

TECHNICAL INSIGHTS

SENSOR

TECHNOLOGY ALERT



21st February 2014

- 1. HANDHELD BIOMETRIC DEVICE WITH MULTI-SENSING FEATURES**
- 2. SMART WATCH FOR TRACKING SWIMMING**
- 3. IMAGE SENSOR WITH HIGH-DYNAMIC RANGE FOR AUTOMOTIVE APPLICATIONS**
- 4. PATENT ANALYSIS--PARTIAL DISCHARGE DETECTION**

1. HANDHELD BIOMETRIC DEVICE WITH MULTI-SENSING FEATURES

Advances in biometric technologies, such as fingerprint sensing, iris recognition, and face detection/recognition, have resulted in an increasing number organizations using biometrics for authentication. Since biometrics provide a unique identification of individuals, the technology is being used for various purposes, such as passports (where biometric data can be used to authenticate the authenticity of a traveller), voter ID cards, access control, security, brand impact assessment, and so on.

Existing biometric systems can have difficulty in challenging lighting conditions. For example, face recognition systems can have challenges in environments where illumination is not controlled or is problematic. Iris and fingerprint capture in an integrated biometric system have been challenging in a conditions of bright sunlight. There is thus a need to have devices, which can be used indoors as well as outdoors under varied lighting conditions without requiring an environment suitable for biometric data capturing. Furthermore, multi-modal biometric systems (such as combined iris scan, fingerprint capture, and face capture) can ensure higher accuracy biometric identification systems.

US-based Credence ID LLC has come up with a handheld biometric scanner that integrates multiple sensing technology platforms. The device, Trident, consists of a dual iris scanner, a face scanner, and a FAP 45 (fingerprint acquisition profile) fingerprint sensor. The mobile device can be easily used in far reaching areas of large countries where civil or law enforcement programs require biometric information concerning the population. The device weighs only 1360 grams and comes with in-built GPS (global positioning system) sensors. This enables geo-location tagging of people and authentication. It also has wireless connectivity using Bluetooth and supports 3G cellular or WiFi networks.

The device is roughly designed like a binocular, which enables iris recognition in any light condition. The fingerprint scanner is capable of scanning single as well as dual fingers. The Trident also features a camera with 5 megapixel resolution and accompanying light-emitting diode (LED) flash lights for capturing high-quality facial images. The device has an integrated high definition (HD) display and a very rapid quad-core processor. In biometric authentication and enrolment, it is necessary to have high-speed processing, which the device is able to provide. The Trident runs on an Android operating system, which enables customization by users and developers based on specific requirements.

Governments across the world are employing biometric-based enrollment of residents that provide a unique identification of each individual. The Trident is primarily going to benefit such programs. It can also be used in other areas, such as border security, to verify the identification of people crossing over. The device can also be used for fast and mobile identification in case of accidents and crime scene investigations. Biometrics is also becoming a key platform for authentication in medical services and commercial transactions. This makes Trident a potential device for usage in hospitals or user authentication in case of opening a bank account. The device is currently available for purchase and Credence has also provided a software development kit. This can be used by organizations to develop their own applications using Trident. Biometric authentication systems are stated to have solid growth going forward, reflecting demand for ensuring the security of individual information and safeguarding access to documents or key areas.

Details: Bruce Hanson, CEO, Credence ID LLC., 2000 Powell Street, Suite 950, Emeryville, CA 94608. Phone: 1-888-243-5452. E-mail: sales@credenceid.com. URL: www.credenceid.com.

2. SMART WATCH FOR TRACKING SWIMMING

Wearable electronics is a key, increasingly trend. Wearable technology garnered attention at the Consumer Electronics Show (CES) 2014, Las Vegas, USA. Among the various applications of wearable electronics, sensing is very prominent. Fitness tracking and healthcare are key applications of such wearable sensors. Wearable sensors also have opportunities and applications in sports and training. Sensors fitted on the body can measure various parameters

and monitor the training and performance of athletes. By having access to relevant data, an individual can better understand his or her performance and improve it.

Swimovate Ltd., a UK-based company, has entered the wearable electronics market by providing smart watches that can monitor performance of swimmers. The company has recently launched Poolmate Live, which is a waterproof watch that can monitor swimming. The watch contains micro-electromechanical system (MEMS)-based accelerometer and microcontroller from STMicroelectronics (Switzerland), a leading provider of semiconductor solutions (including MEMS inertial sensors). In wearable electronics, power consumption is a major issue; and ideally components should be ultra-low power consuming. The microcontroller--STM32L--leverages STMicroelectronics' low-power technology and is able to provide a battery life of over 12 months for the Poolmate watch. The chip measures only 3 mm x 3 mm, and is able to fit easily in the tight space of the watch.

The Poolmate Live watch is able to capture data such as lap numbers, time per lap, distance swum, strokes taken per lap, and calories burned, which can be downloaded to a personal computer and analyzed using software provided by Swimovate. The accelerometer in the watch detects the motion of the swimmer's arms. Using a software algorithm and signal processing, data is extracted. Calorie information is calculated using the weight of the swimmer for reference. The watch has enough memory to store information from more than 100 swimming sessions, which can be downloaded at a later time. The watch also offers a vibrating alarm function that can depend on pre-set distance, laps, or time.

Swimovate's Poolmate Live offers swimmers the ability to monitor their training effectively and at a low cost. The watch costs about \$150 (based on the current exchange rate) which makes it affordable. The company also offers PoolMate HR, which has similar functionality as the Poolmate Live and can additionally monitor heart rate under water. The company has a patent portfolio covering Europe and USA. The Poolmate watch has been tested on various swimmers for a long period of over 18 months before it was launched. The watch has an accuracy of more than 99%, which makes the product highly reliable. The wearable sensors and electronics market has been significantly expanding. It is expected to grow significantly in the near to long term as

innovative and relevant products are introduced into the market, including lower-power, smart sensors and related electronics ; sensors that can provide novel types of data; and enhanced communication among Internet-connected devices.

Details: Lisa Irlam, CEO, Swimovate Ltd., 4 The Worple, Wraysbury, Middlesex, TW19 5NY, UK. Phone: +44-1784-481-562. E-mail: info@swimovate.com. URL: www.swimovate.com.

3. IMAGE SENSOR WITH HIGH-DYNAMIC RANGE FOR AUTOMOTIVE APPLICATIONS

Advanced driver assistance systems (ADAS) consist of technologies, which improve the safety aspect of a vehicle by assisting drivers in various degrees. Systems such as lane departure warning, blind spot detection, adaptive cruise control (where a vehicle maintains a constant distance from the vehicle in front automatically), parking assistance, night vision, are getting introduced into vehicles. The major technologies used include vision sensors, infrared image sensors, ultrasonic sensors, radars, and lidar.

Vision sensor technology is a key technology as it can provide multiple ADAS functionalities. A major challenge in image sensing for automotive applications is the low-dynamic range of the sensor. Dynamic range determines the contrast in image condition, which normally arises when a scene has both brightly lit areas as well as dark areas . Such situations can occur in cases such as headlight from an oncoming vehicle falls directly on the sensor, a vehicle is entering/exiting a tunnel, and sunlight falls directly on the sensor. During such cases, certain pixels tend to get over saturated and a distorted image is generated. As this image becomes the primary input for ADAS systems the reliability decreases. Thus, it is important to have sensors with a high-dynamic range, which is able to generate accurate images in challenging lighting conditions.

Omnivision Technologies Inc., USA, is a major provider for image sensors. The company has recently launched OV10626, an image sensor with high-dynamic range and as good low-light sensitivity, which is ideal for ADAS applications. The OV10626 is a system on a chip solution that uses complementary metal oxide semiconductor (CMOS) technology. The sensor is packaged using chip scale packaging technology developed by Omnivision. The

compact packaging allows the sensor to be part of miniaturized camera systems. Due to space constraints in automobiles, it is desirable to have camera systems that have a small footprint. The key features of the sensor are that it has a high dynamic range of up to 120 dB and sensitivity of 15 V/Lux-sec. The low-light sensitivity allows the sensor to be used in dark conditions with minimal ambient light. The chip has image processing circuitry integrated with the sensor. This capability will enable wider penetration into medium segment vehicles..

The major applications to benefit from the sensor include lane departure warning, traffic sign recognition, surround view, blind spot detection, obstacle detection and avoidance, pedestrian detection, occupant detection, and automotive machine vision. The adoption of advanced sensing features in vehicles has increased in recent years, but they have predominantly been available in premium segment cars. Lower cost systems will enable wider penetration into medium segment vehicles.

Details: Scott Foster, Senior Manager, Marketing Communications, Omnivision Technologies, 4275 Burton Drive, Santa Clara, California 95054. Phone: +1-408-567-3077. E-mail: sfoster@ovt.com. URL: www.ovt.com.

4. PATENT ANALYSIS--PARTIAL DISCHARGE DETECTION

A partial discharge (PD) is an electric discharge, which results from the breakdown of insulation systems operating under high-voltage stress. In particular, it is an electrical charge that only bridges the insulation between the conductors and that may or may not occur adjacent to the conductor. A PD is an indication of electrical stress that may lead to breakdown or catastrophic failure. It normally starts with the breakdown of a small portion of the insulation. PD detection is a key element in ensuring the safe and efficient operation of electric power grids. This is because major faults and breakdown of power transmission equipment, such as transformers or switch gear, mostly start with the breakdown of insulation. PD activity thus can provide an indication of an imminent fault or breakdown. By detecting PD at an sufficiently early stage, major faults, failures, and potentially catastrophic events can be avoided, thereby preventing power outages and damage to assets/personnel. Preliminary detection of PD activity can be carried out using handheld equipment.

Major technologies used for detecting PD include conventional PD monitoring in which impedance and induced charge in a detection circuit are measured (the sensors used in this method can be capacitive, inductive-high frequency current transformers, Rogowski coils), acoustic emission (typically uses piezoelectric transducers), ultra-high frequency sensors (UHF measurement of radio waves in the 300 MHz to 3 GHz frequency range). Dissolved gas analysis (DGA) is also used as an initial indicator of a PD, since PD in voids or gas bubbles form hydrogen, methane, or other gases that can be detected via DGA. There are key needs for improved ability to detect a PD more precisely and at an earlier stage. There is also a need for more precise and robust detection of a PD located within the transformer winding or insulation layers or between the winding and the core.

Unsurprisingly, the patent landscape is dominated by electric power companies. Top assignees include Mitsubishi Electric Corp, Korea Electric Power Corporation, and Toshiba Corp. The most number of patents has been published in Japan, followed by the Republic of Korea. Among recent published patents, patent No WO/2014/005407 by Ningxia Electric Power Research Institute pertains to a self-diagnosing current transformer that has an in-built super high-frequency partial detection sensor. Patent No. WO/2014/009035 assigned Siemens Aktiengesellschaft pertains to ultrasonic frequency (UHF) measurement of a partial discharge at a gas-insulated substation.

PATENT TITLE	PUBLICATION DATE / NUMBER	APPLICANT/ ASSIGNEE	INVENTORS	ABSTRACT
Device for monitoring an activity of partial discharges which occurs in an electrical apparatus	13.02.2014; WO/2014/0240 60	TechImp Technologies S.R.L.	Montanari, Gian Carlo	A device (1) for monitoring an activity of partial discharges occurring in an electrical apparatus comprises: a sensor (2) having a ring (3) of ferromagnetic material which can be coupled to a conductor of the electrical apparatus so as to enclose it, designed for measuring electrical pulses generated by the partial discharges and generating an analogue signal representing the entire wave form of the pulses; a box-shaped body (4) integral with the sensor (2) for forming with it a single body; an electronic card (5) contained in the box-shaped body (4), connected to the sensor (2) for receiving the analogue signal

				from the sensor and designed for processing substantially in real time the wave form of the pulses of the signal extracting the value of at least one predetermined parameter relative to the pulses; an output stage connected to the electronic card and set up to perform a signalling to the outside as a function of the values extracted for the at least one predetermined parameter.
Method for the ultra-high-frequency measurement of a partial discharge, and related device	16.01.2014; WO/2014/0090 35	Siemens Aktiengesellschaft	Charot, Gérard	The present invention relates to a method for the ultra-high-frequency (UHF) measurement of a partial discharge (PD), wherein said measurement is carried out using an ultra-high-frequency sensor (C) at at least one point of a gas-insulated substation (GIS), characterized in that the point is selected at at least one porthole (H) of said substation and in that the ultra-high-frequency sensor (C) is in contact with the outer surface of the porthole. A base for supporting an ultra-high-frequency sensor implemented in the context of said measurement method is also provided.
Signal extraction device and method for ultrahigh-frequency partial discharge sensor implanted in sulfur hexafluoride current transformer	16.01.2014; WO/2014/0087 18	Ningxia Electric Power Research Institute	Wu, Xutao	A signal extraction device and method for an ultrahigh-frequency partial discharge sensor implanted in a sulfur hexafluoride current transformer. The signal extraction device comprises a connector installation base (15) welded on a transformer base near a through-hole; and a connector (16) fixedly installed on the connector installation base. The connector is composed of a casing, a bush (6), a glass insulator (3) and an internal conductor (1), and the bush, the glass insulator and the internal conductor are formed integrally by cooling adhered glass after sintering and fusing. The casing is composed of an upper casing body (8) and a lower casing body (7) connected through screw threads, and the bush is welded on the inner wall of the upper casing body or the lower casing body. The signal extraction device and method can extract an ultrahigh-frequency signal

Sensor Technology Alert

				outputted by the partial discharge sensor arranged inside the sulfur hexafluoride current transformer out of the transformer, and have good electrical performance and sealing performance.
High-voltage sulfur hexafluoride gas-insulation current transformer	09.01.2014; WO/2014/0054 07	Ningxia Electric Power Research Institute	Wu, Xutao	A high-voltage sulfur hexafluoride (SF6) gas-insulation current transformer having a function of monitoring superhigh-frequency partial discharge, comprising a pedestal (6), an insulator, a supporting insulation component (4) and a secondary coil shielding cover (1) which are connected successively. A secondary coil shielding tube (5) is arranged in the insulator. A superhigh-frequency partial discharge sensor (2) is arranged on the secondary coil shielding cover (1), and an output end of the superhigh-frequency partial discharge sensor (2) is connected to a wiring terminal (7) which is arranged on the pedestal (6), through cables (3), which thereby serves as an output end. The superhigh-frequency partial discharge sensor is arranged on the current transformer, online test of partial discharge amount of the onsite high-voltage SF6 gas-insulation current transformer is realized, and at the same time, technical support is provided for system status analysis and assistant decision making, which makes a power grid possess a self-diagnosis function.
Partial discharge sensor	02.01.2014; US 20140002099	Fukasawa Toru	Fukasawa Toru	A partial discharge sensor includes a top-loading monopole antenna including a disc and a post to be installed even in a branch pipe with a small diameter such that a length between the disc and a structure is adjusted to set thereto a frequency band to be detected.
Locating of partial-discharge-generating faults	02.01.2014; US 20140002098	Sales Casals Lluís-Ramon	Sales Casals Lluís-Ramon	A method of locating incipient faults that generate partial discharges in an AC power distribution system includes detecting at least one spike in a PD pattern generated by such system; getting the voltage wave of the AC power in the system; detecting a phase of such spike with respect to the

Sensor Technology Alert

				<p>voltage of the AC power; and locating an incipient fault where such phase is below a predetermined threshold. An apparatus includes at least one sensor of electrical pulses, means for getting a synchronism signal with a power supply of the power distribution system, and modules adapted to carry out the method.</p>
<p>Amplifying device used for capacitor partial discharge on-line monitoring system</p>	<p>26.09.2013; WO/2013/1391 31</p>	<p>Shanghai Municipal Electric Power Company</p>	<p>ZHOU, Xingxing</p>	<p>An amplifying device used for a capacitor partial discharge on-line monitoring system. The capacitor partial discharge on-line monitoring system comprises a current sensor (IV) and a signal collecting device (VIII). The amplifying device comprises a voltage follower unit (I), an amplifying unit (II), and a cable driving unit (III). An input end of the voltage follower unit (I) is connected to the current sensor (IV), an input end of the amplifying unit (II) is connected to the voltage follower unit (I), an output end is connected to the cable driving unit (III), and the cable driving unit (III) is connected to the signal collecting device (VIII). Compared with the prior art, the amplifying device has advantages of eliminating influence of amplifier impedance on sensor impedance, and influence of refraction and reflection on signal transmission.</p>

<p>Partial discharge sensor for a high voltage insulation monitoring device</p>	<p>12.09.2013; US 20130234726</p>	<p>Alstom Technology Ltd.</p>	<p>Hobelsberger Maximilian</p>	<p>The present invention relates to a partial discharge sensor for a high-voltage insulation monitoring device comprising a housing and located in the housing a measurement circuit for measurement of partial discharges in a high voltage system to be tested and a coupling capacitor having one electrode connected to the measurement circuit and the other electrode to a first high voltage conductor to be connected to a high voltage line of the system to be tested, wherein it further comprises a calibration circuit located in the housing and comprising a calibration capacitor having one electrode connected to the calibration circuit and the other electrode connected to said first or a second high voltage conductor to be connected to a high voltage line.</p>
---	-----------------------------------	-------------------------------	--------------------------------	--

Exhibit 1 lists some of the recent published patents related to partial discharge sensing.

Picture Credit: WIPO Patentscope/Frost & Sullivan

Back to TOC

To find out more about Technical Insights and our Alerts, Newsletters, and Research Services, access <http://ti.frost.com/>

To comment on these articles, write to us at tiresearch@frost.com

You can call us at: **North America:** +1-843.795.8059, **London:** +44 207 343 8352, **Chennai:** +91-44-42005820, **Singapore:** +65.6890.0275