# Electronic Evolution: Wearable Devices

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*Abstract*— This paper throws light on changing trend of modern consumer electronics from hand held devices to wearable. How wearable devices are helping to accomplish task such as sleep monitoring, pulse monitoring, live location, etc. How wearable devices will help to pave a path for future start-up. Apart from these we will also examine the loop holes that needs to be addressed to have optimum results. This paper will help its readers to understand the fundamentals about embedded system, wireless connectivity and sensor technology.

***Key words:*** Wi-Fi, IOT, RF, IR, Artificial Intelligence, SWS

## I. INTRODUCTION

A wearable device is a combination of devices with microcontroller embedded into clothing or on certain arrangement that can be worn on body. History of wearable devices goes back to 1500 in Germany when Peter Henlein invented pocket watches. So we can say that the simplest form of wearable device that we are familiar is pocket watch and wrist watches. The origins of modern wearable technology are influenced by both of these responses to the vision of ubiquitous computing. One early piece of widely adopted wearable technology was the calculator watch, which was introduced in the 1980s. An even earlier wearable technology was the hearing aid. After mid 2000's it's become very clear that future of consumer electronics will be wearable systems.

## I. MOTIVATION

Aiming to demonstrate the proof of concept, a low cost wearable system with wireless data transmission and reception capabilities which can be used for health monitoring etc. It will be an open source product for countries where people face difficulties to acquire knowledge and also to encourage youth to learn-by-doing. Most of these devices would work with low power; in particular, they use a radio transmission with a current consumption of 40 mA at 3.3 V(may vary with process) sending the data to a remote central unit for the following processing. Therefore, in, a low-power electronic board, supplied by battery, has been designed to improve all day long acquisition. The concept of remotely monitoring whereabouts of a person is not new but recently a lot of attention has been placed on smart wearable body sensors (SWS). Whereas other articles have focused primarily on devices which have been used for research or have needed a physician's prescription, this article expands upon the opportunities and studies with devices that are available to all consumers. There is now more evidence to support the reliability of these devices and the technology is more easily accessed. These devices contain an assortment of different sensors which can be used to monitor variables and transmit data either to a personal device or to an online storage site. The variety of the sensors can be attributed to the types of stimuli that they respond to (e.g. physiological vital signs) and their placements (clothing, subcutaneous implant, body part accessory, etc.) These devices have the opportunity to meet the needs by administering information in real-time to the smartphone, computer or other wireless devices and has the potential to influence their behaviors. Sensors allow patients to self-monitor, track, and assess human physiological data, while also providing interfaces and a dashboard for healthcare providers. These sensors are easily managed and are becoming increasingly accurate and reliable for patient's care. The SWS's can also be utilized as a diagnostic tool to aid in identifying and managing a myriad of diseases. Current sensor technology for vital-sign monitoring promises great benefits for prevention, prediction, and management of diseases. Despite significant progress within the monitoring device industry, the widespread integration of this technology into medical practice remains limited.

## II. BLOCK DIAGRAM

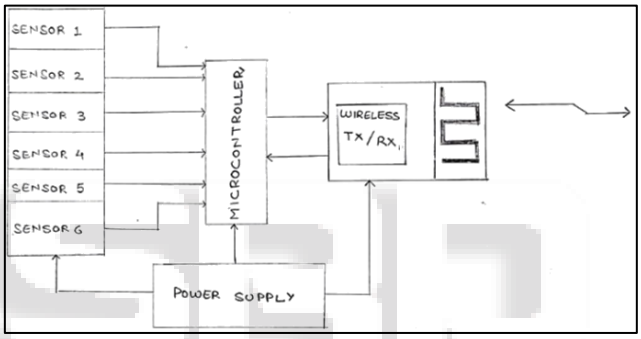


Fig. 1: Block Diagram

Understanding the block diagram:
This is a simple block diagram to show the concept and fundamentals of a wearable device.

### *A. Microcontroller*

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.

Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances among other devices. A microcontroller's processor will vary by application. Options range from the simple 4-bit, 8-bit or 16-bit processors to more complex 32-bit or 64-bit processors. In terms of memory, microcontrollers can use random access memory (RAM), flash memory, EPROM or EEPROM. Generally, microcontrollers are designed to be readily usable without additional computing components because they are designed with sufficient on-board memory as well as offering pins for general I/O operations, so they can directly interface with sensors and other components. We will be seeing s great change in this technology with VLSI and Nano science we might just be seeing the 'tip of the ice berg' of what we might see in near future.

 

### *B. Sensors*

Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. A Sensor converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) into a signal which can be measured electrically. Let's explain the example of temperature. The mercury in the glass thermometer expands and contracts the liquid to convert the measured temperature which can be read by a viewer on the calibrated glass tube. Surface Plasmon resonance and Light addressable potentio – metric from the Bio-sensors group are the new optical technology based sensors. CMOS Image sensors have low resolution as compared to charge coupled devices. CMOS has the advantages of small size, cheap, less power consumption and hence are better substitutes for Charge coupled devices. Accelerometers are independently grouped because of their vital role in future applications like aircraft, automobiles, etc. and in fields of videogames, toys, etc. Magnetometers are those sensors which measure magnetic flux intensity B (in units of Tesla or As/m2).

### *C. Wireless TX/RX*

Wireless TX (transmission) and RX (reception) capable devices have opened up a huge window of opportunities and have mitigated lot drawbacks associated with wired transmission. Wireless transmission is a form of unguided media. Wireless communication involves no physical link established between two or more devices, communicating wirelessly. Wireless signals are spread over in the air and are received and interpreted by appropriate antennas. The various types of wireless communication include radio broadcast (RF), Infrared (IR), satellite, microwave, and Bluetooth. Mobile phones, GPS, Wi-Fi, and cordless telephones are devices that use wireless transmission to exchange data and information.

### *D. Power Supply*

A power supply is a component that supplies power to at least one electric load. Typically, it converts one type of electrical power to another, but it may also convert a different form of energy – such as solar, mechanical, or chemical - into electrical energy. It is one the constraints we often witness while we work on a project. Choosing a power supply is similar to choosing a perfect heart for a person if might increase or decrease the life of the subject. There are various types of sources available each of which is chosen according to the project requirement. Most common are different types of batteries among them we have find alkaline, Li-Po, Ni-cd cells most promising among them though we see development in that field and in near future we might not need to depend on them.

## III. EVOLUTION AND SCOPE

Electronics industry changed rapidly year after year with implementation of sophisticated development techniques. According to a report by Transparency market research, the healthcare and medical segment held the largest revenue share and accounted for about 35.1% of the entire wearable technology market in 2012. The report cites that major reasons for this include the rise in aging population and an increase in people with diabetes. Fitness and wellness was the second major sector with a surge in activity trackers.

This was closely followed by the infotainment segment. However, by 2018, the Infotainment segment is expected to surpass the fitness and wellness segment driven by robust growth of smart watches and smart glasses. The market is yet to take off in India both in terms of companies manufacturing wearable smart devices and customers willing to use them.

It will be correct to say now that wearables are indeed the future and will be the next chain of evolution after emergence of smart phones. This will steer current businesses towards a new era of possibilities. Artificial intelligence will only be acting as a catalyst to this whole evolution cycle and this will directly affect lives of people. The major sector of dominance will be fitness, healthcare and possibly military.

### *A. Fitness*

Smart bands and wrist watches being able to record daily activates such number of laps with different sensors embedded into it will be able to measure various parameters.

### *B. Healthcare*

Measuring various vital parameters such as ECG etc. and being able to send and receive that data during emergencies

### *C. Military*

It will all depend on the requirement of mission and assignments this will lighten the heavy load on soldiers and we be able to provide better performance than bulky equipment which lack mobility.

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