

STUDY ON CHARACTERISTICS AND TYPE OF SENSORS FOR IOT BASED RETAIL STORE

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Abstract- Sensors in IOT, Are rare to experience an electronic consumer product that doesn't use sensors to build new experiences for its users. Sensors are experiencing a regeneration of sorts as micro-electromechanical systems (MEMS) technology becomes less expensive and further miniaturized, in turn fueling penetration of sensors into new applications and creating new potential for the sensor market. This paper focused on sensors used in a retail store, The primary sensor technologies in use today are reviewed and are classified according to their characteristics.

Keywords –Wireless sensor system, Internet of Things, micro-electromechanical systems, sensors

1. INTRODUCTION

The Internet of Things (IoT) inspires innovation and opportunities by bringing all items, client and events into the computerized domain. This evolved technology connects different devices through sensors, software and electronics for information sharing, where this combination of sensor data, from personal wearable-devices and store-deployed sensors & IoT devices, is used to create real-time, individualized services for in-store shoppers. Crucial challenges in this process of Digitizing include appropriate joint mining of sensor & wearable data to capture a shopper's product-level interactions, and judicious triggering of power wearable sensors to capture only relevant portions of a shopper's in-store events.

One of the most vital sectors of including the IoT-enabled agenda is to make sure that the right principles, organizational structure, governance and talent exist within the enterprise. Business and IT must recognize chances to control technology and provide a solid security amongst IT and the business, enabled by control, to quickly put up ideas and answers for sale in the market. The IoT will be particularly disturbing the retail industry with all the changes which it will go through, Already, retailers trialing with different ways to use quick, connected devices to deliver services, remake experiences of customers and enter new markets by creating digital ecosystems. The Internet of Things offers an opportunity for retailers to develop a massively improved ecosystem that connects physical and digital worlds, allowing bidirectional, real-time interaction with shoppers both inside and outside the store. The increasingly retail-store website after registering will be a source of interactions.

Connected devices and using the data from it to perform some task aren't just changing the way shoppers live, work and play they're vividly reform entire industries. Adding additional intelligence and connectivity to the things that surround us everything from selecting a product to billing will produce massive volume of data that the retail store can analyze to improve their operations, serve clients better, and create entirely new ways of doing and enhancing business performance. The data produced by these connections are used by the retail-store to analyze least sold product and track the customers path so that these products can be sold by providing discount and placing them in the place where customers mostly visit.

The IOT system will allow the retail-shop to build an entirely new channel. Retailer-store sector could potentially construct platforms which would give retailers another smallest channel to clients, delivering client information data related with practically every part of the sale, from utility usage to consumption patterns. This data could help retailers to target more offers or by interfacing platforms with current business channels, offer new services, for example, computerized substitution of items based on the client's utilization or by observing perishable dates.

2. PROPOSED ALGORITHM/MTHODOLOGY /RELATED WORK

The assortment and the kind of sensors accessible at introduce make you bewildered. They are utilized for different purposes profiting each feature of human life. As IoT ascends to strength, a sensor takes more capable part, which generally, is intended to quantify a physical quality and count it into an esteem that can be perused by a client or another gadget. Since it isn't so natural to drill down or discuss every one of the sensors, we should concentrate on those sensors which are regularly utilized as a part of IoT.

Sensors are the troops of the "Internet of things," the on-the-ground bits of equipment doing the basic work of checking forms, taking estimations and gathering information. They are frequently one of the principal things individuals consider when imagining IoT.

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2.1 Sensor fusion

With biological systems, for example, human, however with sensor system that incorporate eyes (vision), inner ear (adjust), and nose (smell) the most fascinating data comes when a variety of sensors are utilized as a part to take care of issues. This ability is called "Sensor Fusion" and it is performed normally by the brain, enabling us to effectively connect with our environment.[1]

2.2 Motion sensors

A motion sensor is a device that notifies moving objects, mainly people. A motion sensor is frequently incorporated as a component of a system that routinely performs a task or else alert a user of motion in a region. These sensors form a component of security, energy efficiency, home control, lighting control, and other helpful systems. The main principle of motion sensor is to sense a burglar and send an alert to your control panel, which gives an alert to your monitoring center. Motion sensors react to different situations like movement in your living room, doors, windows being unbolt or closed and also these sensors can.[2]

2.3 Proximity sensors

We can say that proximity sensor is a device which identifies objects nearby without any physical contact or sensor's area. In brief we can also say that Sensors which convert information on the movement or presence of an object into an electrical signal are called proximity sensors. [3]



Figure 1. Inductive Proximity Sensors



Figure 2. Capacitive Proximity Sensors

2.4 RFID

Radio-recurrence ID (RFID) is an technology to record the presence of a object through radio signals. It is used for stock control or timing events. RFID isn't a substitution for the barcoding, however a supplement for far distance reading of codes. The innovation is used for normally perceiving a man, a bundle or a thing. To do this, it relies upon RFID labels. These are smallest transponders (consolidated radio receiver and transmitter) that will transmit character information over a short distance. [4]

A noteworthy preferred standpoint of RFID device over the others specified is that the RFID does not need to be situated exactly in respect to the scanner. The difficulty that store checkout clerks some of the time has in ensuring that a barcode can be read. Obviously, credit and ATM cards should be swiped through the reader.

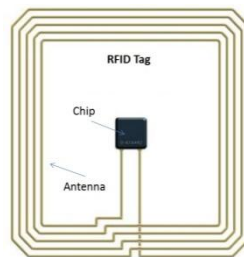


Figure 3.

2.5 Pressure sensors

Pressure sensors are utilized for measuring Pressure of gas or fluid by converting the physical power into an electrical signal. They are great at measuring different factors, for example, speed and height or such components in some way. Barometers and pressure gages are the most well-known pressure sensors utilized for IoT biological system. Barometers are total help in weather prediction as it calculates ambient air precisely. Pressure gauges are for the most part utilized as a part of modern destinations as it is great in observing the pressure in fixed situations. [5]

2.6 Touch Sensor

Touch sensors can be characterized as switches that are enacted by the touch. There are distinctive type of touch sensors that are characterized based on kind of touch, for example, capacitance touch switch, resistance touch switch, and peizo touch switch. The best case of such sensors is the Smartphone Devices with touch screen. Laptops are also being made with touch screen. [6]

2.7 Computer vision

Computer vision is a field of software engineering that works on enabling computers to see, distinguish and process pictures similar to that of the human vision, and after that give proper output. It resembles granting human knowledge and senses to a computer. In reality however, it is a troublesome task to enable computer to recognize pictures of various items. [7]

Computer vision is firmly connected with computerized reasoning, as the Computer must translate what it sees, and then perform fitting investigation or act accordingly.

2.8 Deep Learning

Deep Learning is another zone of Machine Learning research, which has been presented with the target of moving Machine Learning nearer to one of its unique objectives: Artificial Intelligence. [8]

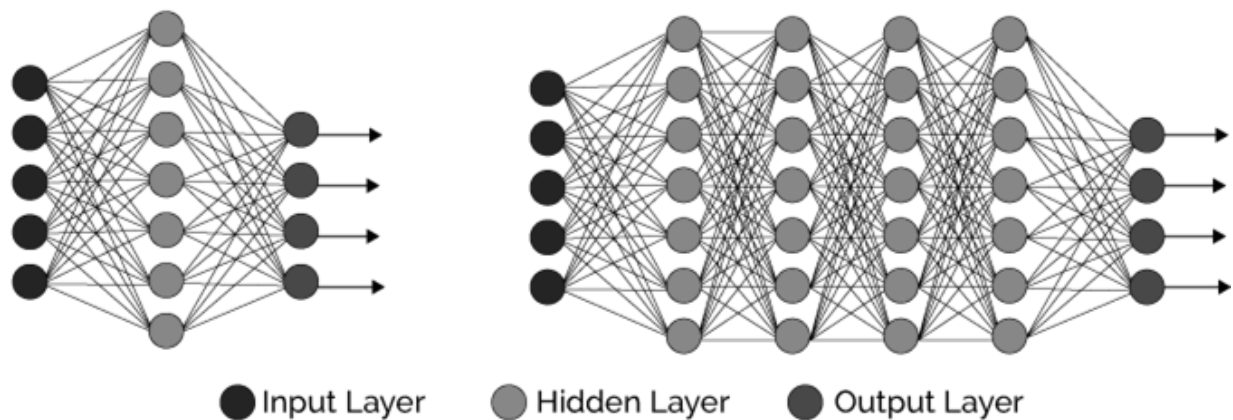


Figure 4. (a) simple neural network (b) Deep Learning Neural Network

3. EXPERIMENT AND RESULT

This is just a research paper which can be implemented in the future. This makes shopping experience much simpler where the customers need not wait in queue to pay the bill or to purchase anything. They can just check-in buy whatever they need and just checkout. The sensors included in the project will take care of the payments which the customer has to pay for the product that he buys. This project uses sensor fusion which are normally used in self driving cars, deep learning algorithm which informs the retailer about the current trend and the demand on a particular product, computer vision and just walkout technology. Normally a retail shop will have many employees who provide services to the customer and minimum of two employees who collect the bill from the customer. This results in financial outflow of the company. And the customers have to wait in queue to pay the fees where the time is commonly wasted.

Shelves of the retail store will contain some sensors. Firstly, the customer should have an android or iPhone in which an application related to the retail store is installed. This application will be connected to an e-wallet or any online banking. This android or iPhone application will generate a unique QR code whenever the application is opened on the phone. Customer compulsorily has to take his/her phone when he/she is going to this retail shop. In the entrance, there will be a QR code reader where the customer has to verify (Just scan the mobile screen) his/her phone. After entering to the retail store, the customer can place the phone in his pocket. The shelves contain RFID, computer vision and sensor fusion where the shelf itself recognises which customer bought which product. The shelf also decides whether the product has demand or whether it is an outdated product.

3.1 Movement towards Self-Checkout:

This concept is an evolution from the self-checkout operational model that is used at in some of the grocery stores. However, self-service in the retail arena has been evolving for over a hundred years. According to a study conducted by computer and point-of-sale terminal company, NCR, those who use the self-checkout indicated that they appreciate the convenience and ease of use that it provides. One interesting note of those surveyed, was that they indicated that they still liked knowing an attendant

was nearby to provide help if needed. Meanwhile, the rest give preference to the traditional cashier check-out method. Cashless payment or online payment plays an important role in the self-checkout concept of this project.

3.2 Sustainability of Supply Chain:

With all of this next generation innovation associated with this concept, we must also look at any potential strides in supply chain sustainability that may also be occurring. Deep learning algorithm helps in getting the details about the demand of the product based on the selling of the products, this can help the retailer to know the trends, likes and dislikes of the customer so that retailer can look for the sustainability of the supply chain.

3.3 Impact on Workforce:

According to the Bureau of Labor Statistics, in 2016, there were 2.7 million people identified as being employed by retail grocery stores, 856,850 of whom are employed as cashiers. This number doesn't even reflect the 3.5 million cashiers that are employed across all industries, not just the retail grocery industry. With so many people being employed in this industry, and in jobs that this disruptive technology may make obsolete, it follows that one may be curious how these individuals will be affected by after the implementation of this concept and its cashier-less operational model. [9]

4. CONCLUSION

IoT based retail store plans to introduce its checkout-free grocery shopping. The strategy is an evolution from the self-checkout version that is used in many grocery chains today. Advanced technology and computer integrated inventory management systems enable the customer to take products off the shelves, put them in their carts, and leave the store without going through a checkout line. Besides the convenience to the customer, this store evidently plans to benefit through a reduction of checkout clerks. The cost of implementing, maintaining, and sustaining the system may offset or exceed cost-savings through reduction of checkout clerks. We can plan to add items other than grocery so that the customer can get everything he wants under one roof. Deep learning algorithm helps one to view the demand for a product. This algorithm checks which are the items in the retail shop is not sold for a long period (usually 20-30 days) and gives the detail about the sales of the product hence the retailer can sell it with an offer to clear the stock. This technology helps the retailer clearly understand the high demand on a product with the deep learning algorithm technology. Computer vision, sensor fusion along with the deep learning algorithm play a key role in the implementation of this retail shop. This retail shop implementation also includes the concept of cashless transactions. This system will reduce the physical cash flow and also the interaction between human so that it increases the profit of the company. This system brings network, wireless and Internet of Things technology to the retail shop business. This retail shop sells products like bread, milk, cheese, chocolate and ready-to-eat meals and snacks prepared by on-site chefs. This can be one of the "world's most advanced shopping technologies." This retail store and shelves are equipped with computer vision, sensor fusion and deep learning.

5. REFERENCES:

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