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Editorial

Metamaterials

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In recent years, the possibility of taking advantage of the unusual properties of the so-called metamaterial technology has led to a great deal of research activity. These structures can be engineered to realize novel electromagnetic properties and to achieve behaviors that are not found in naturally occurring materials. For instance, many efforts have been aimed at improving the performances of novel metamaterial arrangements in terms of equivalent circuit descriptions, metamaterial modeling, functionality, miniaturization and reconfigurability.

The principal goal of this special issue on metamaterials is to provide an in-depth description of the state of the art of research and development in this area. In particular, it highlights contributions intended to stimulate new metamaterial-inspired designs and practical applications.

P. Vélez et al. successfully present the design of broadband microstrip bandpass filters based on the use of a novel compact metamaterial-concept based cell, the so-called open complementary split ring resonator (OCSRR). After presenting the new proposed resonator, a design procedure of two different bandpass filters is shown, which are then manufactured and measured. Experimental results fully validate the two band pass filter designs.

H.-M. Lee and H.-S. Lee describe a method to extend the bandwidth of metamaterial absorber using multiresonance structure (a periodic arrangement of an electric-LC resonator and a square loop structure). Numerical simulations and experimental results show the efficiency of the method, demonstrating excellent performance. The authors increase the absorption area of a metasurface based on geometrical variations of a unit cell.

Z. Hao et al. report on a modeling method to characterize metamaterial structures integrated with active and tunable components based on both FDTD and SPICE methods. The authors remark along the paper the advantages of their hybrid method versus the conventional FDTD method.

Y. Zhang et al. explain the optical and electrical properties of different materials via chemical reaction, which has the potential to metamaterial preparation, such as Mie resonance type structures.

Y.-l. Geng proposes an analytical method for computing the electromagnetic scattering from a three-dimensional (3D) conducting sphere coated with a uniaxial anisotropic single-negative (SNG) medium. This is achieved by using a spherical vector waves. Numerical results were obtained using this technique. Those results have been compared with Mie theory, and the two were found to be in good agreement.

G. I. Sajin and I. A. Mocanu present two novel antennas. These antennas are based on zeroth-order resonant (ZOR) millimeter wave composite right/left-handed (CRLH) coplanar waveguide (CPW) structures. The antennas were fabricated on silicon substrates. They were designed, processed and electrically characterized in order to operate on two different frequencies in the mm-wave domain (i.e., $f_1 = 27$ GHz and $f_2 = 38.5$ GHz).

J. J. Yang et al. provide an interesting and informative review of various different forms of metamaterial sensor. The article is detailed and well written. It contains an extensive list of references and is excellent reference material for any individual wishing to gain more knowledge of the subject area.

G. Expósito-Domínguez et al. propose a design in order to suppress the surface wave propagation modes and consequently to reduce the mutual coupling between radiating elements in low permittivity substrates. This structure, which is an improvement of the mushroom electromagnetic band gap (EBG) one by means of double metallic layer design and edge via location, leads to a size reduction factor of about 30%.

H. N. B. Phuong et al. propose a design based on fractal Sierpinski Gasket patterns in order to synthesize both broad- and dual-band gap media. These designs are experimentally characterized by means of the suspended microstrip method and compared to the performances of conventional mushroom like structures.

V. Sanz et al. propose a new equivalent circuit in order to model a coplanar wave guide (CPW) loaded by split ring resonators. This approach, by taking into account the additional capacitive coupling occurring through the CPW, leads to a broadband description that includes both the left-handed and right-handed propagation bands.

The papers received for this special issue present a mixture of exciting new developments and authoritative reviews. The quality and breadth of topics covered by the papers is impressive. This special issue will be of considerable interest to students, academics, and industry experts alike. We would like to thank all authors and reviewers for making this special issue in Metamaterials possible.

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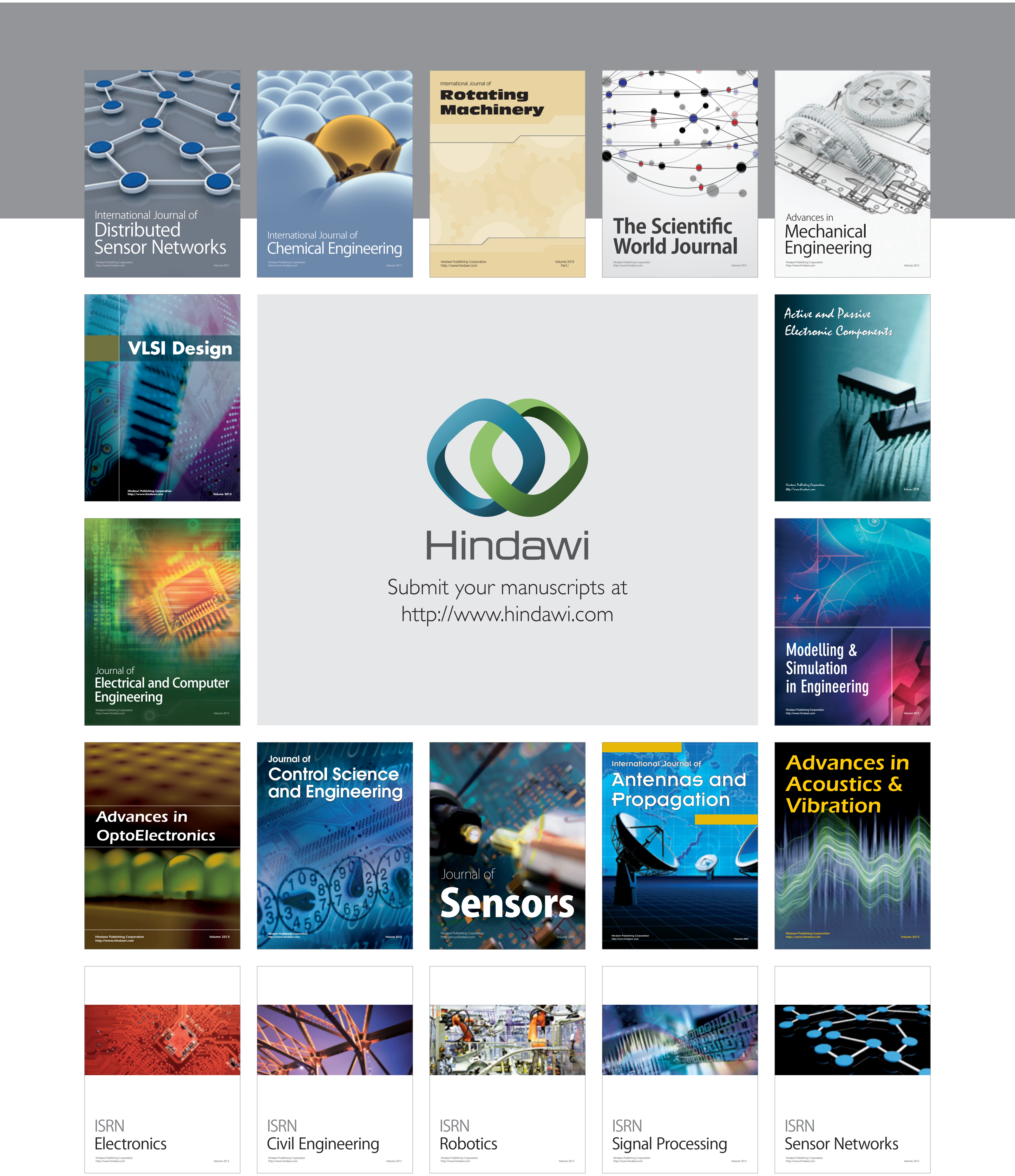
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