Heart Rate Monitoring Ring – Smart Ring

1. Device

Heart rate monitoring ring is also known as a smart ring which was recently released to the technological market. It includes such functions like counting steps, tracking heart rate and body temperature, also taking control over the phone to some extend with the help of Bluetooth or Near-Field Communication chips.

Fig.1 An example of a smart ring and its features

2. Use

There are multiple variations of smart rings suitable for whatever chosen environment; however, the number of their abilities depend on the price. There are no doubts, that the most common purpose to use such device is, in the first place, convenience, since it is an extremely compact multi-tool. Regular customers might be people, who often monitor their wellness and the ones who highly connected to the technological world. The most common functions are sleep management, exercising and fitness tracking, contactless payments, travel pass and remote control. Some of them also have online security and may work as a smart key.

3. Users

One of the users might be a person named Kris Smith who is a self-employed owner of the most popular restaurant in Los Angeles. He is forty-seven and he has a high-income level. Although Kris is a businessman, he still finds time for healthcare and wellness since he is already middle-aged. Thus, a smart ring would be the best option for him, specifically in order to manage his sleeping schedule and heart rate. Whenever Kristopher is jogging, he likes listening to classical music without wanting to carry a phone in his hand. Therefore, he could use a ring to conveniently do such and also pick up important calls whenever it is required.

4. Sensors (and accessories)

Even though smart ring is quite small, it contains sensors and plenty of accessories inside, such as NFC and Bluetooth chips, battery, microcontroller, and light indicator.

- **NFC**

Near-field communication basically stands for communication (wireless connection) between a pair of devices on a small distance (Wikipedia Contributors, 2019). Smart rings are passive NFC devices connected to active ones (for instance, smartphones) since they have detector and decoder circuits. That creates the electromagnetic field allowing them to exchange the data.

- **Bluetooth**

To pair a smart ring to a smartphone or a tablet, the manufacturers also enable Bluetooth functions, a wireless technology for data exchange and communication between two devices on usually rather bigger distance comparing to NFC (Wikipedia Contributors, 2019).

- **Battery**

Commonly smart ring's battery may last from four and up to seven days. Then it is necessary to charge it using the basic USB-cable. Comparing to other devices like watches and fitness bands, it takes a bit over an hour for rings to be fully charged.

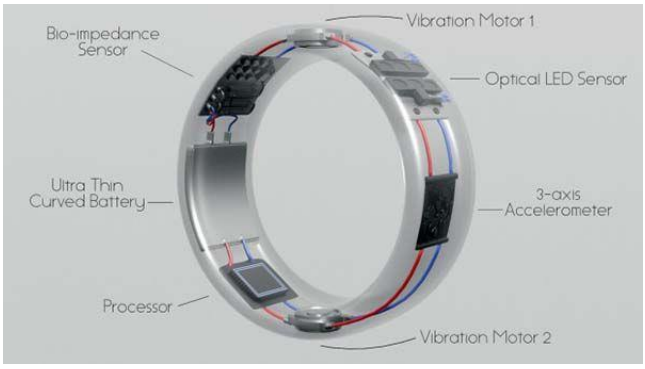

Fig.2 Smart ring system architecture

- **Microcontroller and sensors**

As shown in the picture, the ring is also equipped with a processor or, to be precise, a microcontroller, in which certain code is embedded using a programming language. Then accelerometer along with other sensors (optical LED sensor is for detecting and displaying the light) allows to determine energy signals, then measure acceleration and vibration, whilst vibrating motors, in turn, give a certain signal to indicate the operation of the sensors.

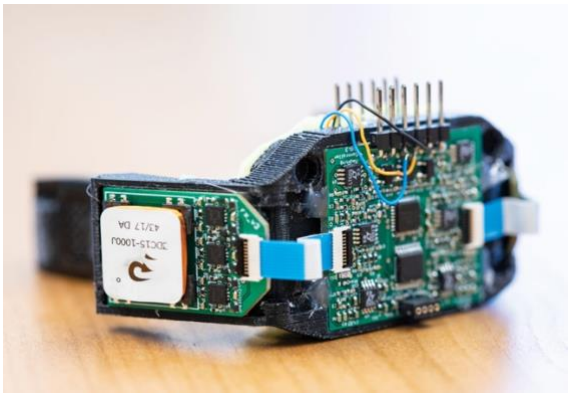

Fig.3 Microcontroller of a smart ring

5. Data collection

As it was stated above, smart ring is commonly for a daily use to collect information of its user's steps and calories, his heart rate and lifestyle overall, like sleeping habits and fitness routine. The ring allows to store information on the non-volatile random-access memory, but usually most of it is exported to the cloud services as they help with data communication and synchronization including door key ID, transit pass details and banking credentials.

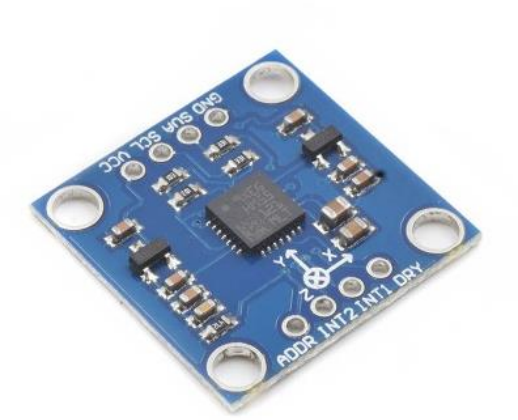

Fig.4 3-Axis accelerometer sensor

6. Sources

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7. Images

Fig.1 https://img.fruugo.com/product/4/39/179385394_max.jpg

Fig.2 http://media.gadgetsin.com/2016/07/bioring_smart_ring_tracks_your_fitness_stress_and_nutrition_3.jpg

Fig.3 https://createdigital.org.au/wp-content/uploads/2020/06/create-online-mag-techwatch-may2020-4-1140x783.jpg

Fig.4 https://www.smart-prototyping.com/image/cache/data/SKU%20Photos/10100071/3-axis-accelerometer-sensor-lsm303dlh-43462-750x750.JPG