

## Microcontrollers in Smartwatches (Apple Watch, Fitbit, Samsung Galaxy)

### Introduction:

In our daily life, we have been using all sorts of products throughout the day and the main one is watches. Especially, when the technology has been developing and the number of smartwatches being bought and created is also skyrocketing. According to Boettcher, watches were first introduced in Europe during the thirteenth century named Mechanical Clock [1]. As the world evolved with technologies, the watches also made their evolution from being mechanical to smartwatches. In the early ages, the usage of watches was just for checking time but time has evolved now. There are so many features being added using advanced technology, microcontrollers and other mechanisms in order to develop unique components such as heart rate check and monitoring human health. In order to successfully implement watches like Apple, Fitbit and Samsung Galaxy, we need the services of microcontrollers which play a major role in managing sensors like the heart rate, batteries and monitoring time. In this paper, we will be discussing the types of microcontrollers being used in smartwatches such as Apple, Fitbit and Samsung Galaxy. We will go through their purpose, performance, and the impact microcontrollers have in smart watches and how they play a major role in introducing successful smartwatches to society.

### Summary of References:

#### Apple:

Apple is one of the biggest global market companies and has been involved in developing all sorts of technologies such as Iphones, Macbook and watches. Apple started to reveal their ideas

and watch products to the world in early 2015 with showing their first ever apple watch. In order to implement the Apple Watch successfully, the company needed the services of a microcontroller in order to create unique and better features. Apple utilizes the ST32 microcontroller in order to control sensors and other features including batteries and interactive displays in smartwatches [2]. Basically, microcontrollers help to read data and information from sensors and send them directly to the processor which makes signals and gives the connection to the heart rate when it's being connected to the humans. So for example, when we run or exercise the microcontroller stored inside the apple watch collects the data from our movement and utilizes it to determine accurate results such as the amount of calories burned by us and the exact heart rate for that specific time. So, without a microcontroller, the Apple watch won't be able to track our health and won't have any interaction features in them which is essential and needed for companies in order to make the watches unique from their competitors.

Fitbit:

Fitbit is a modern watch which is primarily used to monitor things related to health which includes the heart rate, amount of walking steps per day and other fitness related activities. In order to implement fitbit, it is being created with ST Microelectronics STM32L151C6 microcontrollers which is technically an 32-bit microcontroller with an important mechanism of ARM cortex - M3 core imported in the fitbit [3]. There are key main services that would be impacted if there is not a quality microcontroller which are the sensors, batter power and bluetooth radio. Sensors are a really key feature in smartwatches such as fitbit since it really helps the person wearing it to track their heart rates and the amount of steps. Microcontrollers also help to save the power of the battery that is being used by the buyers and provide them a

quality battery life rather than getting damaged in the early stages. In terms of bluetooth, they utilize the microcontroller in order to communicate with the Fitbit app and make sure the battery doesn't drain quickly. So overall, the microcontroller in fitbit plays an important role in keeping the fitbit watch secure and maintained properly which provides a quality service for customers that are purchasing fitbit.

Samsung Galaxy:

Samsung is also one of the largest global market companies and the major competitor of Apple in all sorts of technologies. They both are the competitors for phones, laptops, computers, tabs and smartwatches. In terms of the smartwatches, Samsung uses Samsung Exynos multiprocessors which helps them with Wifi, location and bluetooth. So the smartwatches don't need that much power compared to other technologies that Samsung makes. So the Exynos processor plays a huge part in terms of graphic processing with the 64 bit multicore CPU in order to have better performance and be efficient [4]. It is also similar to other companies where the multiprocessor helps them with tracking heart rate and sleep monitoring. It also enhances the user's experience with calls, texts, bluetooth connections and more in order to keep the buyers engaged while using the Samsung smartwatch. Samsung is also using advanced and more powerful multiprocessors in latest generation smartwatches and planning to use them in the upcoming ones as well. The features they are planning to add on is that the users can access applications through visual interfaces and keep them engaged. Overall, Samsung also uses powerful multiprocessors in order to give one of the best experiences for the users of Samsung galaxy smartwatch.

### Discussion:

Smartwatches have been a regular usage for most people in this era which helps them save time in regard to checking their health, where you get an instant update on your heart rate, and steps check. Specifically, In my daily life the existence of microcontrollers in smartwatches plays a massive role since it checks health, helps me to manage my time well and efficiently. With regard to the importance of microcontrollers, it's the device that works behind the display in order to track my heart rate and step count with a sensor when I go swimming or go for a run in the evening. It keeps me actively engaged and also provides me some motivation to be disciplined and follow a healthy life. Overall, microcontrollers are really important for me, especially in smartwatches in order to keep me active, engaged and in a healthy lifestyle.

### Conclusion:

In conclusion, microcontrollers play a very important role in the field of smartwatches now and also in the future as technology advances to another level. Without quality microcontrollers, smartwatches won't be able to track sensors accurately which includes heart rates, sleep patterns and might have problems with battery draining so fast. They behave like the brain of smartwatches which connects to many other parts and gives energy in order to keep them active. Overall, microcontrollers enable smartwatches to work efficiently and accurately in order to satisfy the buyers expectations from the smart watches.

References:

1. Boettcher, D. (n.d.). *Early watches*. Available at:  
<https://www.vintagewatchstraps.com/earlywatches.php>
2. eeNews Europe. (2015, June 28). *Apple Watch has European chips inside*. Available at:  
<https://www.eenewseurope.com/en/apple-watch-has-european-chips-inside/>
3. Udanis, A. (2016, April 19). *Teardown Tuesday: Fitbit Charge Fitness Tracker*. Allaboutcircuits.com; All About Circuits. Available at:  
<https://www.allaboutcircuits.com/news/teardown-tuesday-fitbit-charge-fitness-tracker/>
4. *Exynos processors for smartwatch* | Samsung Semiconductor Global. (2016). Samsung Semiconductor Global. Available at:  
<https://semiconductor.samsung.com/processor/wearable-processor/smartwatch/>