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## A RESEARCH AND CHRONICLE ON INTERNET OF THINGS & DIGITAL JEWELLERY

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### **Abstract**

As the technology is growing the thoughts and ideas of the man are also increasing simultaneously. Apart from this the luxuries of the man are also increasing where he wants the technology to fulfill his desires even his daily cores. This brings “INTERNET OF THINGS” into existence. IoT is capable of performing certain tasks discussed further which give a luxurious life to the man. Everyone is searching for technology in everything no matter they are certain devices and even jewellery. This is the concept of the “DIGITAL JEWELLERY” where you can carry your technology just through the things you wear. Internet of Things and Digital Jewellery are mostly related to each other. Thus, this survey highlights the technologies and importance of Internet of Things and Digital Jewellery and how these might take over the existing technology. The main purpose of this survey is to provide all the latest technologies, their corresponding trends and details in the field of IoT and Digital Jewellery and a research idea on the influence of IoT over Digital Jewellery. It might be helpful for further research as well.

### **MY RESEARCH IDEA ON DIGITAL JEWELLERY USING IoT**

Whenever a family with kids goes to a public place like shopping malls, religious place or where there is massive crowd, parents might lose the hand of their child or children out of mischief may miss their parents. Searching for their kids in crowded place might become very difficult. Apart from this due to some incidents happening now a days on girl child, parents are worried to send their daughter to work during night or to anywhere away from them. When we take our grandparents to a religious place and when they don't even know to contact us where there is a chance that they may get lost. These problems can be resolved by using digital jewellery and IoT. This is what my research idea is about. A sensor or a tracking device can be placed in a Brooch. Brooch is a pin like jewellery which can be worn near the pocket just for fashion. The sensor of the Brooch can be monitored by some of our friends or family members. The device which is connected with the sensor in the Brooch, shows the distance, direction of the person wearing Brooch. To give in a live example way, Brooches can be attached to children when the family goes to any public place and the sensor in the Brooch should be connected to parent's mobile. In case the kid goes missing, parents can check where the child is, in which direction and how much distance. Thus, parents can be tension free if they have this when they go to public places. Same is the case for parents who are worried to send their daughter for job. Sensors in other devices like watches, bracelets can be easily identified. In case of children, they might throw the watches away. But as Brooch is a pin, losing it is difficult. That is the reason I suggested for sensor in

Brooch.Sensor in Brooch is a Digital Jewellery which as it is connected to a Person's mobile, it comes under the concept of Internet of Things. Digital Jewellery and IoT are the upcoming technology, my research idea might be helpful.

**Keywords:** Internet of Things, Digital Jewellery

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## 1. INTRODUCTION:

Now a days each and every individual has mobile phone. We have various features in our mobile phone which we use. Even when we want to buy a mobile phone we see various latest features which are more user friendly. Today's mobile phones have GPS Tracking, Mobile Gyroscope, Adaptive Brightness, Voice Detection, Face Detection and etc., in them which are some of the advanced features in the world of mobile where :

- **GPS Tracking** is used to track your current location and helps you find path for your set destination.
- **Mobile Gyroscope** has the same functions as the accelerometer which measures linear acceleration of movement.
- **Adaptive Brightness** is a feature in the phone where our mobile senses the environment or conditions around it and sets its brightness.
- **Voice Detection** is an advancement feature of the mobile which is used to detect the voice.
- **Face Detection** to tell in a common way is trendy now a days where the phone detects your face and unlocks it. It is used as lock for the applications as well. It scans our eye retina and some features of our face and identifies it. Before face

detection finger print was used and is been used now as well.

These functions are inter-operable.

For example, brightness can be adjusted based on the GPS location or direction of the device which is found out by mobile gyroscope. If these functions are combined under a single application or a device then they will bring up a better system overall. Here what it comes up as Internet of Things.

## 2. What is Internet of Things?

Internet of Things also known as IoT is basically a collective platform where everything embedded with sensor, electronics or software is connected to the internet which enable them to collect and exchange data. Here "thing" can be everything or anything which is a physical object in the network which has its own IP address and has ability to send and receive data over network. There are various real life implications of Internet of Things as in has an impact on the real life both in how we live and how we work. Let us consider, Suhaan has a home which has a lock, ac, and lights. These must be connected on a single platform in such a way that when he is returning home from his office he must be able to turn on the AC and set its appropriate temperature. In further more advanced way when he reaches home, it must sense that it is the owner of the house who came and based on the location of the mobile, the lock must be unlocked automatically. These can

be done if his mobile and home devices are connected with each other on a single platform. Thus, life would be easier if all the required components are connected through internet which acts as a medium to connect these components on a single platform. This is what Internet of Things is.



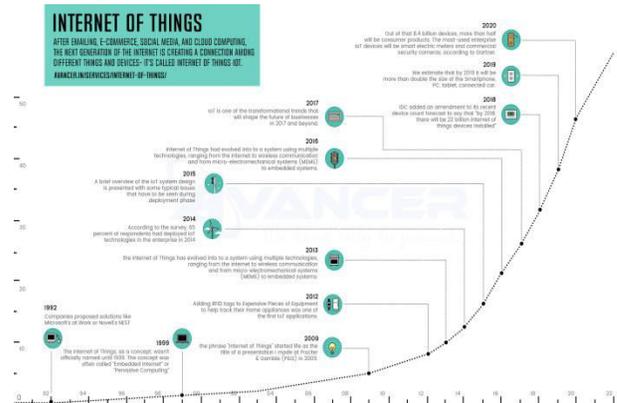
### 3. History of IoT

The idea of connected devices was in existence from 1970s. At that time, it was called as “embedded internet” or “pervasive computing”. The term “Internet of Things” was coined by Kevin Ashton in 1999 during his work at Procter&Gamble. As internet was in hottest new trend in 1999 he named it as Internet of Things but this term was not widespread for the next 10 years.



**Kevin Ashton** – Inventor of IoT

The concept of IoT started to gain some popularity in the summer of 2010. In October 2013, IDC published a report stating that IoT would be \$8.9 trillion market in 2020.



### 4. Why IoT?

As IoT is based on real life instances, let us consider a real life situation which describes us clearly about the need of IoT. Say, there is a patient at home who is on constant life support whose health is been monitored using a health support system which is connected to the cloud. The patient is monitored directly by the doctor from the hospital wherein the hospital is also connected to the same cloud as that of the patient. In simpler way to say, the patient’s health is being monitored continuously through IoT. Now suppose, the condition of the patient becomes worse like he has an irregular heartbeat or his blood pressure is low there is some serious issue. Since the information on the cloud is connected to the hospital, the patient’s deteriorating health is also notified to the hospital. The doctors at the hospital check if the patient’s condition is serious, if it is then immediately the hospital sends and ambulance for the patient. Until the patient reaches the hospital, the tests or operating theatre can be kept ready if required and the doctors will also have the complete information about the patient’s condition. This brings in a lot of transparency and reduces time and effort

involved in this. But in today's scenario, someone should keep monitoring the patient and in case his condition worsens then they must call the hospital request for an ambulance and after the patient reaches the hospital he must be checked up, lots of test ought to be done and etc., which results in delay in case of emergencies. If a system can do this, this is where our future lies in and where we need to move forward to. IoT is expanding interdependence of humans to Interact, Contribute & Collaborate to different things around us. If this interdependence of things is done in an appropriate way then that is when we are building a proper IoT. This would be much more safer, effortless, secure and time saving environments in existence. The need for IoT in business is also increasing now a days. IoT will in future expand and improve that data by connecting billions of devices capable of immediately sharing, receiving, and analyzing massive amounts of it to better meet business needs and improve decision-making.

## 5. Benefits of IoT

- **Efficient Utilization of Available Resources** : If we have a smart system which has enough computational power, enough knowledge about how things work with each other then there would be efficient utilization of resources and misuse of resources would be reduced.
- **Minimizing Human Effort** : If most of the works are done by the machine, then human effort is reduced

- **Saves time** : As it reduces human effort, by efficient utilization of resources time can be saved.
- **Development of Artificial Intelligence through IoT**: If we have AI platform, through which all can be managed and maintained then personalization and the human touch also comes into picture. This could be a personal assistant like Siri or Google Assistant.
- **Improved Security** : If these all are present in one single system then security is automatically increased and its going to build much more secure system.

## 6. Features of IoT

Any technology that is available today hasn't grown to its height. Every technology has a potential to grow and IoT is one of them. There are 3 aspects of Internet of Things as to how it works:

- First is the **Connect** aspect. We need to ensure that there is a connectivity between all the necessary things of IoT.
- Next is **Analyze**. To build a business intelligence, the data need to be collected and analyzed appropriately. If we have a good insight into data gathered from all these things, then we call our system has a smart system.
- Another feature is **Integrate**. In order to improve the system, we need to integrate various models to improve user experience.

**CONNECT** :The first stage of connect is **Device Virtualization**. We need to

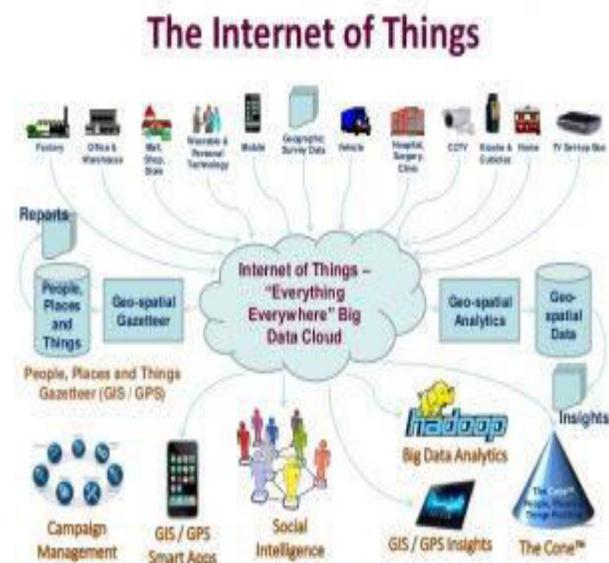
standardize integration of devices with the IoT enterprise. But again these are going to be connected through internet. The second step is **High Speed Messaging** which enables reliable, secure and bi-directional communication between devices and the platform. The purpose of being bi-directional is that we need to control each one of them. If we want to operate an AC then the signal will be going to the device through cloud. The third point of connect is **Endpoint Management** helps in managing the device's endpoint identity, metadata and lifecycle states for all the devices that means we need to know which data is coming from which device and what needs to be done with that data.

**ANALYZE** :The first step we need to do for analyze is **Stream Processing**. If the data coming from a device is not based on real-time basis then the system is of no use. If we want to turn on the AC through the system and the doesnot get on then it is the failure of the system. Thus this is the real time analysis of incoming data streams with event aggregation, filtering and correlation. Next step of analyze phase is **Data Enrichment**. It is the raw data which is being streamed from all the streams. We need to identify which is contextually important which can be taken forward. Once we have relevant information then we can generate composite streams of information which we can take ahead for future usage, analysis and understanding as well. Next step of this phase is **Event Store**. Any data which we require can be queried and visualize massive amounts of data from the cloud with integrated BI Cloud Service support and enable big data analysis. Here

big data refers to the Tera Bytes of data which we get from the devices.

**INTEGRATE** :The first stage of integrate is the **Enterprise Connectivity**. If we could connect to a platform which provides us the required service then the whole process could become more easier. If there is any problem with any device then it could itself contact the organization with which it could be rectified resulting in less human effort and time. For this communication to happen, we need **Rest API**. It makes API based integration with Cloud apps and IoT devices. The third aspect is **Command and Control**. If we donot have command and control the system with our requirement, then it is of no use. For example, if we want to turn on the AC from our mobile so we command it to turn on through the mobile and it doesn't turn on then the system would be a failure. Command can be through voice based application or a message and etc.

## 7. Basics of IoT



Any business, any organization, anybody can use IoT from anywhere any place at any time using any network any path through any device or anything.

## 8. Challenges of IoT

Internet isn't only one network. It has many considerations which may cause problems.

5 major challenges of IoT are:

- **Security** :The threat to security is directly proportional to the number of connected devices; that means when you increase the number of connected devices, it raises security issues.
- **Privacy** : Trouble integrating devices into the environments without people using them consciously is a major challenge when it comes to privacy.
- **Standards** : Developers may design products in any number of disruptive ways online without regard for their impact.
- **Regulations** : Just like privacy, there are a number of legal and regulatory questions that surround the IoT
- **Development** : The less developed regions are going to face to issues like the policy requirements and market readiness to take advantage of IoT.

## 9. Architectures used in IoT

IoT can be implemented using various technologies. Some of the important technologies used in IoT are **Radio Frequency Identification (RFID)**, **Internet Protocol (IP)**, **Wireless Fidelity (WiFi)**, **Machine to Machine Communication (M2M)**, **RFID Reader**.

## 10. Applications of IoT

### ➤ **IoT in Everyday Life** :

IoT in everyday life is probably a hallmark in IoT industry. IoT was first implemented in everyday life itself.

Let us understand it using an example:

Consider a home appliance such as an AC, we come home turn on the AC and enjoy the cool air; it is a perfect functioning of an AC. But it can be done more better with the help of IoT. If our car is 10 minutes away from our home and our AC receives a message that it will automatically turn on. Apart from this it would be more better if there is a dash board of AC wherein it can calculate the distance of the car, outside temperature and the temperature we would like to be in. By the time we reach home it would create an ambiance which we love to. This whole scenario can be done using IoT.

IoT can connect our fit bits to our vehicles to our smart phones, in flight services, home appliances and etc.,

This might be what Aston meant that Man and Machine can be connected to eachother at anytime using sensors.

### ➤ **IoT in Health Care**

Smart medicine Dispenser is a smart appliance which stores dispenses and manages medicines. Healthcare industry faces one of the following issues in most of the cases. Some of the issues are “No Realtime Data

Available, Lack of Smart Care Devices, Inaccurate Standard Analytics". The solutions for these problems is bringing IoT into action. IoT provides Real Time Data , makes Devices Smarter, provides far Superior Analytics. An example of IoT being used in the field of Healthcare is mentioned above in the paper in the reasons of using IoT.

➤ **IoT in Smart Cities**

The thing about smart city is that a smart city solution is very specific to that one city i.e., the problems being faced in Mumbai are not same as that of Delhi. Even the global problems like waste control management, traffic management, water resource management, housing issues, pollution etc., impact different cities with different intensities. The only to make a city smarter is to solve a problem; one such problem which is more relevant to urban cities is Traffic.

Imagine an intelligent device like traffic camera which can monitor the road of traffic jams, accidents etc., and communicate that status to gateway. This gateway receives information from various other such cameras. Now, this itself could form a City Wide Traffic Monitoring System. It can be used when a road is under construction and the camera informs the City wide monitoring system about the road construction. Now these monitoring systems can prepare for diversions and it can be

intimated to the vehicles as well using radios. If there exist any school or office which goes only through that route then it calls the organizations so that they could reschedule.

➤ **IoT in Agriculture**

It is most neglected yet an important factor. However manual handling results in labour cost, loss of energy and other inaccuracies which make its work ineffective. Even here IoT can provide various solutions like Precision Farming, Smart Irrigation, Smart Greenhouse. The first two are likely same as there are sensors detecting various parameters at each layer of the soil. The parameters like temperature, weather conditions, the depth, correct time to sow the crops, water them. Greenhouse is a farming technique where we can increase the yield by controlling natural parameters. If we could use embedded devices in these green houses, we can not only monitor them regularly but also practically control the climate inside the green house. It works as the sensors sense various parameters and areas of issue inside the green house. They then rely the information via connection gateway to the cloud which then passes a command via the same gateway back to the sensors. Once these signals are acknowledged by the sensors, they are passed on to the controls and switchgear which then activate lighting, pump and turbines

inside the green house and create artificial sunlight and sometimes artificial precipitation inside the green house. From the connection gateway there is a monitor from where 24\*7 monitoring has come into effect, so we can use any smart device to remote the conditions inside the green house. With elimination of irregularities and human effort, it gives us an efficient system.

#### ➤ ***IoT in Industrial Automation***

This is one of the domain in which IoT can be a game changer. This is one of those fields where both faster developments as well as the quality of products are the critical factors for higher returns on investment. There are few problems in this sector as well. Some of them are like inconsistency in data entry, time consumption in production and reporting, labour and staff training cost, lack of security. Here again IoT comes to rescue. The IoT increases the line of command immensely. It optimizes packaging and make quality tests so much easier to run. Other than these, we donot even have to worry about training of too much staff or too much staff going on a holiday because these factories pretty much run on their own. We can monitor the supply chain in real time while keeping an eye on our inventories. With IoT applications, one can even re-engineer products and their packaging to deliver better

performance in both cost and customer experience.

#### ➤ ***IoT in Disaster Management***

IoT cannot stop disaster from happening but it can surely help in preparedness or resilience during a disaster. Developing countries are more exposed to the risk of natural disasters and low sustainance due to high population density, poor evacuation infrastructure, exposure to severe weather conditions etc., As a consequence, by a study it is known that more than 95% of deaths are caused due to disasters in developing countries. IoT can compensate for this by Prediction, Preparedness, Response and Recovery to rescue developing countries from their vulnerable conditions.

For example, to be prepared for critical incidents like Forest Fires, Sensors are installed near the parameters of the forest. They contribute to data feeds about the temperature and carbon emission to the control room via network gateway. They predict the problem and inform the nearby areas about it so that they would be prepared by using some preventive measures. Police stations and fire brigade stations are alerted in advance about it's occurrence.

## DIGITAL JEWELLERY

In this era of growing technology, Man is dependent on technology for each and every thing. To perform any task he needs technology. Now a days people are wearing technology. There are sensors, electronic media suspended in the things we wear. It may be a ring, button, chain, bangle and etc., It is one of the greatest advancement in the world of technology. The operations which we perform in our mobile phones now a days can be done by the minute sensors in our jewellery. This is what is called the **Digital Jewellery**.

- The idea of digital jewellery was derived from the concept of wearable computer.
- A wearable computer is a miniature electronic device that is worn by the user under or on top of clothing.
- Wearable computer was first discovered in 16<sup>th</sup> century when Pocket Watch was discovered.
- To say it as a definition, “A digitaljewellery is a fashionable jewelry that has an implanted intelligence which assists to store personal information like passwords, identification number, account information etc.”

### 1. Features of Digital Jewellery:

There are many significant and unique features of Digital Jewelry, some of which are listed below:

- **Portability:**Digital jewellery is easy to carry as we wear it and is very small in size. We need not have a special space for it as

there are miniatures embedded in it.

- **Sensors:** Sensors are the minute electronic devices which can be easily embedded in the jewellery. These may include cameras, microphones etc.,
- **User Attention-Free:**It allows users to perform muti-tasking in their real life i.e., digital jewellery doesn't need user's attention.
- **Communication:**These devices have wireless communication with each other. But the limitation is that the communication can be done only in a certain limit.

### 2. Advantages of Digital Jewellery:

- These devices does not need any platform or space or desk. As these are mostly wireless they don't need any wired connections.
- These must always be connected to internet. The devices which are inter connected must have a proper connection between them.
- As it does not need any desk space these can be used accurately without the time for turning it on.

### 3. Components of Digital Jewellery:

Different companies, manufacturers and even individuals have designed different digital jewelries that ranges from necklace even to the ring.

- **Earrings:** Speakers embedded into these earrings will be phone's receiver. Thus it carries out one of the functionality of a mobile phone making it easy for the user. It may

sometimes act as a sound recorder as well.



- **Necklace:** Microphones are embedded in necklace. Thus, users can speak through them for communication.



- **Ring:** These have LEDs fixed in them which glow on an incoming call. The color of the LED also changes depending on the priority or importance of the call.



- **Bracelet:** It is like a smart watch which displays name and phone number of the caller on an incoming call. It is possible with the help of Video Graphics Array (VGA) embedded in it.



#### 4. IBM Magic Decoder Ring:

The IBM Magic Decoder Ring is a mouse ring which IBM is developing that will use the IBM Track Point technology like the one embedded in the laptop keyboard to wirelessly move cursor on a computer monitor. The TrackPoint technology has been built into a ring which looks like black pearl ring. There is a little black ball on top of the ring that the user will rotate or turn around to move the cursor.



#### 5. Java Ring:

It seems that everything we access today is under lock and key. Even the devices we use are protected by passwords. It can be frustrating trying to keep with all of the passwords and keys needed to access any door or computer program. Dallas semi-conductor developed a new Java based computerized ring that will automatically unlock doors and log on to computers. The ring has 134 KB of RAM, 32KB of ROM, a real time clock & a Java virtual machine which is a piece of software that recognizes the Java language and translates it for the user's computer system. The Java ring which is programmed with Java applets will communicate with host applications on networked systems (Bonsor, 2015). The applet which is a small programs designed to run within another is built in the Java ring.



The Blue Dot Receptor which is used to allow communication between host system and the Ring capture the information stored inside the Ring. At Celebration School where the Java Ring was first launched, The Ring has been programmed to store different numbers of things like cash to pay for lunches, to take attendance, store a student's medical information etc. all these information are stored when the students press the signet of their Java Ring against the Blue Dot Receptor while the system connect to the receptor performs the function that the applet instruct it.



## CONCLUSION:

Both IoT and Digital Jewellery can be said as the upcoming technologies which make the life of man more easier and luxurious. IoT can be very helpful in various fields like agriculture, in controlling traffic, in daily lives, in medical field. Implementing IoT makes the work done more faster in less time

and with less effort. You can access the devices in your home, industry just by using a mobile. Disaster prone areas can be made secure as certain IoT devices have the capability to predict the disaster and warn the people of that area about it. However, AI is in boom now a days. As the growth in IoT increases, there would be a massive increase in the implementation of AI as well. By 2020, it is estimated that there will be up to 21 billion connected devices to the internet. IoT devices will be a huge part of how we interact with basic everyday objects. The future is happening now, and these devices are getting smarter every day through machine learning and artificial intelligence.

In case of Digital Jewellery, if we see in Computer Fashion Wave, digital jewellery looks to be the next sizzling fashion trend of the technological wave. The fashion jewellery embedded with intelligence is going to be a trend. By the end of the decade, we would be wearing our computers instead of sitting in front of them. Digital Jewellery will be the evolution in digital technology that makes computer elements entirely compatible with the human form. The basic idea behind the digital jewellery concept is to have the convenience of wireless, wearable computers while remaining fashionably sound. It is hoped to be marketable soon.

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