DesignNews Serving the 21st Century Design Engineer

Android Developers Can Seize the Day in Wearable Devices

Renjith Ponnappan, eInfochips
11/26/2013

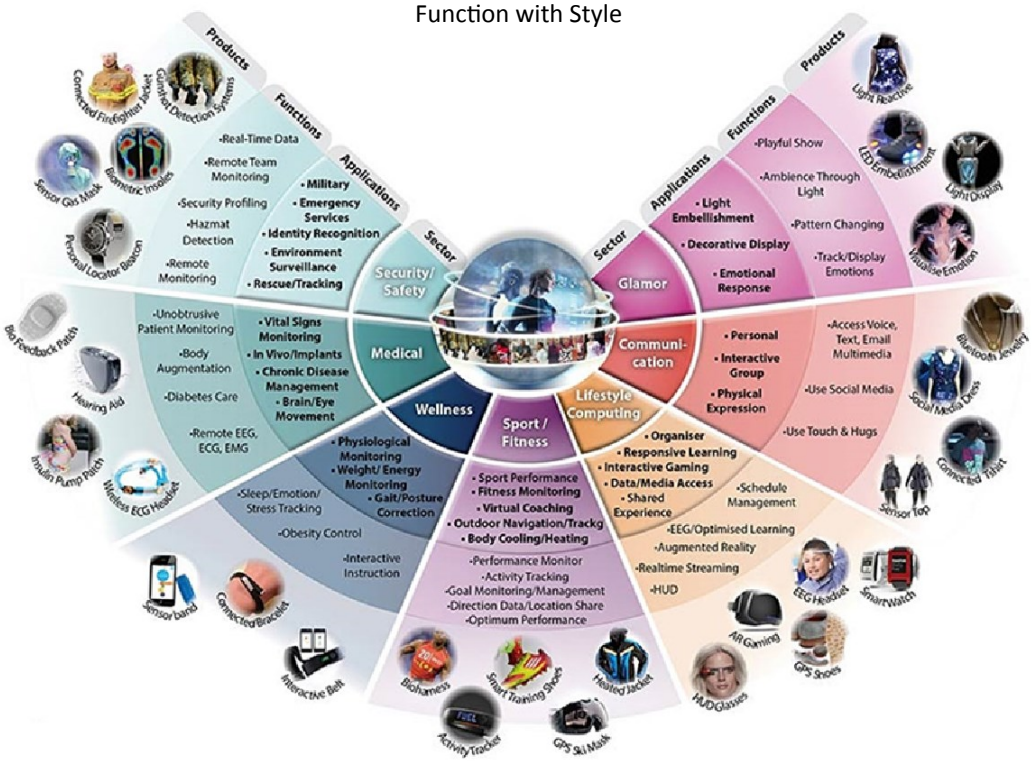
In the movie *Dead Poets Society*, Robin Williams whispers to his students, "*Carpe diem*," or "Seize the day." Today, Android device developers around the world are planning to incorporate new Android KitKat technology into wearable devices and seize their share of this lucrative new market. Developers are also wrestling with how to support their product lines while designing a completely new class of products.

Wearable devices are pouring into the market with huge investments from cash-rich VCs such as Legend Capital, and with development assistance from resource-rich vendors such as Google, Intel, and Baidu. Recent big bets include $43 million in financing for wearable device company FitBit, Legend Capital's funding of Zepp Lab, and an investment by Intel in the ski glass pioneer Recon. On the development side, Intel started a New Device group led by a designer who worked on the popular Nike FuelBand, and Baidu has launched a site featuring wearable devices using its mobile operating system called Baidu Cloud.

Driving the investments are forecasts for huge market demand. According to a Juniper Research report (subscription required), revenue from wearable industry sales will reach $19 billion in 2018 -- more than 13 times the $1.4 billion expected this year.

World of Wearable Technology Applications

Function with Style



KitKat is a wearable device watershed

Until now, Android operating system (OS) technology wasn't optimized for small, low-power wearable devices. The new capabilities of Android 4.4 KitKat, the latest version of Google's mobile OS, are expected to be a watershed for sales of wearable devices, with tools to help developers create memory-efficient applications for smaller devices with as little as 512 Mbytes of memory. Developers who get to market fastest with high-quality products will find an open market in which to establish early incumbency as a wearable device leader.

Key features for wearable devices

Developers should consider leveraging four key features in their wearable device designs: optimized memory footprints, low-power sensor support, step detectors and sensors, and geomagnetic rotation vectors.

An operating system that's designed to run on smaller memory footprints is easier to miniaturize and requires less power for its operations. With KitKat capable of running on devices with just 512 Mbytes, a whole new set of cheaper wearable devices is possible. According to Google, KitKat manages memory through Dalvik JIT code cache tuning, kernel samepage merging (KSM), and swap to zRAM. KitKat has also been tuned such that every major component has a reduced memory footprint. A new API also lets you tune your app's behavior to match the device's memory configurations.

Android KitKat supports hardware sensor batching. This means that the Android device hardware collects sensor events in batches rather, than individually as they're detected. This keeps the device in a low-power idle state until batches are delivered. The apps can define when the batches need to be delivered, empowering app developers to make tradeoffs between power consumption and data collection.

A step detector is a hardware sensor that triggers an event based on a step. It tracks the number of steps taken since reboot. Counters and detector sensors offer cheaper alternatives to accelerometer-based motion sensors for measuring physical activity. Hence, measuring physical activity won't require expensive accelerometer hardware or a complex detection algorithm in the device. Rather, the detection trigger would be generated by hardware with no background software running. This also means that your wearable device will have better battery life, and your programmers needn't spend time perfecting detection algorithms to suit specific devices.

Such a device could act as a less pricy compass and eliminate the dependency on detection of direction on your mobile phone based on the GPS receiver positioning and device movement algorithms. Geomagnetic rotation vector sensors could ensure that, when you stop at a place for some time, it still shows the direction in which the device is pointing.

Cool devices and applications

Let's now discuss the industries and products that could take advantage of Android KitKat's features. In recent years, consumers have become more aware of their detailed health status, and now they carefully plan their fitness regimes. Step detector and counter sensors open up new possibilities for developers to build apps for health and monitoring devices. The sensors help track exercise regimes, daily workouts, and calorie burns more accurately. Android wearable devices then become at least partial substitutes for personal trainers. In an era when all of us are moving toward preventive care, KitKat will likely become the standard OS for wearable fitness monitoring devices.

Wearable Android devices also have a huge potential in home care, as they have the potential for both monitoring and communicating. Imagine a patient with a heart condition who is involved in high-stress activity. A wearable device can notify his doctor that his heart rate/pulse rate is consistently beyond normal stress levels, and there's immediate need for the doctor to slow the patient down.

Photography
Professional photographers take off-camera lighting very seriously. They use a variety of light meters to ensure that the picture captured has the right tone, quality, and exposure.

Wearable devices with light sensors can be used to measure specific light patterns. Such devices can help amateur photographers with their camera lighting techniques and make sophisticated lighting accessible to the masses.

Military
Wearable devices were first adopted in the military in the form of helmet-mounted displays that relay vital information to soldiers in the field. A soldier's life relies on critical information being delivered at the right time. A few companies grabbed this opportunity and built their own software and hardware ecosystems for the wearable device to work effectively. This created a huge entry barrier for smaller companies that couldn't build entire ecosystems. KitKat provides the military with a unified and open platform for development of wearable devices.

Recreation
With the new sensor support in KitKat, expect Android gaming wrist bands with remote-control features and integrated consoles. Instead of holding a controller/remote in your hand, all you'd need to do is wave your hand and point to shoot -- a dream for every gamer.

Challenges for developers
There are many potential applications for wearable devices and almost as many challenges in developing them. The challenges vary all the way from hardware capability to technical expertise.

From a hardware perspective, the expectations of ruggedness for wearable devices will be higher than that of a smartphone. Smartphones are built for computing and can run a lot of applications, but they're personal and fragile systems. Wearable devices won't operate in such a gentle environment. A simple example is the inability to operate touchscreens in dust/dirt conditions or while wearing gloves. To meet the requirements of wearable devices, it's important for designers to look beyond a delicate screen on a wrist.

The probability that your company has the experience and expertise in all domains of Android development is pretty small (unless you're Google). It becomes extremely important to have a sustainable pool of engineers with multiple skillsets to conceive your ideas from paper to actual products. With Android development on wearable devices picking up pace, the demand for skilled and seasoned engineers will only increase.

With new versions of Android releases and with devices not being up to date on the version of software, the permutations of devices and Android versions will grow exponentially. This might not be much of a concern for simple apps, but it's a tsunami of support for specialized apps.

A simple example to consider: Company A makes AppA, which many people have been using regularly. Company B makes AppB, which is recognized but not very well adopted. There's an Android update, and both companies find that their apps are rendered useless on the new version. Company B hires 1,000 engineers to make sure its application is up and running on the latest version. Company A tries to resolve the issue through its current set of engineers. If Company A doesn't deliver before Company B, users may switch to AppB from AppA.

Porting
Off-the-shelf Android is difficult to port to wearable devices, because the OS must be tailored to have a smaller footprint in terms of memory and power consumption. To achieve this, developers must have in-depth knowledge of the Android platform and expertise in kernel level development.

Another challenge that custom Android developers face is compliance. Every customized Android package must be tested for compliance to be labelled as an Android product. It's easy to understand what a challenge this is when you consider the compatibility test suite has more than 21,000 test cases to run, in addition to multiple versions of Android.

Things developers can do
Keep it simple. Developers should strive for wearable devices with simplicity in design and operation. The simpler and more user friendly a design is, the more likely the device is to get adopted. Remember that everyone is not a 21-year-old who has been groomed and brought up in the era of iPhones and tablets.

First comes first. Having a good concept is one part of the story and getting it to market is another. For a great idea to materialize, it's important to be first to market. Don't let your idea get rusty -- it might become someone else's idea. Try to gain help from industry experts to analyze the feasibility of a concept before you reject it. Many a times a product that you feel is unimportant might lead to the creation of a whole new segment of devices. Great ideas also require great effort and collaboration, both within the organization and with other organizations.

Automate your testing. Testing for different Android devices can be painful, and KitKat could consume lots of time and effort for engineers who could be doing more productive work. Automated testing tools like the AQuA TestBorg could reduce QA cycle time and effort, helping developers work on critical tasks and bring out updates in a fast-changing Android landscape.

Moving forward, it would become difficult to keep up with OS fragmentation with different Android versions being used and devices being ported to these versions. An intelligent call for an automated testing framework can help developers use their engineering bandwidth effectively.

Fill gaps in skill and experience. One of the traditional ways to fill gaps would be to hire people with the desired skills and experience. Another is to train your Android engineer to develop a new skill. A big concern with this approach is the pace at which the wearable devices market is moving. An excellent hire today may not be your best investment six months down the road.

Another approach that many companies are now following is using third-party engineering services that have domain expertise. This not only helps them get the best product, but it also ensures that their products get to market quicker. After all, not many remember the person who finished second in the race to market.

Look out for more. Finally, don't restrict your imagination to just watches with screens. There are lots of opportunities to explore.

Renjith Ponnappan is a product manager at eInfochips.