



Defence and Security

DEFENCE AND SECURITY

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Passive MMW Imaging System for Remote Detection of Concealed Objects under the Clothes on Humans



Imaging of Concealed Objects Under The Clothes on Humans

It is a new system which is developed for imaging of concealed objects over long distances. As it provides resolution improvement according to distance, It offers the possibility to use in long distances.

Advantages

Provides resolution improvement according to distance

It can be used in the desired environment (indoor, outdoor) due to being a passive system

It does not harm human health

Imaging of concealed objects under the clothes

Because of being a scanning system, wide field of view can be displayed

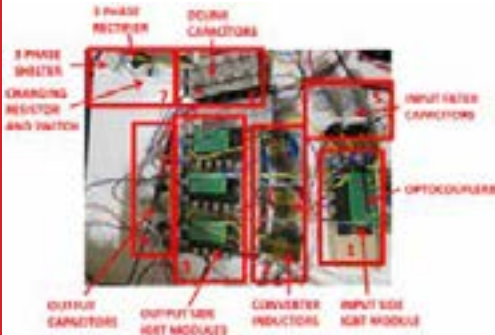
This saves time for the security forces to take the necessary countermeasure

The invention provides resolution improvement according to the distance with an application-specific optical design. Thus, imaging of the concealed objects according to the long distances is provided. It introduces the concept of imaging according to distance to the existing systems.

It helps concealed weapon detection over long distances (10 m - 50 m as an example) and it allows the detection of threat elements such as weapons, explosives etc. from long distances.



Sine Output Downloader for Variable Frequency and Variable Voltage Applications



High-Efficiency Variable Voltage Input 3-Phase Sine Output Converter

By providing higher efficiency than current technology, AC (Alternative Current) can be produced at desired voltage and frequency even at low input voltage levels.

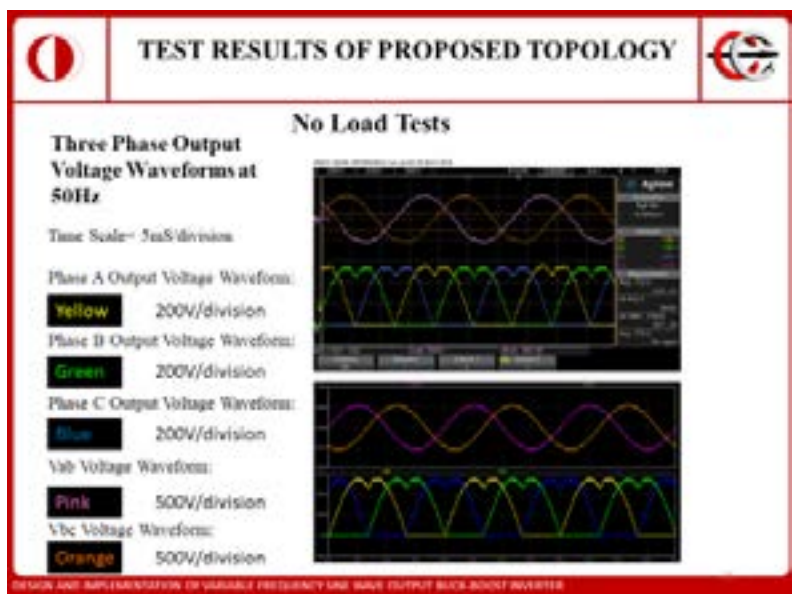
Advantages

- Reduced number of active switches (semiconductors)
- Function at low input voltage levels
- Generating AA energy at the desired voltage and frequency at low wind speeds
- Generating AA energy at desired voltage and frequency at low solar radiation levels
- Reduced maintenance and extended service life of engines driven by this circuit

Pulse-free low-distortion sine output

Today, there are 3 phase AC voltage generating systems. But in most of these applications the output voltage is dependent on the input voltage. As the output voltage drops when the input voltage drops, the inverter cannot operate at rated power. Thanks to the invention, it is possible to reduce the dependence on the input voltage and to operate at lower voltages.

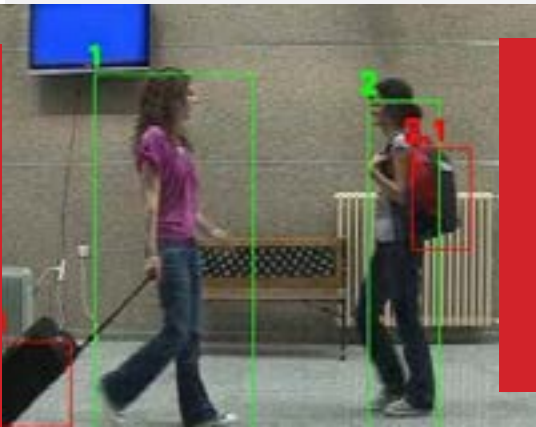
In addition, a pulse modulated voltage occurs at the output of most existing systems. Filters are used to dampen this impact. Thanks to the invention, this problem is solved without the need to use filters.



Object Tracking and Abandoned Object Detection Using Visible and Thermal Cameras

Intelligent Video Surveillance

It prevents false detections due to stationary objects, such as people sitting on a bench and enables detection and tracking of the person abandoned the object.



Advantages

Reliable

Has low false alarm rate

Different

Enables individual tracking of people and the objects they carry

Security

Increases the security of public spaces such as airports and shopping malls

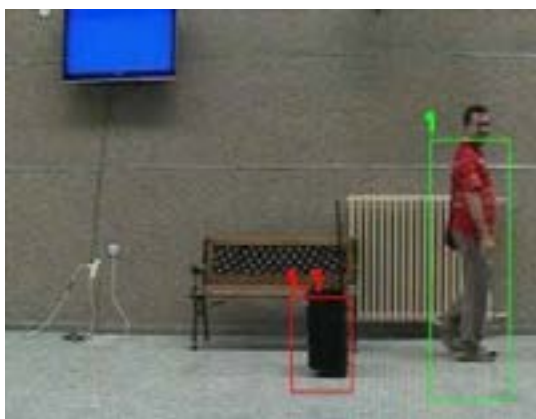
Automatic

Works fully automatic

Be informed of potential security threats by intelligent video surveillance

Rapid detection of abandoned objects is important for the security of public areas. While the security personnel is employed to detect suspicious objects, it is difficult to detect these in a timely fashion to prevent catastrophic events. As such, real time systems with false alarm rate are desirable.

The thermal cameras which are used in addition to visible band cameras provide heat signatures. This enables detection and tracking of people and their belongings individually. Hence, it allows extraction of information that a person in the camera view has a luggage and cases such as abandonment of the luggage or passing the luggage over to another person could be detected.



Nonsymmetrical Wideband Dipole Antennas

Multi-Purpose Dipole Antenna

An antenna with a low profile, efficient and wideband over three octave which can be adapted on any platform allowing it to be conformed to the surfaces.

Can be used as a multi-purpose wideband antenna for both civilian and military applications

In many devices including our GSM telephones, multiple narrowband antennas are used due to their efficiency.

These antennas require large spaces, interfere with each other and increase the system complexity. It is possible to do the same job with a single antenna. The dipole antenna developed in this invention has low profile, and conformal which allows us to mount it on any surface. Thanks to its special design, it can be used over three octave band efficiently. This antenna requires less space, and weight making it a good candidate for many applications.

Advantages

Wideband

Can work over three octave band

Efficient

A good solution for efficient communication

Conformal

Can be adapted to any platform and surface

Cost-effective

Can replace multiple antennas

SWAP

Effective size, weight and power use



A System and a Method for Simultaneous Position, Mutual Coupling and Gain/Phase Calibration of Antenna Arrays

Antenna Calibration System

Antenna labels and laser technology are used to measure the antenna position, orientation and inclination with great accuracy. This measurement and calibration improves the cell size and coverage of each antenna.

Antenna coating and optical labels are used for calibration

Misalignment of antennas on the mast is an important problem decreasing the effective area where the antenna covers. The measurement of antenna position, orientation and inclination from a distance is required for a calibrated system.

A special coating and label are placed on each antenna for identification and positioning using laser technology (Lidar).

Lidar reads these labels to determine the antenna position, orientation and inclination. The distance and positioning between antennas are also adjusted. This technology determines the mechanical positioning of each antenna with great accuracy.

Advantages

Identify

Optical labels on each antenna identifies the antenna

Calibration

Optical labels on each antenna are used to determine position, orientation and inclination accurately

Coverage

Accurate positioning of antennas improves the antenna coverage and communication

Effective

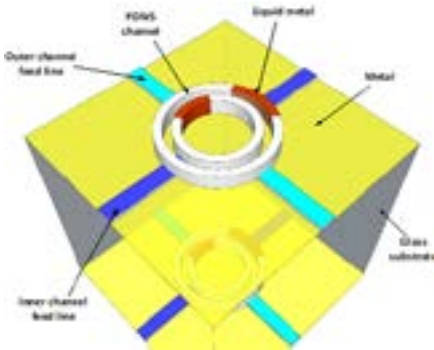
Laser technology allows accurate positioning and identification

Simple

Antenna calibration is performed from a distance



Phase Shifting Method for Reconfigurable Transmitarrays and Reflectarrays and a Unit Element Thereof



Tunable Antenna Using Microfluidics

Movement of the liquid metal in a microfluidic channel integrated with the antenna provides 360° linear phase shift range in the transmitted or reflected field.

Advantages

Compact and Low-cost

No metallic lines and bias circuitry required

Minimized parasitic radiation

No need for metallic bias lines causing parasitic radiation

Scalable

Use of micromachining enables adjustable size and so operation frequency

No tear or wear

Does not wear or tear due to its fluidic actuation nature

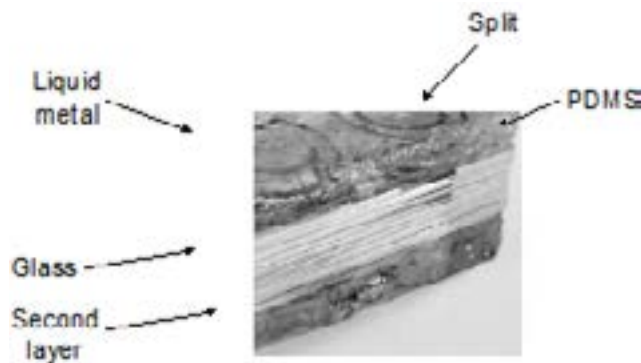
Flexible and wearable

Utilizing microfluidics and flexible substrates enable wearable antennas and antenna arrays

A dynamic phase tuning mechanism for reconfigurable transmit/reflectarrays

There is a need for an alternative method for tunable antenna arrays complementing parabolic reflectors used in telecommunications requiring high antenna gain. Moreover, wearable and flexible antennas are important for military applications.

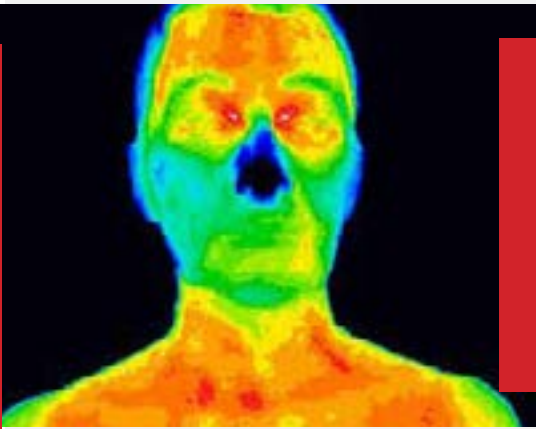
Combining microfluidics and antenna technologies enables implementing flexible and wearable antennas which can adapt to the wearer. The transmitarray element and phase tuning mechanism comprise nested ring-split ring elements where the rings are in the form of microfluidic channels. The liquid metal is confined in these channels. Changing the position of the split along the channel by rotating the liquid metal realizes the rotation of the element.



Mechanical Thermal Camera

A MEMS Thermal Camera Based On Mechanical Resonance

Unlike other thermal cameras, the image is obtained by mechanical vibrations of pixels. Thus it has wider dynamic range, higher resolution and lower power consumption compared to other available thermal cameras.



Advantages

Continuous measurement improves the precision

Measuring the frequency of resonance eliminates the need for an analog-to-digital converter and decreases the power consumption

The use of structural vibration modes of the pixels provides smaller pixels

The lowest and highest operational incident infrared radiation is limited by a structural failure

High frames-per-second (fps) count

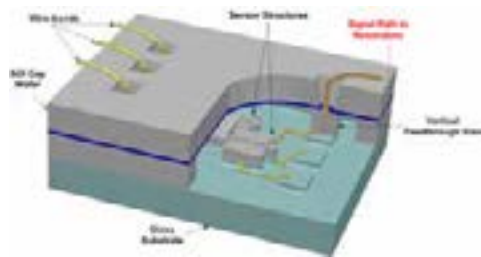
The thermal image is obtained by determination of the mechanical resonant frequency of pixels

Thermal imaging has been commonly used in agriculture, defense and non-military industries. High precision and resolution together with low power consumption and miniaturization of these thermal cameras are common needs of these sectors. With the implementation of the proposed camera focal plane array structure, there is an expected improvement in all these needs itemized above. As known, the tunes (the vibration frequency of the strings) of stringed instruments are dependent of the ambient temperature, and thus, counting the frequency, the true temperature of the spring can be obtained.

Similarly, with the resonant pixel structures, the frequency shifts due to incident infrared radiation on the pixels will be detected. Counting the shift in the frequency will eliminate the need for an analog-to-digital converter and improve the resolution and dynamic range of the pixel. As a result, smaller pixels, and thus, with the same die size, higher resolution thermal cameras with lower energy consumption will be possible.



MEMS Temperature Sensor



Sub-mK temperature resolution

The most important aspect of the invention is that temperature sensor structure can be integrated to other micro systems at the layout level. Thus, it will be possible to solve temperature dependent performance fluctuations of these micro systems.

Advantages

Layout level integration

Layout level integration eases temperature corrections of other MEMS devices

Frequency based measurements

Direct counting of the resonance frequency annihilates the need for an analog-to-digital converter while lowering power consumption

Use of structural vibration modes

Which enables smaller foot-prints

Wide dynamic range

The measurable temperature band is limited only by the thermal damage (cold or hot) on the structure

High shock-survivability

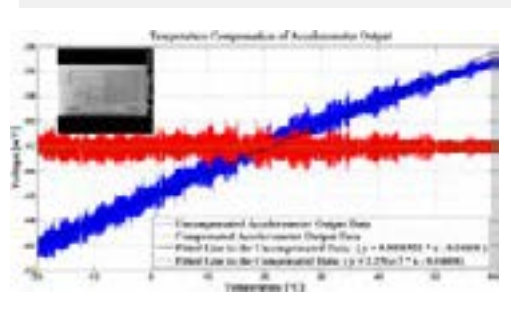
Due to its simple structure, it is resistant to high levels of accelerations and shocks

Low cost, ultra sensitive, high bandwidth temperature sensing

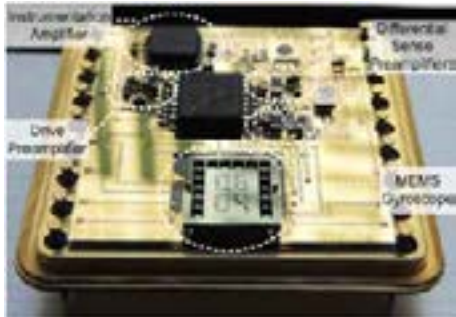
A low cost, ultra sensitive, high bandwidth MEMS temperature sensing with frequency output has been developed with the invention.

Stringed instruments have a temperature dependent chord. If this frequency is counted, the real temperature of the string can be found. Similar to this, if the shift in the resonance frequency of the sensor structure is counted, the resolution and the dynamic range of the sensor is improved while eliminating the need for an analog-to-digital converter. As a result, a low cost, ultra sensitive, high bandwidth MEMS temperature sensor with frequency output can be obtained, which can be integrated to other micro systems at the layout level.

The sensor can be integrated to other micro systems at the layout level. Thus, the temperature measurements will be faster more accurate, which will results in better and more reliable suppression of temperature dependent performance fluctuations of the integrated micro system.



Method for Suppression of G-Sensitivity of MEMS Gyroscope



An Acceleration-Immune Gyroscope

With the method proposed, it is possible to mitigate the acceleration sensitivity of a MEMS gyroscope while obtaining an acceleration measurement with the help of available electrodes on the structure, or by adding special electrodes for this purpose.

Advantages

It is possible to mitigate the effect of external acceleration on the gyroscope output using an electronic feedback circuitry, without modifying the micro structure

It is possible to mitigate the mechanical acceleration response of the gyroscope with additional electrodes on the micro structure

The method is compatible with both closed and open loop readout approaches

From the gyroscope that this method is applied, it is possible to obtain both rate and acceleration readings simultaneously

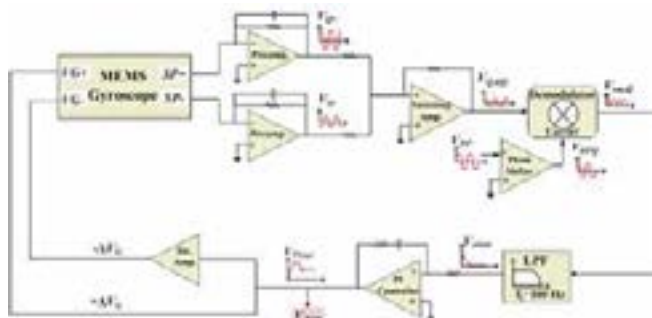
The method can be applied to all capacitive MEMS gyroscopes that are based on linear vibrations

A method mitigating the effects of quasi-stationary acceleration on MEMS gyroscope

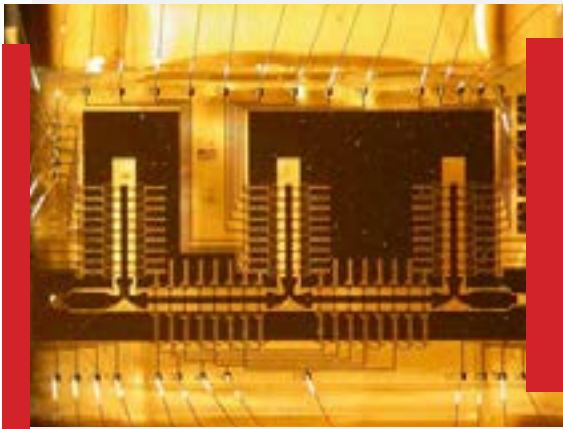
The invention provides mitigation of effects of quasi-static acceleration on the gyroscope output.

The quasi-static acceleration along the sense axis of a gyroscope is a major error source for the gyroscope output. For the gyroscope to provide a reliable output, it should be independent of the quasi-static acceleration acting on the sensor. In this invention, the quasi-static external acceleration is sensed through the readout electrodes with a specialized circuitry. The motion induced by the external acceleration is suppressed with the help of a feedback circuitry. Thus, the sensitivity to quasi-static acceleration is suppressed.

Considering the application areas of a high performance MEMS gyroscope, it is required for the outputs of these sensors not to be affected by the accelerations during operation.



Simultaneous Phase and Amplitude Control Using Triple Stub Topology and Its Implementation Using RF MEMS Technology



Less Component, More Functionality

The proposed component can simultaneously do the phase shifting, amplitude control, and impedance matching functions of instead of using three separate components in an RF circuit.

Advantages

Multifunctional

Performs phase shifting, amplitude control, and impedance matching simultaneously

Single Component

Only one component for three different functions

Low Cost

Can be fabricated with low cost in several different technologies

Small

Can have small dimensions

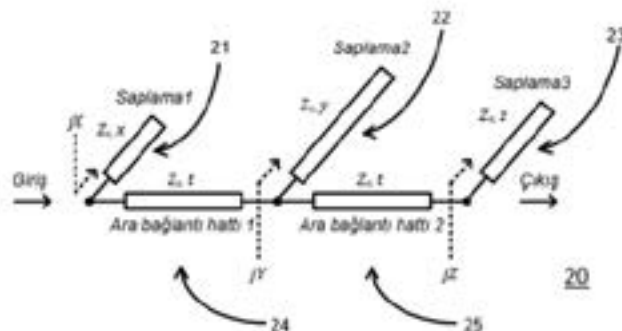
Compatibility

Can be fabricated with several state-of-the-art fabrication technologies

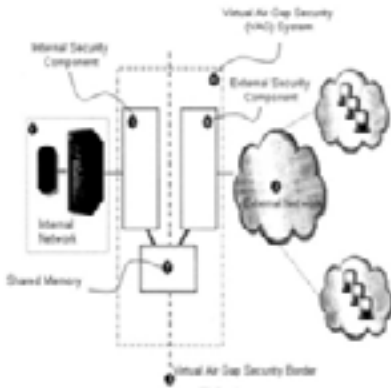
A new component that replaces the functions of three separate components in an RF circuit

The RF circuits in almost all wireless communication systems are expected to be smaller, simpler, and low-cost. At this point, the industry is always targeting components that have lower dimensions, can decrease system complexity and overall cost.

The proposed component uses the triple stub circuit topology which makes it possible to control the insertion phase and amplitude of a given signal while it also performs impedance matching, replacing the phase shifter, amplitude controller (attenuator etc.), and impedance tuner components by a single component. As a result, the total cost and system complexity can be reduced significantly.



Virtual Air Gap – VAG System



File and Data Exchange Security

This invention relates to a virtual air gap-VAG system developed in order to provide Internet and computer security.

Advantages

- Security without IP connectivity
- Multi-layer security
- Controllable data flow
- Identification of a possible source of attack
- Bi-directional insulation

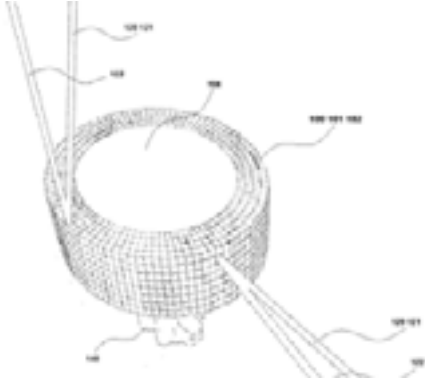
Isolates such systems of institutions utilizing Internet protocols from the Internet, but still enables continuation of real time communication

Virtual air gap system developed under this invention has been devised in order to protect those institutions connected on corporate status to the Internet and receiving/ providing real time service over the Internet against current security threats as well as to eliminate such threats. The system, positioned between the external network (the Internet) (2) and the internal network (organizational net) (1), is not making use of IP based communication internally, and thereby a “ virtual air gap “ border is created between the two nets, enabling a high level of security.

Such characteristic of the system is providing the desired security solution with respect to secure connection to the Internet for such corporate networks carrying out (critical) tasks of high level of security.



Adaptive Methods and Mechanisms for Fast Lidar (Light Detection and Distance Detection) and Location Detection Applications



3D Imaging for Autonomous Systems (LIDAR)

The invention is about an optical scanning device with cost-effective minimal moving parts.

Advantages

Convenient

Very close to the end user with portable design

Cost advantage

Including raw material, small amount of labor compared to equivalent products

Efficient

No limitation except mechanical rotation speed

High performance

Lifts the bottleneck at mechanical scanning speed and is proportional to the laser pulse rate of the decelerating agent

Sensitivity

High-precision scene scanning

Adjustable viewing angle, fast, advantageous cost and easy-to-control scanning

The micro-mirror elements that make up the present invention can address the scene in pixel by pixels and scan the scene effectively using the geometric rotation positions of mirror.

The invention also includes a design which eliminates rotation on both axes. According to their equivalent ones even for the amount of raw materials is advantageous in terms of cost.

