TECHNICAL INSIGHTS

SENSOR

TECHNOLOGY ALERT

25th July 2014

1. MULTIPURPOSE SENSOR FOR MONITORING HOME ENVIRONMENT

Devices providing updates about home environments and connecting to the user through his/her phone are in demand these days. There are some companies, such as Philips and Nest (the Nest programmable thermostat) that are coming up with devices which will provide updates on house conditions. There are sensors in the market which will provide alerts on changes in the house environment. However, these sensors are focused on simple and single tasks. Temperature sensors will sense the temperature in the room and update a user on the conditions so that he/she can turn on his air conditioner. Users need to place different sensors for getting an update about different tasks. As placing different sensors will increase the cost for users, there is a need for a cost-efficient, tiny, multipurpose, and user friendly device.

To address the above challenge, researchers from a Poland-based company Clime Sense have developed a multipurpose sensor called Clime. Clime is designed to measure different environmental conditions. Clime is comprised of ambient light, temperature, movement and humidity sensors. Clime communicates with the user through an embedded Bluetooth device.

Clime is integrated with four different sensors. The temperature sensor is employed to measure temperature. Clime is a very small device and can be placed on various places very easily such as on house windows. Clime may also be placed inside the refrigerator to measure temperature. A movement sensor is deployed to detect the motion of an object or people. The Clime sensor can be used to measure the total cycles in the washing machine. Humidity sensing is used to determine moisture content in gases, air and bulk solids, such as grain, flour and so on. The Clime sensor placed on the window of the house will provide information, such as temperature, light and humidity inside the room. It will guide the user to open or close the windows. Bluetooth low energy (LE)

communication creates a wireless environment by sending data to the users on their smart phones or tablets. Thus, the Clime sensor serves as a multipurpose sensor to create affordable home automation.

Clime sensors will be used in the house to measure humidity, temperature, light and movement. The Clime sensor is a low-cost sensor which can create an automated house environment. Before commercializing a Clime sensor, researchers are planning to add three new sensing elements to the product, such as light color sensor, carbon dioxide sensing and barometric pressure. The Clime sensor is relayed with phones and tablets which are Bluetooth enabled. Clime will provide an update about the change in environmental conditions and provide visualization about the home activity. Clime sensors are small in size, cost efficient and user friendly.

This project was self-funded by the founders of the company. Researchers are planning to create actuators and synchronize them with sensors. Synchronizing actuators with the sensor will help a user to control systems such as automatically opening or closing a window based on changes in the environment. The Clime sensor is expected to be commercialized by 2014. It has the potential to be well received by users due to its long battery life and the ease of use feature.

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2. WEARABLE DEVICE FOR MONITORING ALCOHOL CONSUMPTION

Several accidents and even deaths are caused due to excess alcohol consumption. Hence, there is a need for a technology that can monitor alcohol consumption and generate alerts when the alcohol consumption level of a user crosses a safe limit or when the user needs medical attention.

To address the above need, researchers from the University of Washington have developed a wristband with integrated sensors called Vive. Vive can be worn individually by a group of people at parties or other events involving alcohol consumption. Vive connects all the users of the group via social networks such as facebookand monitors each user's alcohol consumption, and sends alerts to the other members in the group via Bluetooth if it senses that the user is at risk or needs medical attention.

The Vive wearable wristband is comprised of a transdermal alcohol sensor, a gyroscope, accelerometer, dehydration sensor, and Bluetooth. The Vive transdermal alcohol sensor monitors the level of ethanol excreted from the skin of the user. The dehydration sensor monitors the dehydration level of the user. If the person's alcohol content or dehydration level is at dangerous levels, the device alerts the other members in the group.

The band keeps sending small vibrations to the user at regular intervals and the intervals decrease with the increasing inebriation levels of the user. If the user acknowledges the vibration by briefly squeezing the band within a stipulated time, the band does not act and sends the next vibration after an interval. If the user does not acknowledge the vibration, the Vive device alerts the other people in the user's group connected with the user via Bluetooth.

The gyroscope and accelerometer sense motion of the user and activate an alert if there is lack of motion; for example, if the user has lost consciousness, the sensor will alert other users in the group. Vive monitors and updates the user about alcohol consumption status by a simple vibration.

Vive can be used in events involving alcohol consumption for keeping users safe and connected from the start of the event till the end. It can monitor alcohol consumption by the users and alert the other users in the group in case of emergencies.

This project was funded by the University of Washington. The researchers of the wristband are working on making the triangulation process effective. Using GPS (global positioning system) or wireless network triangulation, a user can track the location of other users. The researchers also plan to work on reducing the size of the transdermal alcohol sensor, which is currently bulky.

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3. DETECTING EXPLOSIVES WITH TINY SENSORS

To ensure security of civilians and defense personnel, it is important to detect traces of explosives efficiently and reliably. There are some devices available in the market to detect these explosives, such as ion mobility spectrometers (IMS). However, IMS devices have challenges detecting low

vapor pressure explosives, and conventional explosive detectors are susceptible to false alarms. Pentaerythritol tetranitrate (PETN) is considered a favorite among terrorists because it is made up of a plastic body and is very hard to detect. Sniffer dogs can be deployed to sniff the explosives, but they may not be completely reliable. There is a need for a device which can trace minute airborne molecules of explosives. The device should be easy to place, should have good efficiency in tracing the explosives as well as cost efficient.

To address the above challenge, researchers from the University of California, Berkeley, have developed a plasmon laser detector. This plasmon laser detector, which comprises a tiny sensor, can trace minute concentrations of explosives.

The plasmon laser sensor is very small in size compared to other explosive detectors available in the market. It is deployed to detect the airborne molecules of explosives. The plasmon laser sensor operates below the visible light diffraction and is free from metal losses. This loss compensation within metals leads to a sharp emission of the ultrasensitive laser to absorb molecules. The plasmon laser sensor is covered with a layer of cadmium sulfide because of its optoelectronic properties, such as light energy absorption. A semiconductor is placed on the silver sheet and it is coated with a layer of magnesium fluoride. This apparatus works as a reflector to compensate for light leakage. The reflector allows the light to bounce back and forth inside the sensor. The sensing mechanism of the Plasmon laser sensor detects shifts or changes in the wavelength of light. The plasmon laser sensor creates a sharp signal to detect any changes for even minute traces of explosives. It will be able to detect tiny airborne molecules of explosives.

The plasmon laser sensor will be used to detect Dinotrotoluene (DNT), ammonium nitrate, Trinitrotoluene (TNT) explosives, pentaerythritol tetranitrate (PETN) and nitrobenzene. The plasmon sensors can detect DNT at concentrations of 0.67 parts per billion. Such sensors could be used in airports, train stations, and public places, such as schools and hospitals to detect terrorist threats.

Work on the plasmon laser sensor was funded by the US Air Force Office of Scientific Research. The researchers have noted the sensor could have applications in areas, such as biomolecular research.

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4. RECENT PATENTS IN THE FIELD OF FLOW SENSORS AND APPARATUS

Liquids and gases are used in processing plants. Coolants and lubricants are supplied for plants and machines. If there is an error in the flow of liquid or gases, it will considerably affect the end product. Thus, it is important to monitor the flow of liquids and gases.

Liquid or gas flow is defined as the volume per unit time or area per unit time at which liquids or gases travel through a given segment and it can be categorized at specific pressures and temperatures. Often, a flow sensor element is used in a flow meter or flow logger for fluid flow measurement. Fluid flow sensors can monitor media, such as irrigation systems, water recycling for home application, storage tanks, and water conservation systems.

Key types of flow sensing or metering technologies include differential pressure, positive displacement, vortex, thermal mass, ultrasonic, turbine, vortex, Coriolis, ultrasonic.

A recent patent in flow sensing involves the incorporation of a substrate supporting a piezoelectric element. The free end of the substrate undergoes vibrations by gas flow. This flexes the substrate and the piezoelectric element, providing an alternating output to a microprocessor with an amplitude dependent on the gas flow rate. The assignee for the flow sensor with Patent no WO/2014/108658 is Smiths Medical International Limited.

PATENT TITLE	PUBLICATION DATE / NUMBER	ASSIGNEE	INVENTORS	ABSTRACT
FLOW SENSORS AND APPARATUS	17.07.2014; WO/2014/108658	SMITHS MEDICAL INTERNATIONAL LIMITED	ADAMS, Grant Alan	A gas flow sensor (1), such as for a respiratory tube (120) or a convective warming blanket (40), includes a stiff, flexible rectangular substrate (10) supporting a piezoelectric element (11). The substrate (10) is mounted at its downstream end (15) and aligned in the gas flow (2) so that its free end (16) is vibrated up and down by gas flow. This flexes the substrate (10) and the piezoelectric element (11) so that it provides an alternating output to a processor (20)

				with an amplitude dependent on the rate of gas flow. The processor (20) provides an output to a display (3) indicative of the gas flow rate.
DEVICE FOR DETERMINING A POSITION OF A ROTOR OF A POLYPHASE ELECTRIC MOTOR	17.07.2014; WO/2014/108746	FREESCALE SEMICONDUCTOR, INC.	LOVAS, Ivan	A device (1) is for determining a rotor position in a polyphase electric motor having a first phase, a second phase and a third phase. A power control unit (3) applies a first voltage on the first phase, and a second voltage on the second phase, the first voltage and the second voltage being periodic signals of opposite polarity, alternating between a first part and a second part of the alternating period, such as square waves. A sample unit (4) samples a third voltage on the third phase for acquiring a first sample at a first instant in the first part and a second sample at a second instant in the second part, and a difference value between the first sample and the second sample. The difference value represents a mutual inductance between the stator coils due to the rotor position. Finally, a determination unit (5) determines the rotor position based on the difference value.
PROTECTION ASSEMBLY FOR DOWNHOLE WET CONNECTORS	17.07.2014; WO/2014/109753	HALLIBURTON ENERGY SERVICES, INC.	RICHARDS, William M.	The invention addresses protecting the free ends of communication lines from debris during downhole wet-mate connection in a wellbore, with protection of the lines upon disconnection as well. A reciprocating debris exclusion device is provided for use with upper and lower tools to be connected. The lower tool has a reciprocating cover member mounted for sliding engagement with the housing of the lower tool, the cover member shielding the free end of a communication line. An upper tool has a bladder-type cover member attached to the upper tool and protecting the free end of a communication line. The reciprocating cover member is moveable between a closed and an open position and is moved in response to contact with the upper tool. The bladder cover is movable between closed and open positions and is moved to the open position by contact with the reciprocating cover member of the lower tool.

METHOD AND SYSTEM FOR TARGETING DELIVERY OF VIDEO MEDIA TO A USER	17.07.2014; WO/2014/108195	TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)	HUBER, Michael	A method for targeting delivery of video media to a user is disclosed. The method comprises the steps of displaying a video segment to a user via a user equipment (step 10), determining a reaction of the user to the video segment (step 120), inferring user interests from the user's reaction to the video segment (step 130), and selecting a video segment for future display according to the inferred user interests (step 140). Also disclosed are a computer program product and system for targeting delivery of video media to a user.
VOLTAGE ADJUSTMENT FOR AN ENERGY HARVESTER	17.07.2014; WO/2014/108205	AKTIEBOLAGET SKF	BARTL, Frank	An arrangement (111,211) for voltage adjustment for an energy harvester (101,201) comprises: a first input terminal (131,231) and a second input terminal (133, 233) adapted to receive a AC voltage therebetween, the AC voltage having an input magnitude, the AC voltage being supplied at an inductance (107,207); a switch module (135,235) connected between the first input terminal (131,231) and the second input terminal (133,233) for controllably connecting the first input terminal with the second input terminal; and a controller (127) adapted to receive an input signal (129,229) indicative of the input magnitude of the voltage, and to control the switch module (135,235) to operate selectively in a first mode (121) or a second mode (125) depending on the input magnitude, in order to adjust the voltage to have an output magnitude in a predetermined range.
CBCT AND X-RAY COMBINED SETUP WITH X-RAY VERIFICATION OF PATIENT POSITIONING	17.07.2014; WO/2014/108174	BRAINLAB AG	BERLINGER, Kajetan	The invention is directed to a data processing method for determining the consistency of registration of the position of a treatment body part to be treated by radiotherapy with a treatment beam arrangement of at least one position of a treatment beam issued by a treatment device, the treatment body part being a soft tissue part of an anatomical structure of a patient's body and the data processing method being constituted to be executed by a computer and comprising the following steps: g) acquiring CT data

				comprising predetermined CT information about a position of the treatment body part relative to a bony structure of the patient's body and about a first position of the bony structure relative to the treatment beam arrangement; h) acquiring x-ray data comprising x-ray information about a second position of the bony structure relative to the treatment beam arrangement; i) determining, based on the x-ray data and the CT data, bony structure position first transformation data comprising bony structure position first transformation information about a first transformation between the first position and the second position of the bony structure; j) acquiring CBCT data comprising CBCT information about the position of the treatment body part relative to the treatment beam arrangement or relative to the bony structure; k) determining, based on the CBCT data and the CT data, bony structure position second transformation data comprising bony structure position second transformation information about a second transformation between the first position and a third position of the bony structure relative to the treatment beam arrangement; determining, based on the bony structure position first transformation data and the bony structure position second transformation data, transformation difference data comprising transformation difference information about a difference between the first and second transformations.

APPARATUS AND METHOD FOR CONTROLLING ADAPTIVE STREAMING OF MEDIA	17.07.2014; WO/2014/108194	TELEFONAKTIEBOLAGET L M ERICSSON (publ)	HUBER, Michael	A method for controlling adaptive streaming of media comprising video content is disclosed. The method comprises the steps of managing a quality representation of the video content according to available resources (step 120), detecting user engagement with the video content (step 130) and checking for continued user engagement with the video content (step 140). The method further comprises the step of reducing the quality representation of the video content on identifying an interruption of user engagement with the video content (step 150). Also disclosed are a computer program product for carrying out a method of controlling adaptive streaming of media comprising video content and a system (200) configured to control adaptive streaming of media comprising video content.

Exhibit 1 lists some of the patents related to flow sensing.

Picture Credit: Frost & Sullivan

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