Papers Published in Technical Journals and Conferences

Image Statistics and the Perception of Surface Qualities

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Nature Macmillan Publishers, Vol. 447, pp. 206–209, May 2007.

Here we show that the skewness of the luminance histogram and the skewness of sub-band filter outputs are correlated with surface gloss and inversely correlated with surface albedo (diffuse reflectance). We find evidence that human observers use skewness, or a similar measure of histogram asymmetry, in making judgements about surfaces. When the image of a surface has positively skewed statistics, it tends to appear darker and glossier than a similar surface with lower skewness, and this is true whether the skewness is inherent to the original image or is introduced by digital manipulation. We also find a visual after-effect based on skewness: adaptation to patterns with skewed statistics can alter the apparent lightness and glossiness of surfaces that are subsequently viewed. We suggest that there are neural mechanisms sensitive to skewed statistics and that their outputs can be used in estimating surface properties.

An Energy-aware Routing Scheme with Node Relay Willingness in Wireless Sensor Networks

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International Journal of Innovative Computing, Inf., IJICIC, Vol. 3, No. 3, pp. 565–574, 2007.

Energy efficiency has been known as the most significant issue in all facets of Wireless Sensor Network (WSN) operations. Many routing schemes that use the constrained energy available at sensor nodes more efficiently, have been presented. A lot of these routing schemes try to find the optimal paths to optimize the energy utilization at a sensor node. We take the view that network survivability is an important metric for measuring network lifetime. For an energy-aware routing scheme in WSNs, it is necessary to use sub-optimal paths occasionally to increase the network survivability. In this paper, we present a new network lifetime definition and formulate the energy-aware routing problem with the defined network lifetime. And then we propose an energy-aware routing scheme with the node relay willingness for WSNs, which considers routing packets not only through the sensor nodes with sufficient energy reserves, but also through lightly loaded nodes. Simulation results show that the network lifetime of the proposed algorithm is longer than that of the routing algorithm that considers only the energy reserves.

Miniaturized Broadband Lumped-element In-phase Power Dividers

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This paper describes miniaturized broadband lumped-element in-phase power dividers. We first propose two types of miniaturized broadband lumped-element in-phase power dividers composed of two inductors, a resistor, and two capacitors. Next, we use a simulation to compare these dividers with conventional power dividers. The simulation results reveal that the proposed lumped-element in-phase power dividers can help miniaturize circuits (by decreasing inductances by about 30%, reducing the number of necessary capacitors by half, and decreasing necessary capacitances by about 30% compared with conventional lumped-element dividers) and attain broadband frequency characteristics (by increasing normalized operating frequency bandwidths (f/f_0) by about 80% compared with conventional lumped-element dividers).

An Active Terminal Circuit and Its Application to a Distributed Amplifier

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This paper describes a broadband active terminal circuit and its application to a distributed amplifier. In this study, we first analyzed and compared three types of active terminal circuits using representative circuit configurations, namely, an active terminal circuit with a common-emitter bipolar junction transistor (BJT), an active terminal circuit with a Darlington BJT pair, and an active terminal circuit with cascode-connected BJTs. The simulation results showed that the active terminal circuit with cascode-connected BJTs kept the matching condition up to high frequency. After the simulation, we fabricated a distributed amplifier that used an active terminal circuit with cascode-connected BJTs. The RF amplifier achieved a flat gain of 9.7 ± 1.0 dB over a range of 3–15 GHz.