency. Based on a prediction by Tech analyst company IDC, by the end of year 2025 there are more than 41.6 billion connected IOT devices or things. The Internet of Things helps everyone to gain maximum control over their lives and work smarter. IOT plays an important role in industrial purposes too. It enables companies to automate their work which in turn makes the output more efficient and also reduces labor cost.

IoT Working :

An IOT system consists of web-enabled good devices. They use embedded systems such as sensors, processors and communication hardware. They collect and send data act on data they acquire from their environments.IoT devices share the device knowledge they collect by connecting to Associate in Nursing IoT gateway or different edge device wherever knowledge is either sent to the cloud to be analyzed or analyzed regionally. Sometimes, these devices communicate with other connected devices and act on the data they get from each other. Without human interaction most of the work is done by these devices. People can interact with the devices to set them up, give the instructions or access data. IOT also uses Artificial Intelligence and Machine Learning to help in making data collecting processes easier and more dynamic.

Fig. 1. IOT Working

Importance of IOT :

The physical devices are included with multiple sensors, which are intended to collect the data. With continuous flow of data, one can analyze the trends in data, improve the functionality and features of the customized device.

• The status and statistics of devices embedded with IOT technology can be monitored from any location remotely.

• These devices are capable of performing tasks quickly and precisely which saves lot of time and cost. These are developed in a way that little or no human involvement is required to complete many tasks.

• IOT is one of the fastest growing and ever-changing technology. It is very simple and really quick to make any required modifications in the device without whichit would be difficult to modify the hardware circuitry based on our requirement which is costly and time consuming.

• IOT made drastic changes in many sectors like business, health care and many more with its high computational capacity, resources, availability, scalability and interoperability.

Architecture of IOT

Architecture of Internet of Things (IOT) contains 4 layers. They are

- Application Layer
- Gateway and Network Layer
- Management Service Layer
- Sensor Layer

Application Layer:

Application layer in the initial layer, that collects and process the real time information. It connects the physical world with digital world and is included with various sensors to measure the physical quantities.

Gateway and Network Layer:

This layer is robust which includes high performance network that supports various requirements for latency, bandwidth and security. The network layer allows the same network to be shared between multiple entities independently.

Management Service Layer:

This layer is responsible for capturing periodic sensor data, extracting required information from the raw data and processing real-time information. This layer ensures the safety and security of data.

Sensor Layer:

This layer provides a user interface in order to interact with the integrated device. It is used in various applications like Transportation, healthcare, Agriculture, Governments and supply chain etc.,

Characteristics of IOT:

The list mentioned below is the characteristics of Internet of Things. They are

- Heterogeneous Architecture
- Scalability
- Dynamic and Self-Adapting
- Connectivity

- Intelligence and Identity
- Ecosystem

Architecture:

The architecture of IOT is heterogeneous in nature. This architecture should support various products, manufactures to function most efficiently in IOT network. IOT does not bound to one domain. It is combination of multiple domains.

Scalability:

The number of devices connected to IOT is increasing enormously day by day. So, IOT should be capable of handling those devices without any issue. As, the number of devices increasing day by day, the data that generated or gathered by those devices is enormous an it should be handled appropriately.

Dynamic and Self-Adaptability:

IOT devices should be capable of adapting themselves to the changing context dynamically. For instance, let us assume an IR Proximity Sensor is used to detect the presence of an object. It should be capable of working in different conditions and scenarios like day light, low light, during thunder storm etc.,

Connectivity:

One of the most important traits of IOT device is its ability to connect with other devices over internet. These devices can be controlled from anywhere, by anyone, at any time with the help of Internet. Without proper internet connection, we cannot control any IOT devices remotely.

Intelligence and Identity:

The ability to extract information from collected data by various sensors is very important. The data that various IOT devices and sensors collected is useful only when it is interpreted properly. Every IOT device can be uniquely identified with the help of a unique ID. This unique id is used to monitor, control, tracking of that device.

Safety:

The availability of data is great but it is exposed to outer world. Many people who use IOT devices in their day to day life are becoming victims of identity theft. For companies too data breach is considered as a greater threat which leads to cyber attacks and misuse of data.

Ecosystem:

The ecosystem of Internet of Includes every component that enables the user to interact with their IOT devices. It includes remote, network, database and security.

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2. Human speech generation

Introduction

For humans, the voice is extremely important. Voice is the primary means by which we communicate with the outside world: our ideas, emotions, and personalities. The voice is the speaker's very emblem and has become the fabric of speech indelibly. Many occupations, such as teachers, singers, and influencers rely heavily on the voice. Voice communication used to be an essential part of everyday life in our personal and professional lives. For most people, the voice is just the sound waves that come out of the human lips and are interpreted through the ears. However, it is produced via a complicated system.

Mechanism of Human Speech

The evolution of human speech production and detection mechanisms is crucial and required for the development of hearing aids, assistive devices, speech recognition, speech augmentation, voice simulation, speech modelling, and other technologies. Mainly, three functions comprise speech production technique. The Fig 1 shows the speech production mechanism. Motor control is the first function. Engine control is the human brain-driven function, which gives a view of what is to be said and therefore produces sensory nervous control signals for the speech production organs. When the control signals are sent from the engine control system, the organs of the speech production process move and take a suitable form, depending on the speech or sound to be produced. In the following paragraphs, the full mechanism, called Articulatory Motion, is discussed. In speech production, the third function is speaking, consisting of air that enters from the mouth and the respiratory tract in the form of acoustic waves and is propelled into open space.

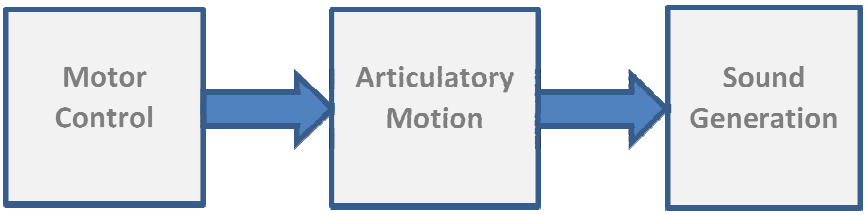

Fig 1 : Block Diagram of Human Speech Production

Motor Control

We witness people talking automatically, without knowing what's happening behind the process of speech generation. The speech production begins with a concept of what we can talk

about. This concept is transferred through the sensorial nerves of the human voice system. The entire process is called the motor control function and the language is further separated into two parts, the creation of processing and motor commands. Experts have divided our brain into several segments. The different segments of human brain is shown in the Fig 2.

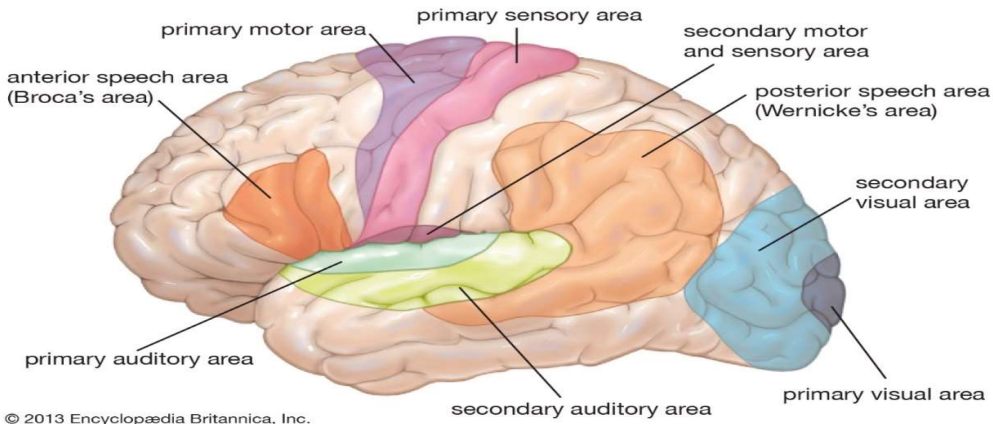

Fig. 2. Segments of Human Brain

These segments have different memory, thinking and control mechanisms. Fig 3 shows the block diagram of control mechanism involved inside the human brain The auditory cortex is the region of the auditory lobe that processes human and many other species with hearing input. It is a portion of the auditory system that performs basic and deeper auditory activities such as language switching. Analysis of the inputs transmitted from the ear involves the auditory cortex, which comprises of time and frequency. The cortex subsequently filters and transmits the information to the speech processing stream. This helps in selecting what to say or what sound it produces in the form of listening and visual movements. The brain receives information from the sensor systems, the spinal cord and other areas of the brain. The motor control region organises voluntary movements such as posture, balance, coordination and speech that lead to smooth and equilibrated musculoskeletal activity. This region (Wernicke area) generates control signals to activate organs in the vocal tract and other organs such as lungs, vocal cords, glottis, jaw, tongue, teeth, and lips. These organs are simply referred to as Human Vocal Setup

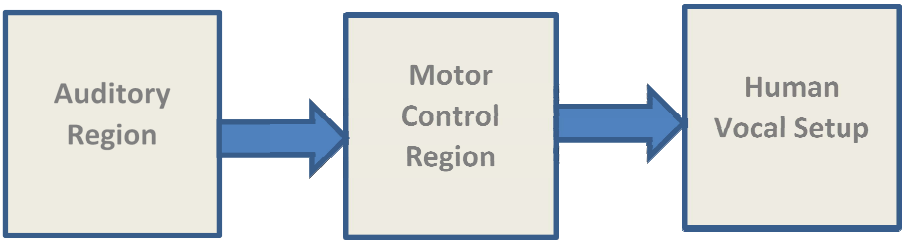

Fig 3. Control Mechanism in Human Brain

Articulatory Motion

The lungs, larynx, and vocal tract are the primary components of the human voice generating system, as seen in Fig 4 and Fig 5. Our speech generation mechanism is powered by our lungs. We inhale air during voice production by expanding the rib cage around the lungs, and we expel air from the lungs by lowering the diaphragm placed at the base of the lungs. Depending on the duration of a sentence or phrase, we manage the muscles around the rib cage to maintain a continuous flow of air. In the below Fig 6 we have seen an image of the vocal tract that connects the lungs and the upper parts of our mouth and nasal cavity. The trachea is the name given to this tract. This motion causes air to surge into the epiglottis via the trachea.

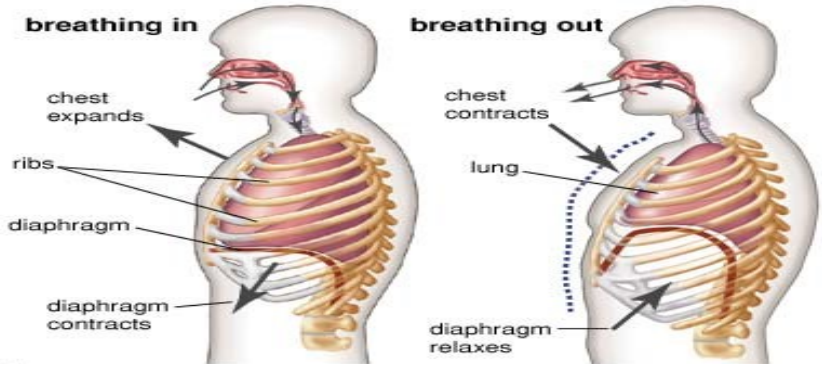

Fig. 4 . Air pumping mechanism in lungs

Our voice creation system is influenced by the larynx. The larynx is popularly known by the name of the voice box and is an organ that sits at the top of the neck that contributes to breathing, sound and food suction protection. The parts inside the larynx is schematically shown in the below Fig 5. The larynx entrance is around 4–5 cm in diameter, called the laryngeal inlet.

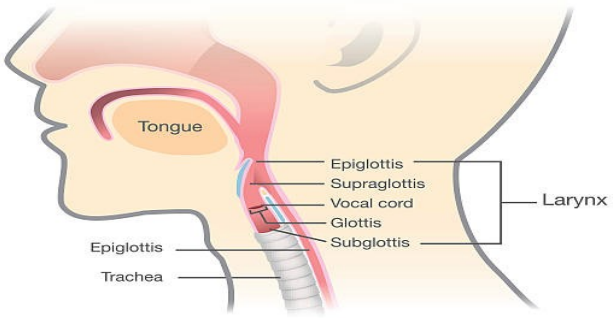

Fig 5. Anatomy of Larynx

Generation Of Sound

The larynx contains the voice cords to adjust the phonation pitch and loudness. They are made up of cartilages, muscles and ligaments. The larynx's major duty is to control vocal folding, consisting of two masses spread between the larynx's front and back. Between the two masses, there is a slit-like opening called the glottis. A pair of lips, such as tissue called vocal cords, limits the air in the larynx. These are highly crucial membranes of the vocal apparatus that determine the duration of the generated speech.

The vocal cords are coloured pearly white, linked to the cartilage on the back and the cartilage on the front of the thyroid. Males generally have a low tone voice with large larynx opposed to women with tiny larynx with a high tone voice. The vocal folds vary between 17 and 25 mm for men and between 12.5 to 17.5 mm for women.

Fig 6. Vocal tract(trachea)

Functioning of vocal folds while breathing and speaking

In reality, several other forms of utterance, which are called phonemes, open or close the vocal cords in various ways to let the air through and send it into the upper section of the vocal tract. The vocal tract is a tube that runs from the glottis to the opposite end and from the oral and nasal cavities to the glottis. The cross section is uniform and approximately 17 cm in length for men. It emerges from the soft palate (velum) about halfway down the tract and enters the nose as the second branch. A soft palate is the soft tissue consisting of the rear side of the mouth roof in animals (also known as the velum). The soft palate in the front of the mouth differs from the hard palate in that it contains no bone. The Velum has two significant language functions. The tongue body strikes it to produce the sounds [k], [g]. This is also known as the gatekeeper of the nasal cavity. The velum is usually elevated, which blocks airflow via the nose during speaking. But it

lowers and enables air to pass through the nose with a few sounds (like nasal sounds such as [m], [n]).

The length of this section of the vocal tract is around 13 cm. When the vocal folds vibrate, the resulting vibration produces a "buzz" characteristic of speech, known as a voice, speech, or pronunciation. Sound creation, which includes closing together the vocal folds, is called glottal. English has "h" as a voiceless glottal transition. This sound comes from a certain stretching of vocal folds, leading to non-rigid airflow through the glottis. The glottal stop (formed with folds pushed together) is employed in various accents of English as an Allophone version of the phoneme, which is a phoneme of its own in various languages.

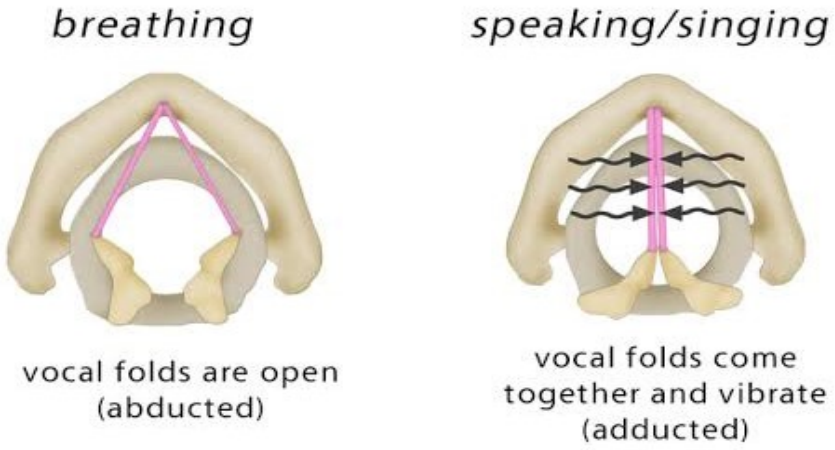

Fig 7. Vocal Cords Functioning

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3. Smart Homes

In most homes, many smart devices are used for entertainment and home safety. While they are operated either manually and also need the physical presence of a human at the place of the device. In some situations, there will be no chance of giving a command to the device with a touch, in that case, the security system fails to protect. We can't see the performance of the devices, status of devices, statistics of devices, and many more. Whenever there is theft in the house and there is no tech to detect it and inform the owner of the house, there will be less interest in implementing those kinds of systems [2].

When there is a situation that needs voice commands to activate a particular device or deactivate and it's in a distance were unable to give a command, it's impossible to accomplish the task [1]. The performance of a device is way helpful to know the condition of the device and its health span. By installing memory into the device there may be a loss of that data in any fire accident or damage of it.

There are some situations in which we can't go long distances to control the device's operation. Let us say we are in a state named Alabama and our house is located in another state named Veronica, we can't alter the condition of devices and we can't know the status of our house without proper surveillance [3]. This makes the inefficiency of the system. Any system has to be efficient in fulfilling its task and also has to be done with ease and simple way. If the devices are connected to the internet and we have a mobile application that controls the devices present in the house, it's a far better solution to improve efficiency. When we connect the devices to the internet, we can control those devices from any part of the continent with an internet facility. This helps us to see the stats of devices and the status of devices. By keeping all this information in the cloud, we can access that data on any device and in any place [4].

Introduction to IOT

The abbreviation of IOT is the Internet of things. It is the most used technology nowadays. Billions of devices are connected to the internet nowadays The Internet of Things helps everyone to gain maximum control over their lives and work smarter. IOT plays an important role in industrial purposes too. It enables companies to automate their work which in turn makes the output more efficient and also reduces the labor cost.

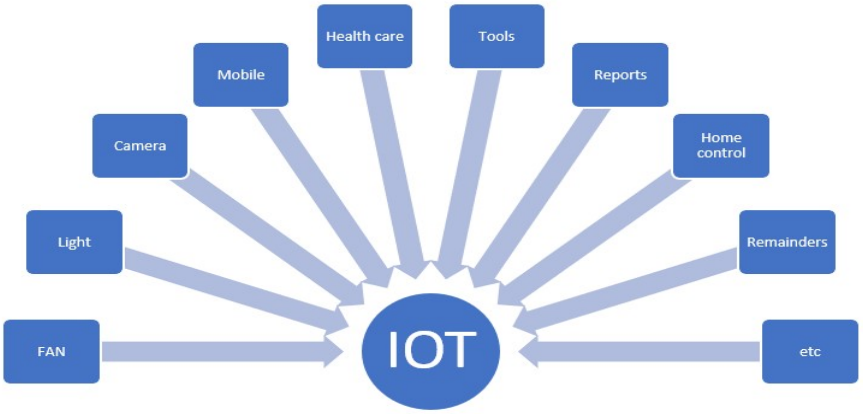

Fig. 1. Internet of Things (IOT)

In the above Fig 1, it shows that various components like mobiles, lights, fans, camera modules ,etc are connected to the internet, connecting all these devices to the internet is said to be the internet of things. This is the rapidly growing technology with billions of new devices which are added to IOT. This technology makes use of Cloud technology to store the data that is provided by the device and shares it with the user. Similarly, the command or the data that is given by the user is initially stored in the cloud, and then the particular device access that information to perform the given task.

Usage statistics

IOT is a widely used technology nowadays. There is a rapid growth in the no of devices that are connected to the IOT every year. IOT makes the life of a human being an easier one. There is no need for physical presence to operate the devices but can operate them from any place in the world where there is the availability of internet .We will see the statistics of the usage of IOT and the number of devices that are connected to IOT every year.

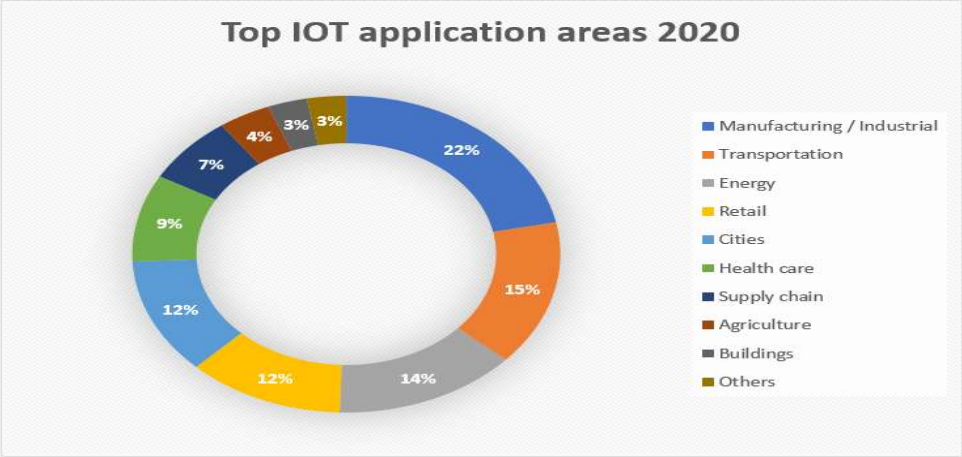

Fig 2.Top IOT application areas 2020

In the above Fig 2 , it is shown that the IOT usage of different sectors. Manufacturing industries make use of IOT to a large extent. IOT made drastic changes in many sectors like business, health care, and many more with its high resources, availability, and scalability. Thus, from the above figure, we can say that most of the world is gradually increasing the usage of IOT to accomplish their work more efficiently.

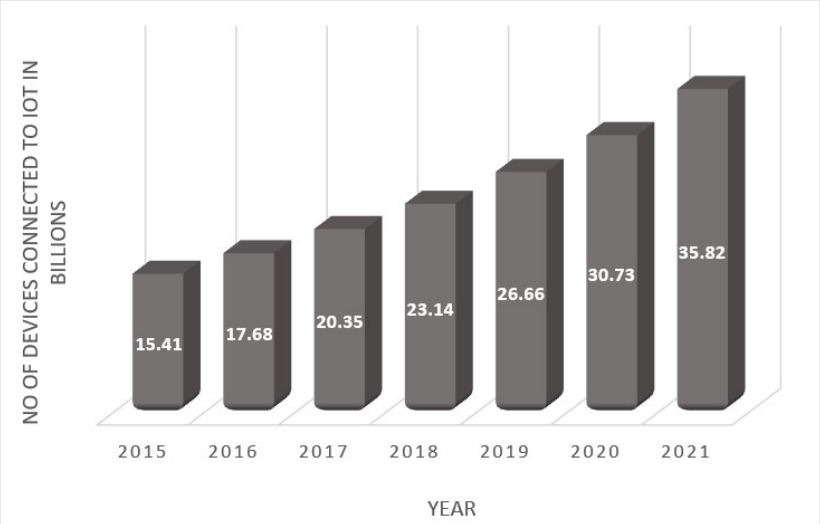

Fig.3.Number of devices connected to IOT

The above Fig. 3 shows the number of devices that are connected to IOT every year. From the above graph, we can understand the growth of this technology and the trustworthiness that are present in users.

Advantages

There are several advantages of IOT and the below mentioned are some of them.

- ♣ It's very easy to use this technology using the web or any other user interface and the level of security is also increased.
- ♣ Devices can be controlled from any place in the world when connected to the internet.
- ♣ While using this technology we canefficiently use electricity and energy.
- ♣ Alerts during problems help to control them before getting bigger.
- ♣ Reduces work to a large extent.
- ♣ Continuous monitoring of the device's data is possible.

Disadvantages

- ♣ IOT works only when there is an internet connection.
- ♣ Since it's a cloud-based technology, there are a lot of unethical activities from hackers.

- When you install an IOT device, it continuously sends data to the cloud which makes a loss of privacy.
- Due to automation involved in this technology, there will be a huge unemployment crisis.
- It is difficult to store huge chunks of data in the cloud and it's a bit costlier idea.

Applications

Many sectors in this world use the Internet of Things to make their work an easier one. Here is the list of some of them;

- Manufacturing / Industry – Used to store details of manufactured goods.
- Transportation – Data of goods that are under transportation.
- Energy – Stores the statistics of energy generated and used.
- Retail – examples of this are, Amazon online store, Flipkart, etc.
- Cities – Data related to houses and persons who live in the city.
- Health care – Diagnosis data is stored in the cloud to access from any location on this earth at any time.
- Supply chain – Data related to the spread of information or matter from one to another.
- Agriculture – The amount of manure needed for a crop or amount of food that is grown on a farm is stored in the cloud to access it somewhere else.
- Buildings – Construction cost, CC tv footage, and details of a car that is entered into the building, etc.

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4.Smart Glasses

The large number of optically challenged people is linearly increased in the country, which is a vast impact on the caution of the respective country. As a result, visually impaired persons require assistance in their everyday activities, particularly while travelling from one point to another on highways.

Mostly these people are assumed that, it is a burden to others for requesting to help us, so that most of them to care for themselves to complete all their works on own. Other problems for them are difficulty in identifying and recognizing people, noticing the obstacles on their path.
Some gadgets are available on the market to assist them in overcoming some of these obstacles.

There are always a large number of research projects underway with the primary goal of developing gadgets to assist these visually impaired persons. As a result, there is a need to create a device or system that can assist the visually impaired in all of their everyday tasks. The optically challenged people need to be additional attentive while on roads and to recognize a person by blind people. Usually, blind people pick out the people positioned on their voice, but it is not a corrective measure due to if the people are interacting after long gap. As a result, a system or technology to assist them in identifying known persons becomes essential. Face detection or recognition algorithms can be used to tackle this problem.

As a result, the goal of this study is to assist visually challenged or impaired people to engage in daily activities such as travelling from one location to another and identifying or recognizing people or objects.

The smart glasses will assist a visually impaired person in recognizing the person in front of him and learning about potential difficulties. Face recognition and distance detection features will make this possible.

People with visual impairment encounter a variety of challenges in their daily lives, as current assistive gadgets frequently fail to fulfill consumer expectations in terms of price and amount of aid. This project introduces a novel assistive smart glasses design for visually challenged people. The goal is to use the wearable design format to assist in a variety of daily tasks.

The goal of the Blind Assistance project is to raise awareness of a common difficulty in computer vision, such as recognizing people in the environment, which is something that the blind do on a regular basis. The camera was mounted on the glasses of a blind individual. To apply the requisite recognition, a dataset of people acquired from everyday scenarios is developed. Any person can be detected with the camera.

Objective for smart glasses

The primary objective of "Smart Glasses" is to assist blind and vision-impaired individuals by providing new technology that allows them to read written text. The technology in these glasses allows them to scan any written material and convert it to auditory text and also this smart glasses can also be used to measure the distance of the objects near them and warn the blind people through voice commands.

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Editorial

Hope is the oxygen that makes human to live and survive against many odds. It even can make a patient on the bed to recover and live for the society and for loved ones. Along with fear, pain and grief, the year has also shown a new ray of hope through many inventions. Being not the only pandemic, Covid has opened a new way of living life. It has made more faster steps towards automation , increased the attention f the people from wealth to health as life is more than anything. Happy New Year for all wishing that new year brings lots of happiness and courage for each and every one because we, need to live for our loved ones.

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