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Importance of Smart Sensor Technology in IoT Based Applications

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***Abstract*- Nowadays , there is a large requirement of Smart Sensors as recent technologies are developing with high speed electronic circuits with low cost. These collaborative interactions need higher quality, reliability, and economic efficiency of technical products. In this article, there will be an overview about Smart Sensors and Sensor Technology in today's IoT based applications with structures, types and example.**

Keywords- smart sensors, IoT, Signal Processing, Technology.

I. INTRODUCTION

In the new era of manufacturing intelligence, Smart Sensors play a very important role. As the industry develops increasingly sophisticated and complex processes, there is a high requirement of smart sensors to grasp all the commands and acknowledge back to the systems.

If we talk about city infrastructures, various factories or wearable devices, all use Internet of Things where large arrays of sensors collect respective data and this data then transmits over the Internet to cloud based computing sources. There is an analytical software running on cloud computer which generates the information for users and action to be taken from actuators in the respective fields.

In IoTs success, sensors play an important role. But here, conventional types of sensors are of no use as they simply convert physical variables into electrical signals. IoT environment needs advance sensors to play more technical and economic role so as to improve productivity.

II. SMART SENSORS-HOW ARE THEY DIFFERENT FROM CONVENTIONAL SENSORS?

Smart sensors are the one which can be used for its in-built intelligence, self-diagnostics and repair. In instrumentation and process control systems, a Conventional sensor is a device that senses something or detects change in physical properties and generates an electrical output in response to that change.

We know various sensors that can see, feel, hear, smell, and even taste. Now in case of smart sensors, they can perform data conversion, digital processing, and can communicate to external devices. It comprises a conventional sensor, a microprocessor, some form of onboard diagnostics along with the capacity of communication. Smart Sensors are capable of Performing self-assessments and self-calibration.

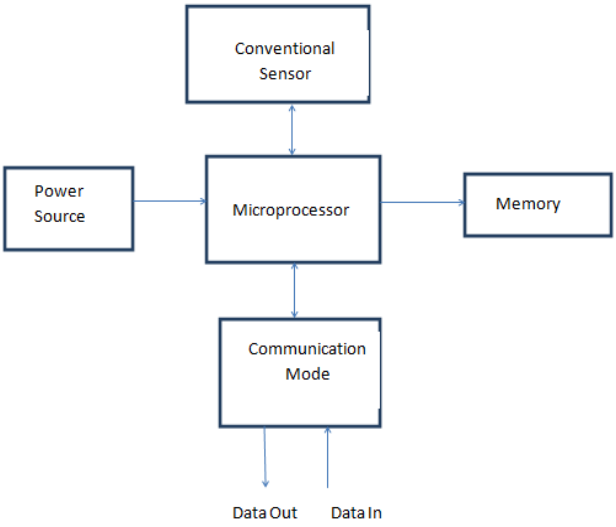

Fig 1. Smart sensor .

III. CAPABILITIES OF SMART SENSORS

To perform as IoT components, smart sensors must have following properties.

- Firstly and importantly, senors must be of Low cost, so as to deploy economically in large numbers
- It should be Physically small
- As a wired connection is typically not possible, smart sensors must be wireless.
- They should be capable of Self-identification and self-validation
- They should consume very low power to survive for years without a battery change.
- Smart sensors must Robust to minimize maintenance
- They should have Self-diagnostic, self-healing and Self-calibrating abilities.

IV. HOW SMART SENSORS WORK?

When Sensors integrated with many sensing elements and other system blocks and circuitry in a single silicon chip, it is called Smart one providing high accuracy and multiple functions. Smart sensors as IoT component are developed to convert the real-world information into a digital data signal for transmission and further process.

A built-in microprocessor unit (MPU) performs the application algorithms. signal conditioning tasks can be performed by these algorithms. Usually the sensor relies on a battery or energy harvesting in the absence of connected power.

If the smart sensor contains two elements in the probe, sensor cans self-diagnostics by itself. Any developing change in one of the sensor element outputs can be immediately detected. Additionally, if a sensor fails entirely — the second measuring element does the same process. A probe can contain two sensors which work together for monitoring feedback improvement.

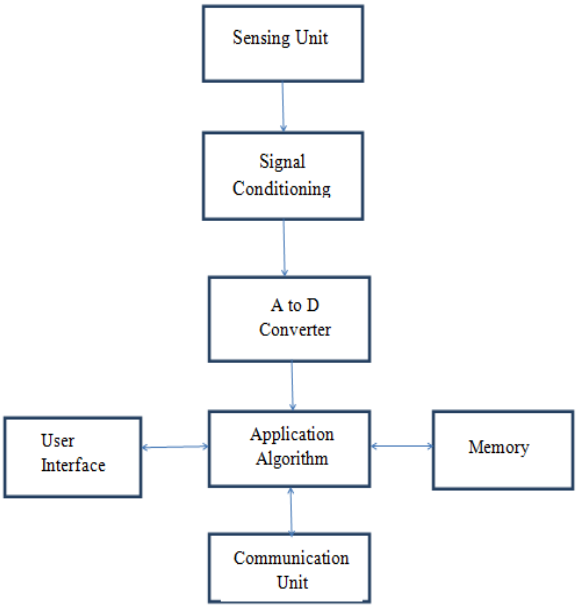

Fig 2. Smart sensor building blocks.

V. PRACTICAL EXAMPLE OF SMART SENSOR IN IOT

1. Smart Farming:

For optimizing a lot of different activities, Farmers can use the smart IoT farming applications such as determining the best time to harvest plants, creating fertilizer profiles. Based on the chemistry of soil and moisture levels, sensing soil nutrients, the sensors can definitely increase the production quality.In the farming, IoT technologies can help precisely which can lead in gaining production. According to one report, agricultural market using IoT device installation will grow at the rate of 20 percent by 2021.

Various devices like, Smart Elements, AllMETOE, and Pynco can detect weather conditions and other environmental data and accordingly collects the data and process over it in order to get the correct information which can help the farmer to understand the concept of farming. The smart farming concept can help to boost both the quality and quantity of agriculture production.

VI. CONCLUSION

Internet of Things (IoT) offers endless opportunities for evolving technology and making systems smarter and efficient in every aspect. This article highlights the introduction of IoT technology and the use of smart sensor in IoT for expanding applications of the technology. In this article, we have seen how smart sensors can work with respect to IoT and IoT based applications. Smart sensors involved improved fabrication also for their intelligence and communication capabilities. By integrating smart sensors with other systems, one can be implemented in small, low-cost environment.

VII. THE SCOPE AND FUTURE OUTLOOK

Sensors can be made to fit almost anywhere in consumer devices with micro and nano technologies. Various applications in robots, automobiles and even human bodies can use smart sensing technology. Use of smart sensors also increasing rapidly in counter-terrorism, cargo tracking, biometrics among other applications. Looking forward, with advancements in sensing technology, the new wave of sensors including IoTs is going to make revolutionary changes in the electronics industry.

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