ADAPTIVE ANTENNAS pdf

1: ARTECH HOUSE USA : Adaptive Antennas and Phased Arrays for Radar and Communications

Adaptive antennas and phased arrays, with rapidly scanned beams or multiple beams, are commonly suggested for radar and communications systems in ground-based, airborne, and spaceborne applications that must function in the presence of jamming and other sources of interference.

Each of the antennas in the array has a respective tapped delay line in which the tap output signals are weighted and summed. In a known theoretical proposal, the weights W are determined as follows: In practice estimates of Rxx and rxd may be obtained by averaging the instantaneous matrices and vectors over the training sequence. Description This invention relates to adaptive antennas, e. Adaptive antennas are used to counter dispersion due to multipath propagation and interference from other stations using the same frequency. In order to adapt the antenna, each frame of symbols transmitted by a mobile terminal contains a "mid-amble" comprising a known "training" sequence of 26 symbols. The mobile terminal is instructed by the relevant base station to use one of a number of predetermined training sequences so as to enable interfering terminals to be distinguished. An improved estimate of Rxx may be obtained, in accordance with the invention, which provides a method of adjusting tap weights of an adaptive antenna array wherein each of a plurality of antennas has a respective tapped delay line in which the tap output signals are weighted and summed, the weights w being determined as follows: One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which: Figure 1 is a schematic drawing of an adaptive antenna system and its tapped delay line equaliser; and Figure 2 is an illustrative plot of signal levels of the real part of the out put from the receiver. Referring to the drawings, each antenna 2 in an array of M antennas is connected to a respective receiver 4. The signals received by the array are gaussion minimum shift key GMSK modulated. The signals are de-rotated to remove differential phase encoding which is applied in GMSK modulation. The de-rotated signal from each receiver is fed to a respective analog to digital convertor 3 where it is sampled and quantised, and the quantised samples are converted to coded digital signals. The digitised de-rotated signals are stored in a store 5 from which they can be read in sequence. The digitaised de-rotated signals are read in sequence to a respective symbol spaced tapped delay line 6 for each antenna. The tapped delay line may be physical or simulated by one or more data processors. The processing is carried out faster than real time in either case so that several iterations can be caried out in one frame. Whether the tapped delay line is physical or virtual, at each tap, the signal is weighted by individual weights 8, and the weighted signals are summed in a summer The sums from each equaliser are summed in a summer It is desired to adjust the weights to compensate for multipath propagation and for interference from other terminals using the same channel. In each frame of the signal transmitted by a mobile terminal 15, there is a mid-amble comprising a known training sequence of 26 symbols. There is a plurality of different training sequences and the mobile terminal 15 is instructed by the base station which sequence to send. The training sequence is not reused by mobile terminal 15 which might interfere with the terminal 14, so that they can be distinguished. The theoretical basis for weighting the delay line taps is the Wiener-Hopf equation: An estimate of the autocorrelation matrix is made by averaging the instantaneous i. The matrix Rxx is then recalculated as follows: The output of summer 14 is analysed to temporarily ascribe symbol values so as to enable Rxx new to be evaluated. A temporary decision to ascribe a symbol value of logical zero or a logical one depends on whether the level of the real part of the output of the summer 14 is positive or negative. Thus a set decision level 16 of zero see Figure 2 distinguishes the level of logical zero symbols 18 from the level of logical one symbols The mean 22 of the distances d0 between the zero level 16 and the levels of the symbols 18 ascribed the value of zero is calculated. The mean 24 of the distances d1 between the zero level 16 and the levels of the symbols 20 ascribed the value of logical one is calculated. The distance between the level of each symbol 18 ascribed the value logical zero and the respective mean 22 is calculated. The distance between the level of each symbol 20 ascribed the value logical one and the respective mean 24 is calculated. The sum of all the distances from the means is calculated. The distances of the levels of all symbols from the decision level 16 is calculated. The sum of the distances of the levels of all symbols from the set decision level 16 is calculated.

The ratio of the sum of the distances from the means to the sum of the distances of the levels of all symbols from the set level is calculated. The smaller this is, the better the effect of the estimated autocorrelation matrix Rxx. Ideally, the levels of the symbols ascribed the value logical zero would all be the same, the levels of the symbols ascribed the value logical one would all be the same and the levels of zero and one symbols would be equally spaced from the decision level The value of the product so obtained is a measure of goodness i. The lower the value the better the estimate. A search strategy may be employed so that a value e. A value about e. If the result is better than the last, a further value e. Claims 4 A method of adjusting tap weights of an adaptive antenna array wherein each of a plurality of antennas has a respective tapped delay line in which the tap output signals are weighted and summed, the weights w being determined as follows:

ADAPTIVE ANTENNAS pdf

2: EPA1 - Adaptive antenna - Google Patents

Smart antennas (also known as adaptive array antennas, digital antenna arrays, multiple antennas and, recently, MIMO) are antenna arrays with smart signal processing algorithms used to identify spatial signal signatures such as the direction of arrival (DOA) of the signal, and use them to calculate beamforming vectors which are used to track and locate the antenna beam on the mobile/target.

The latest generation of Wi-Fi chipsets is bringing a potentially useful new addition to the toolkit: TxBF can offer gains under the right circumstances, but it has some inherent limitations that mean it cannot solve the performance challenge all by itself, despite some vigorous vendor marketing claims to the contrary. Ruckus is continuing in its long tradition of pioneering the work in the cost-effective application of smart antenna concepts to Wi-Fi, by enhancing our statistical optimization approach to radio performance with this combination of TxBF and adaptive antennas. As a result, APs equipped with our BeamFlex 2. Discussing RF technologies with precision can get complicated, a careful, step-by-step search for the devil behind TxBF really requires the bandwidth of a proper whitepaper rather than a simple blog entry. For those interested in the technical hows and whys, Ruckus Wireless have published the step-by-step story in just such a beefy whitepaper. In a properly designed Wi-Fi system, all of these tools can be used in combination to maximize results. While a promising potential addition to the RF toolkit, in reality, TxBF is subject to a number of constraints and disadvantages: Today this is a complete show-stopper. To achieve any real performance gains with TxBF in Wi-Fi, clients must support the optional feature in the Incompatibility with Spatial Multiplexing. The explanation for this one is definitely best left to our beefy whitepaper, since it requires looking under the hood of how spatial multiplexing in This diagram explains how Spatial Multiplexing works. With only 3 or even 4 radio chains to work with, TxBF makes very symmetric beam patterns, generally sending as much energy away from the client of interest as it does toward it. Incompatibility with Polarization Diversity. Modest Gains at Best. Even when it works, the Wi-Fi chipset engineering community predicts that performance gains in practice will be modest, on the order of 2â€"3 dB. This is achieved by electronically switching a subset of a large number of small antenna elements into use with each radio chain for each packet sent. There are circumstances when TxBF will be useful when client support emerges and in combination to adaptive antenna switching. Ultimately combining TxBF with adaptive antenna technology will simply deliver the best of both worlds yielding what no other Wi-Fi supplier can provide and every customer wants:

3: Adaptive Antenna Arrays - LMS Algorithm

" base station and user terminal can perform joint adaptive antenna processing, so called "MIMO" systems, with additional benefits Fundamental issue is an economic one.

Antenna Arrays Home Antennas and antenna arrays often operate in dynamic environments, where the signals both desired and interfering arrive from changing directions and with varying powers. As a result, adaptive antenna arrays have been developed. These antenna arrays employ an adaptive weighting algorithm, that adapts the weights based on the received signals to improve the performance of the array. In this section, the LMS algorithm is introduced. This algortihm was developed by Bernard Widrow in the s, and is the first widely used adaptive algorithm. It is still widely used in adaptive digital signal processing and adaptive antenna arrays, primarily because of its simplicity, ease of implementation and good convergence properties. The definitions of all the terms used on this page follows that from the MMSE page , which should be understood before reading this page. The goal of the LMS algorithm is to adaptively produce weights that minimize the mean-squared error between a desired signal and the arrays output; loosely speaking, it tries to maximize reception in the direction of the desired signal who or what the array is trying to communicate with and minimize reception from the interfering or undesirable signals. Just as in the MMSE case, some information is needed before optimal weights can be determined. Note that these parameters can vary with time, as the environment is assumed to be changing. The directions and power can be determined using various direction finding algorithms, which analyze the received signals at each antenna in order to estimate the directions and power. The gradient vector derivative with respect to the weight vector can be written as: The LMS algorithm requires an estimate of the autocorrelation matrix in order to obtain weights that minimize the MSE. The LMS algorithm estimates the autocorrelation matrix using only the current received signal at each antenna specified by the vector X. The weights are updated iteratively, at discrete instances of time, denoted by an index k. The estimate of the autocorrelation matrix at time k, written with a bar overhead, is written as: The LMS algorithm then approximates the gradient of the MSE by substituting in the above simple approximation for the autocorrelation matrix: The adaptive weights will be written as W k , where k is an index that specifies time. The LMS weighting algorithm simply updates the weights by a small amount in the direction of the negative gradient of the MSE function. By moving in the direction of the negative gradient, the overall MSE is decreased at each time step. In this manner, the weights iteratively approach the optimal values that minimize the MSE. Moreover, since the adaptive algorithm is continuously updating, as the environment changes the weights adapt as well. The parameter controls the size of the steps the weights make, and affects the speed of convergence of the algorithm. To guarantee convergence, it should be less than 2 divided by the largest eigenvalue of the autocorrelation matrix. Substituting in the estimate for the gradient above, the LMS update algorithm can be written as a simple iterative equation: The algorithm simplicity is the primary reason for its widespread use. The above update equation does not require any complex math, it just uses the current samples of the received signal at each antenna X. Assume there are two interferers arriving from 40 and degrees, with an interfering power of 10 dB relative to the desired signal. The desired signal is assumed to come from 90 degrees. The algorithm is starting assuming a weight vector of all ones the starting weight vector ideally has no impact on the end results: The convergence parameter is chosen to be: Using random noise at every step, the algorithm is stepped forward from the initial weight. The LMS algorithm is fairly efficient in moving towards the optimal weights for this case. Since the algorithm uses an approximateion of the autocorrelation matrix at each time step, some of the steps actually increase the MSE. However, on average, the MSE decreases. This algorithm is also fairly robust to changing environments. Several adaptive algorithms have expanded upon ideas used in the original LMS algorithm. Most of these algorithms seek to produce improved convergence properties at the expense of increased computational complexity. However, it uses a more sophisticated update to find the optimal weights that is based on the matrix inversion lemma. Both of these algorithms and all others based on the LMS algorithm have the same optimal weights the algorithms attempt to converge to. No portion can be reproduced except by permission from the author. LMS algorithm for antenna arrays.

4: Adaptive antenna processing systems (VHS tape,) [www.enganchecubano.com]

Smart antennas and smart antenna technology using an adaptive antenna array are being introduced increasingly with the development of other technologies including the software defined radio, cognitive radio, MIMO and many others.

5: Smart antenna - Wikipedia

An adaptive antenna is type of smart www.enganchecubano.com's "smart" because it improves on the traditional antenna by adjusting for traffic patterns at a given time to increase signal strength and quality.

6: What is an Adaptive Antenna?

BeamFlex+ is an enhancement to Ruckus BeamFlex adaptive antenna technology by providing adaptive support to mobile devices. BeamFlex+ enables antennas to adapt to client device orientation in addition to client device location.

7: Nokia AirScale Active Antennas Â¦ Nokia

The term "adaptive antenna" has previously been used by Van Atta['] and others[61 to describe a self-phasing an- tenna system which reradiates a signal in the direction from.

8: Adaptive Antennas and Phased Arrays | MIT OpenCourseWare

Online shopping from a great selection at Books Store.

9: Adaptive beamformer - Wikipedia

tuning adaptive handheld, manpack and vehicle omni antennas COJOT has created a family of tunable adaptive antennas for handhelds, manpacks and vehicles cover 30 - MHz for enhanced communication performance.

ADAPTIVE ANTENNAS pdf

How to Do Your Own Bricklaying and Stone (Popular Science Skill Book) Selected dreams from the animal kingdom Pokemon Stadium 2 Introductory medical surgical nursing 11th edition workbook Ch. 1. [ch. 2. [ch. 3. [ch. 4. [ch. 5. [ch. 6. [ch. 7. [ch. 8. [ch. 9. [ch. 10. [ch. 11. [ch. 12. [ch. 13 Patients guide to medical testing Perspective and Other Optical Illusions (Wooden Books) Vocabulary workshop level a teachers edition Treatment of tissue sections for in situ hybridization Gregory H. Tesch, Hui Y. Lan, and David J. Nikolic The Witches Of Mobra In Spain Pamphlet Deus ex mankind divided strategy guide Chinese Street Opera in Singapore Cutaneous lymphomas, pseudolymphomas, and related disorders Customer satisfaction through total quality assurance 2006 sv650s owners manual Tidings From Zion Bargain hunting in Toronto, 1976 Encyclopedia Of Associations, Volume 2 California residential listing agreement Five steps to romantic love European-American Trade And Financial Alliances (New Horizons in International Business) 1994 Summer School in High Energy Physics and Cosmology Crystal report as in vb net Planned political assassination Growing up bilingual Update report, reduction of toxic chemicals from Ontario point sources discharging to the Niagara River, Outline and studies to accompany Myers ancient history Reports on the means of improving the present harbour and the construction of docks at Montreal Plays by dramatists represented in this volume (p. 372-374) No. 9 (July, 1902 Are vessels infected with yellow fever? Some personal observations, by H. R. Carter. Adobe photoshop 6.0 tutorials for beginners Groundwork and Preliminary Considerations Home, school, community interaction Philosophy of human person book Sugar-Coated Antenna Fundamentals Mean Soup (Harcourt Brace Big Books) Letter to Harrison G. Otis, esq. from John Q. Adams, senator of the United States, in reply to Timothy Pi Sci-tech collections Tony Stankus, editor Demons and angels book Progress in Numerical Fluid Dynamics