

# TECHNICAL INSIGHTS

## INSIDE R&D

### TECHNOLOGY ALERT



20<sup>th</sup> September 2013

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### **1. SIGNAL-FILTERING ALGORITHMS TO REDUCE INTERFERENCE**

The popularity of mobile computing devices such as, tablets and smart phones, has led to the widespread use of wireless communication technologies such as, Wi-Fi, Bluetooth, global positioning system (GPS), and so on. The mobile devices are equipped with multiple radio frequency receivers and transmitters to facilitate these technologies. Though these technologies use respective frequency bands or spectrums, there are occasions where the transmissions interfere with each other and create electronic noise. Such noise and interferences result in slow device performance and high-battery consumption. This gives rise to the urgent requirement of a technology, which could reduce the effect of the interference and noise in the communication system.

With the aim of addressing the above mentioned challenge, USA-based AvaTekh Inc., has collaborated with Kansas State University's Electronics Design Laboratory to form a research team. The researchers have developed a solution containing non-linear algorithms and circuits known as Adaptive Nonlinear Differential Limiters (ANDLs), which is capable of reducing the impact of interference and noise in a communication channel.

In order to overcome interference, equipment are required to identify and neutralize wayward signals. Usually this process is done by digital processing after the transmitted signals are captured and digitized. This approach does not always fix some types of interference. Most of the present wireless systems transmit digital data, but the transmitted signals are actually analog in nature. The ANDLs, unlike conventional systems, which try to mitigate the noise and interference after conversion, work with analog signals to prevent interference at the source. ANDLs are integrated in the analog sections of receivers and transmitters to operate in real-time.

ANDLs will be highly effective to enhance smart phone performance along with reductions in complexity, size, and power consumption. Additionally, ANDLs

could be highly useful to counter intentional jamming. It is also likely to be effective preventing the damages in power line networks. The reduction in noise and interference is likely to facilitate the wireless communication systems for better data transfer. ANDLs will be helpful to accommodate the exponential growth in the use of mobile computing devices across various sectors such as, industrial, government and public. The newly developed solution is likely to be helping in preventing economic loss and performance degradation. ANDLs will also open up new applications in military communications and commercial navigation. Overall, the new technology is capable of improving any system where man-made electrical or electronic noise is present.

AvaTekh Inc., has been researching, developing, and commercializing leading edge technology for defense and consumer applications. The recently developed and patented ANDLs seem to be a revolutionary discovery to mitigate signal noise and interference. Funded by a Phase I Small Business Innovation Research (SBIR) grant from the National Science Foundation (NSF) called, 'Adaptive analog nonlinear circuits for improving properties of electronic devices,' ANDLs is likely to be a popular discovery among the manufacturers of electronic devices by the end of 2014.

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## **2. NOVEL SET-TOP BOX POWERED BY LTE**

The advent of the smart age has seen revolutionary enhancements in all sectors of the society. Entertainment has been an area, which has immensely benefitted from smart technologies. The smart television (TV) has been the flag bearer of smart entertainment. With the widespread use of set-top boxes, digital entertainment is now a reality. However, smart TVs still cannot ensure optimum viewer experience due to the limited connectivity speed of conventional set-top boxes. Following the concept of connected world, even smart TVs require seamless connectivity coupled with rich viewing experiences and console quality multiplayer gaming. Though LTE (long term evolution) has been used by mobile devices for high-speed connectivity, conventional set-top boxes fail to leverage it due to lack of processing power and portability. The need for a highly efficient

set-top box with efficient processing capabilities to support LTE connectivity is realized to deliver optimum user experience in entertainment.

California-based Qualcomm Technologies Inc., a wholly owned subsidiary of Qualcomm Incorporated, has collaborated with Technicolor to develop a next generation set-top box to address the above mentioned challenge. The new development, known as Simulating Video Experience over LTE (SVELTE), is a portable device, likely to deliver enhanced entertainment experience.

SVELTE is uniquely designed converging LTE technology, Android operating system (OS), and terrestrial broadcast. Leveraging the LTE technology as a service, SVELTE is capable of delivering real-time 3play over cellular network. The LTE module enables transmission of unicast along with broadcast content. SVELTE is equipped with the highly efficient Qualcomm Snapdragon 600 processor. This next-generation processor enables to integrate the core set-top box software assets to deliver high-quality Android services. The chipset coupled with the leading edge LTE technology allows multiband support. The Snapdragon 600 processor has high graphics and multimedia support to deliver optimum performance for applications, user interfaces, and games.

The SVELTE is highly efficient portable media center to deliver futuristic entertainment experience. The new development is likely to change the present day smart TVs concept of entertainment delivering optimum platform performance. It is likely to open up new definitions of TV viewing, network communication, and advanced gaming. SVELTE is designed to deliver dynamic features of mobile computing devices in smart TVs. It is likely to provide a smarter and connected entertainment experience. The unique combination of Snapdragon and LTE will enable seamless communications along with sharing and streaming of High Definition (HD) content.

Qualcomm delivers and optimizes next generation wireless technologies such as 3G and 4G. It has collaborated with digital innovating company, Technicolor, to elevate and enrich viewing experience with the SVELTE. SVELTE is likely to re-define home entertainment. The highly attractive features and the fast time to market of SVELTE are likely to make it a huge success by the end of 2014.

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### **3. iTClamp HEMORRHAGE CONTROL SYSTEM**

Severe bleeding also known as hemorrhage continues to be a leading cause of preventable death associated with traumatic injuries. Current treatments such as, applying direct pressure, hemostatic agents, or tourniquet becomes inappropriate when used as emergency medicines for penetrated injuries where the bleeding remains uncontrolled. There existed a need for a portable point of injury device that can be applied quickly and effectively without disrupting distal blood flows (like that in a tourniquet) for external hemorrhages.

iTraumaCare incorporated in 2010 and based in San Antonio, Texas, has developed solutions to address the unmet need of preventing death from severe bleeding in a pre-hospital setting. Dennis F. Filips, the founder of iTraumaCare, designed the iTClamp™ Hemorrhage Control System to effectively control bleeding in life threatening injuries. The iTClamp provides injury solutions that are crucial for first responder paramedic applications, and in military applications requiring medical care to be given under tough situations. The iTClamp is a temporary wound closure device that controls external bleeding in open wounds with compressible zones where quick hemostasis (arrest of bleeding) is required. Taking the shape of a hair clip, the device is made of sterile plastic measuring approximately 2 in. by 2 in. and weighing less than 3 ounces. It has piercing metal teeth along the jaw of the clamp that bites into the skin for tight sealing. The gums of the device seal the edges of the wound and forces the blood to pool temporarily under pressure to transform into a stable clot preventing further blood loss until the wound is surgically repaired.

iTClamp is compact, light, and durable. The size and efficiency of the clamp are its highlight features, making it versatile to be used on all types of traumatic injuries. The device is an intuitive development that requires minimal training and motor skills for use to overcome the significant challenge of time in hemorrhage control. The quick use of the clamp also allows medical professionals to attend toward crucial patient care after stopping bleeding in traumatic injuries.

In May 2013, the iTClamp Hemorrhage Control system was approved by the US Food and Drug Administration (FDA) for efficacy and patient safety. In March 2013, the device received the CE Mark for sale in Europe. In August 2013, the iTClamp was used on a 64 year-old patient from Olive Branch, Mississippi, who had suffered a chainsaw injury. Two iTClamps were used on the wound to stop the bleeding, stabilize the patient, and transport him via air to a hospital for

surgery. As severe bleeding can lead to morbidity and mortality, use of iTClamp enables providing effective on the spot care for emergency bleeding injuries, and hence proves to be great investment in the field of healthcare.

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#### **4. SENSOR-BASED REMOTE PATIENT MONITORING PLATFORM**

Ambient Assisted Living (AAL) systems are in increasing use in the health-care sector for monitoring age-related health risks or people with disabilities. The systems are in huge demand for remote monitoring of patients directly in their homes. This helps people to reduce the number of visits to the doctor and adds convenience for the medical institutes to diagnose patients. However, there are not many commercialized solutions in the market, which could deliver optimum result for remote patient monitoring in a cost-effective manner. With traditional approaches, people need to deploy costly systems to gather and transfer data to the medical centers for further analysis. Additional cost of deployment of the system for occasional use only makes it difficult for wider adoption of the concept in the industry. This generated the need to develop an efficient cost-effective solution, which could leverage commonly used components to capture and transmit data to medical centers.

Realizing wide scale usage of smart-phones across the globe, Harald Mathis, professor and head of 'Bio-molecular Optical Systems' department of Fraunhofer Institute for Applied Information Technology FIT, along with Charité and T-Systems, Deutschland, introduced a platform, which integrates several miniaturized sensors in mobile devices to capture patients' data. Leveraging Bluetooth wireless communication of mobile device, the sensors can transfer data to connected medical centers seamlessly, thereby enabling them to monitor and diagnose patients from remote locations.

The key highlight of the solution demonstrated by the researcher of Fraunhofer Institute for Applied Information Technology FIT is its integrated platform, which comprises of three different types of sensors to capture various patients' data. The solution incorporates a nanopotentiostat sensor, which helps to measure biochemical information such as, lactate, glucose, and cholesterol levels from a patient's body. In addition, it integrates a fluorescence sensor--

which is meant for detecting color-marked biomarkers--and a SpO2 sensor for the purpose of monitoring heart rate and saturations in arterial oxygen.

Apart from the above mentioned sensors for capturing data from patient's body, the researchers also developed an application interface for smartphones, which enables users to process data and then transfer that information to the server using secured Bluetooth wireless communication.

At present with the prototype model, the researchers have used Bluetooth communication for the purpose of data transmission. However, due to the limited range of access for Bluetooth it is required to send the data from patient's smartphone to an intermediate server, which then forwards that information to the servers of medical centers. It is expected that, with further advancement to the system, researchers will be able to leverage other forms of communication, which could help users to send information directly to the medical centers at any locations from the smartphones. The funding support from Federal Ministry of Education and Research (BMBF)/EU could soon help the researchers to commercialize the integrated platform to the market in the next 1 to 2 years.

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