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A Survey on Direction of Arrival Estimation for Closely Spaced Signal

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ABSTRACT: High resolution direction of arrival estimation algorithms based on the subspace decomposition received considerable attention while rarely used in the practical applications. The reasons are its difficulty to resolve closely spaced signals in low SNR. For applications of closely spaced signals within a priori known angle range, we filter the spectrum in direction domain to improve the SNR of signals on array sensors and reconstruct the covariance matrix with which Multiple signal classification algorithm is applied. The improvement in the aspects of resolution and accuracy in low SNR is shown by Monte-Carlo simulations. The spatial spectrum expresses signal distribution in the space from all directions to the receiver. Hence, if one can get the signal's spatial spectrum, then the direction of arrival can be obtained.

KEYWORDS: Direction-of-Arrival, SNR.

I. INTRODUCTION

Direction-of-Arrival (DOA) estimation plays a vital role in many applications. The problem of estimating the wave number or angle of arrival of a plane wave is referred to as direction finding or DOA estimation problem. It has a large application in radar, sonar, seismic systems, electronic surveillance, medical diagnosis and treatment, radio astrology and other areas. Estimating directions of interesting targets is an important task in the area of electronic countermeasure. The so-called high resolution methods such as MUSIC and ESPRIT can break through the Rayleigh limit and are thereby widely researched. Direction-of-arrival (DOA) estimation for highly correlated signals is of great importance in multipath environments such as low-elevation altitude measurement.

SMART antennas have been widely used in many applications such as radar, sonar, and communication systems. The performance of smart antennas relies heavily on the accurate estimation of the direction of arrival (DOA) of each signal, and various techniques for DOA estimation have been proposed the most commonly used techniques are multiple signal classification (MUSIC), estimation of signal parameters via rotational invariance technique (ESPRIT), and their variations.

Evaluating directions of interesting targets is an important task in the area of electronic countermeasure. The supposed high determination techniques, for example, MUSIC and ESPRIT can get through as far as possible. Additionally enhancing the determination of the techniques for nearly separated signs is a testing work. High-determination DOA estimation calculations, for example, MUSIC and ESPRIT are great if there should arise an occurrence of different impinging signs of a similar time and a similar recurrence. Then again, these high-determination DOA estimation calculations can barely work when the SNR is low, the number of sensors or the quantity of depictions is few, or particularly at the point when the signs are firmly dispersed in headings

II. OBJECTIVES

(a) Comparative Study different Techniques of Direction of Arrival (DOA) Estimation
(b) To Study different Techniques of Direction of Arrival (DOA) Estimation for Closed Spaced Signal
(c) Comparative study of Basic and modified technique

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III. LITERATURE SURVEY

The direction of arrival gives the reviewed information related to the theoretical comparison, capabilities and limitation, Angle of elevation for MUSIC in beamspace by self initiating, beam pattern effecting DOA, iterative AOA estimation, MUSIC and ESPIRIT algorithm in smart antenna. The 'different DOA techniques' section gives reviewed information about improving DOA resolution, MUSIC employing conjugate symmetric. Next section is related with the characteristics of MUSIC which gives the information about the sensitivity analysis, a statistical characterization, effects of model errors, comparison of adaptive superresolution and MUSIC algorithm resolution [1]. Last section is related with more additional information about adaptive algorithm.

Wireless Communication technology in recent years has seen a massive progress and themarket especially for the cellular telephones is growing enormously. For high speed-data communication the subsequently invention in communication system make use of advanced band of frequency, more channel capacity and wider bandwidth. The technology demands efficient frequency usability and power saving because of high transmission rates and increase in channel capacity. One of the technology that are contributed to improve the wireless systems is an antenna using adaptive array system. An antenna using adaptive array forms pattern of beam at intended direction by applying digital signal processing algorithm to the digitized data from each antenna elements. By algorithm used in digital signal processing, the transmitter is capable of steering the maximum radiation pattern toward a desired user. The receiver does it spatially and not only separate but also reject multi-path fading energy hence channel capacity and higher bit rate services is provided. There are several methods used in an adaptive array antenna. Method used for information to be extorting starting the inward signals is called Estimation Method of Direction of Arrival (DOA). This method is called Spectral Estimation Method. The authors have included, first category is formed by the Spectral Estimation Method that contains Minimum Variance Distortionless Response (MVDR) Estimator, Linear prediction method, Maximum Entropy Method (MEM), Maximum Likelihood Method (MLM). The second category is formed by the Eigen structure Methods that includes the Min-Norm Method (MNM), the CLOSEST Method, the Estimation of Signal Parameters Via Rotational Invariance Technique (ESPRIT) algorithm. More than a few algorithms have launch and utilized for evaluation of Direction of Arrival (DOA). Hence a fundamental one is a Capon Maximum Likelihood (ML) and Multiple SIgnal Classification (MUSIC) algorithm founded by Dr. Schmitt. The many researchers have completed work in the said area to superior MUSIC algorithm that leads to the ROOT-MUSIC and Spatially Smoothed description of MUSIC[4]. FIR filtering is begins by the explanation by the fundamental theory. FIR filtering is commenced with the understanding of the basic concept. Beamformer can be divided into two classes like data independent and statistically optimal beamformer in [3]. Sometimes the records figures are frequently unidentified and vary over the time. The second class use received data of statistics in sequence to choose the weights. Adaptive beam forming so that comes into the picture. Two fundamental adaptive techniques as continuous adaptation and block adaptation are also discussed. Functions carried out in block adaptation and information are predictable commencing a data array of temporal block with unremitting adaptation and the weights are changed with respect to the sampled data.

In literature, the problem and the previous techniques of DOA estimation is described. In the literature different beam forming algorithms are exist like Side-lobe cancellers, Least Mean Squares (LMS), Linearly Constrained Minimum Variance (LCMV), Recursive

LMS, and Direction of Arrival (DOA). Out of this MUSIC and ESPRIT algorithms in the Direction of Arrival (DOA) play the most important role. The performance of these two algorithms was executed and the comparison between them is studied. For the next generation DOAs were obtained by simulating the algorithms at different levels of the signal in wireless system. Mean while in beamforming, ESPRIT found as good DOA estimation suited for the uncorrelated sources. Using an adaptive beamforming algorithm will improve the operation of next generation wireless greatly. Spectral efficiency of wireless communication system raises the variety of reception and protected broadcast increases significantly the performance of beamforming by reducing interception. Maximum radiated signal is steering in the desired direction by estimating the signal arrival and eliminating the signal from the other direction at the same frequency. This is accomplished by using array antenna system in which each sensor weight is altered. So, the ESPRIT DOA algorithm has been treated as an extra tough and faster estimation technique as related to MUSIC. The calculation is also fewer composite relatively. However, ESPRIT has the disadvantage of not being capable of handling correlated sources. Finally, this

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44 accurate direction has been used to obtain better beam forming, which is very essential for nextgeneration wireless systems Z. Y. Song, et.al [1] The amplitude fluctuation characteristicfor got echoes contains the sign data about the many-sided quality of targets which being inside the radar pillar. In this paper the conditional probability density functions of the measured amplitude and observed SNR of received echoes are developed..[1]

Y. S. Zhouet.al [2] This paper presented the jamming principle of the TRAD quickly. The needed equivalent transmitting power, the length of the cable and the off-target distance are analyzed [2]

R. O. Schmidt et.al [3]As this paper, the works of Gething and , Davies were found, offering a piece of the arrangement talked about here however as far as synchronous conditions and exceptional straight connections without response to eigen structure.[3]

N. Y. Wanget.al[4]Another DOA estimation strategy in view of subarraybeamforming has been proposed. In the new strategy, two subarraybeamformers are utilized to get an ideal estimation of the stage moved reference flag whose stage in respect to the reference flag is an element of the target DOA.[4]

IV. PROPOSED SYSTEM

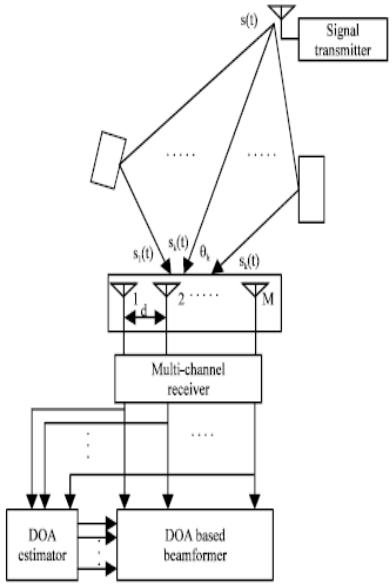

Fig 1 : Block diagram of DOA using MUSIC

A smart antenna composed of various antenna sensors, whose signal is diagnosed automatically in order to use the mobile radio channel's spatial domain. By locating the main beam in the user direction and forming nulls towards the interference signal direction, smart antennas can provide higher signal-to-noise ratio (SNR), minimum co-channel interference and multipath fading with higher the system capacities in mobile network. The main objective of direction of arrival (DOA) estimation is to use the information received by antenna array elements to determine the directions of the signals from the users as well as the directions of interference signals. Some of the DOA estimation algorithms are delay-and-sum method, Capon's minimum variance technique, multiple signal classification (MUSIC) algorithms, estimation of signal parameter via rotational invariance technique (ESPRIT). The DOA algorithm considering SNR is also reported. The target of DOA estimation techniques is to plot a pseudo spectrum, by searching the peak to find the angle of arrival of signal. Among different DOA estimation utilized algorithms, MUSIC algorithm is depended on decomposition of received signal's covariance matrix and has good estimation accuracy and reduced complexity of

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system as compared to other DOA algorithms. Due to decomposition of received signal's covariance matrix, it is partitioned into two subspace matrices such as signal subspace and noise subspace. MUSIC algorithm gives appropriate impinging signal direction and more stable resolution compared to ESPRIT. The high resolution of direction of arrival has achieved by MUSIC algorithm in case of non-coherent or uncorrelated signal. The effectiveness of MUSIC is lost for AOA estimation of correlated or coherent signal.

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V. CONCLUSION

This paper shows the analysis of direction of arrival (DOA) estimation using MUSIC and Modified MUSIC algorithm. this review, a detailed survey on DOA estimation MUSIC algorithms. Based on the literature survey Music can estimate uncorrelated signal very well. Improved MUSIC estimates accurate DOA of signal under coherent condition.

REFERRENCES

[1]Z. Y. Song, H. T. Xiao, Y. L. Zhu and Z. Q. Lu. "A novelapproach to detect the unresolved towed decoy in terminal guidance", Chinese Journal of electronics, Vol. 21, pp. 367-373, April, 2012.
[2]Y. S. Zhou, "Correlation parameters simulation for towed radar active decoy," 2012 International Conference on Computer Distributed Control and Intelligent Environmental Monitoring (CDCIEM), 5-6 March 2012, pp. 214 - 217.
[3]R. O. Schmidt, "Multiple emitter location and signal parameter estimation," IEEE Transaction on Antennas and Propagation, Vol. 34, pp. 276-280, March, 1986.
[4]N. Y. Wang, P. Agathoklis, A. Antoniou, "A new DOA estimation technique based on subarraybeamforming," IEEE Transactions on Signal Processing, Vol. 54, pp. 3279-3290, September, 2006
[5]J. Capon, "High-resolution frequency-wavenumber spectrum analysis," Proceedings of the IEEE, Vol. 57, pp. 1408-1418.
[6]A.RafegaBeham "Performance Analysis of DOA Algorithms "Vol. 4, Issue 1, January 2016 International Journal of Innovative Research in Computer and Communication Engineering PP200-206 DOI: 10.15680/IJIRCCE.2016. 0401038
[7]] Nauman Anwar Baig and Mohammad Bilal Malik "Comparison of Direction of Arrival (DOA) Estimation Techniques for Closely Spaced Targets" DOI: 10.7763/IJFCC.2013.V2.246 PP 654-658 International Journal of Future Computer