SOUND SOURCE LOCALIZATION USING BEAMFORMING, TDOA AND HIGH-RESOLUTION SPECTRAL ESTIMATION

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ABSTRACT: **To detect sound sources on outdoor environment using minimum number of antennas by beam forming technique. The minimum distance of signal is detected using uniform linear array antenna in near by distance places. A Uniform Linear Array (ULA) is a collection of sensor elements equally spaced along a straight line. The requirements of ULA is to improve the signal to noise ratio(SNR) and to improve its response(gain) in particular direction. Here 4 desired sound signals are detected using 10 linear array antenna.**

I.INTRODUCTION

To detect sound sources on outdoor environment using minimum number of antennas by beam forming technique. The minimum distance of signal is detected using uniform linear array antenna in near by distance places. A Uniform Linear Array (ULA) is a collection of sensor elements equally spaced along a straight line. The requirements of ULA is to improve the signal to noise ratio (SNR) and to improve its response (gain) in particular direction. Here 4 desired sound signals are detected using 10 linear array antennas. Here ,using beam forming technique detect signal easy manner .This technique receive or transmit signals easily with a short time . Beam forming is a method used in a array signal mainly for processing the following two goals. To Finding the direction of a desired signal .To enhancing the desired signal.

II.PROJECT METHODOLOGY:

Here five major beam forming techniques are used. They are Classical beam forming, MVDR ,Min-Term, MUSIC and ESPRIT Algorithm.

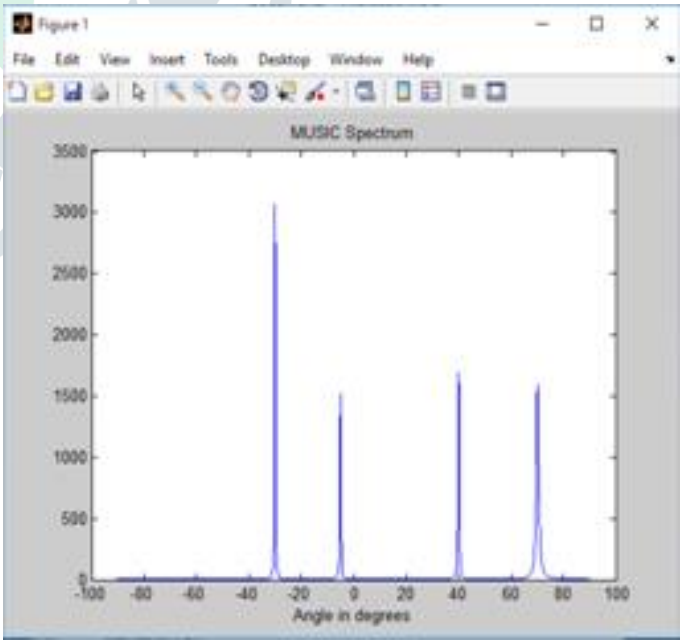
1. MUSIC ALGORITHM:

MUSIC is a subspace based algorithm. The eigenvectors of the covariance matrix belong to either two orthogonal signal or noise subspaces. It estimates the noise subspace using eigen decomposition of the sample covariance matrix and DOA'S. The algorithm is,

```
a1=exp(-1i*2*pi*d*(0:N-1)'*sin([angles(:).']*pi/180));
```

Music spectrum(k)=(a1(:,k)'*a1(:,k))/(a1(:,k)'*Qn*Qn'*a1(:,k));

OUTPUT GRAPH:



2. ESPRIT ALGORITHM:

ESPRIT is a recently developed technique for high-resolution estimation of signal parameters.

It exploits an invariance structure designed into the sensor array to achieve a reduction in computational requirements of many orders of magnitude over previous technique such as Burgis MEM etc. The algorithm is,

```
phi=linsolve(Qs(1:N-1,:),Qs(2:N,:));

ESPRIT_doas=asin(-
angle(eig(phi))/(2*pi*d))*180/pi;
```

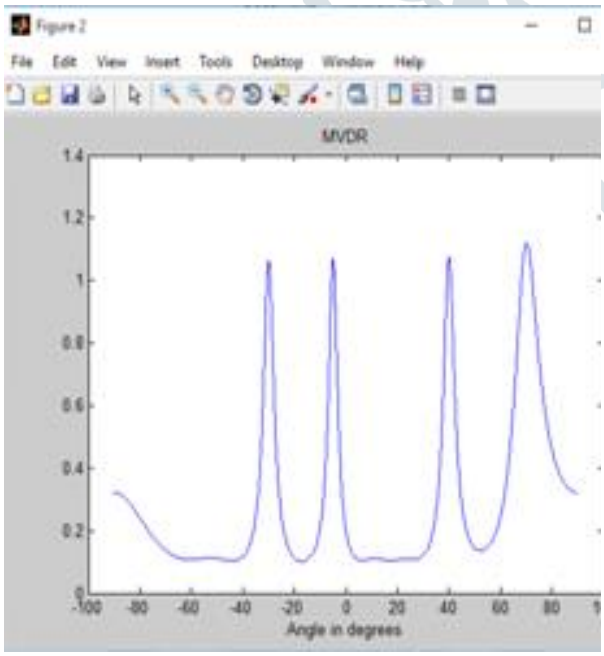
3. MVDR ALGORITHM:

The MVDR beam former is a data adaptive beam forming solution whose goal is to minimize the variance of the recorded signal. If the noise and the underlying desired signal are uncorrelated, as is typically the case, then the variance of the recorded signal is the sum of the variances of the desired signal and the noise. Hence, the MVDR solution seeks to minimize this sum, thereby mitigating the effect of the noise. The algorithm is,

```
IR=inv(R); %Inverse of covariance matrix

Mvdr (k)=1/(a1(:,k)'*IR*a1(:,k));
```

OUTPUT GRAPH:



4. Min-Norm ALGORITHM:

A new estimate of the propagation speed of acoustic waves propagating along a pipe based on array signal processing ,the so-called Min-Norm Beam former (MNB).

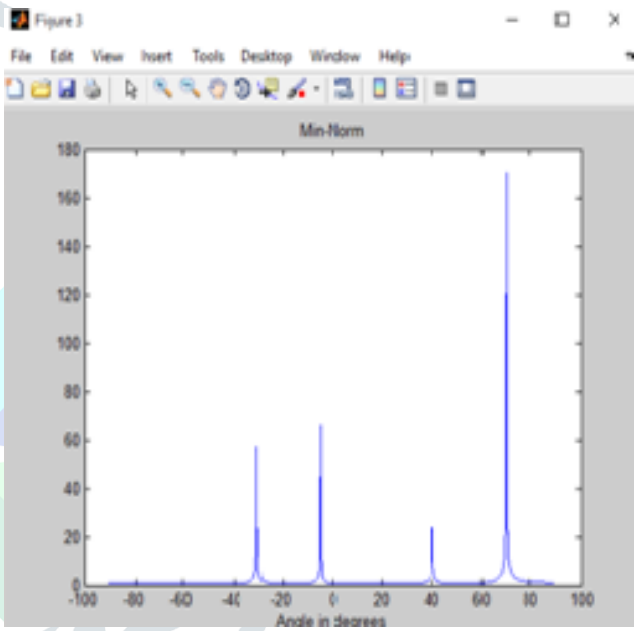
```
Ghat=-Shat*alpha'/(1-alpha*alpha');

g=[1;ghat];

for k=1:length(angles)

min norm spectrum(k)=1/(abs(a1(:,k)'*g));
```

OUTPUT GRAPH:

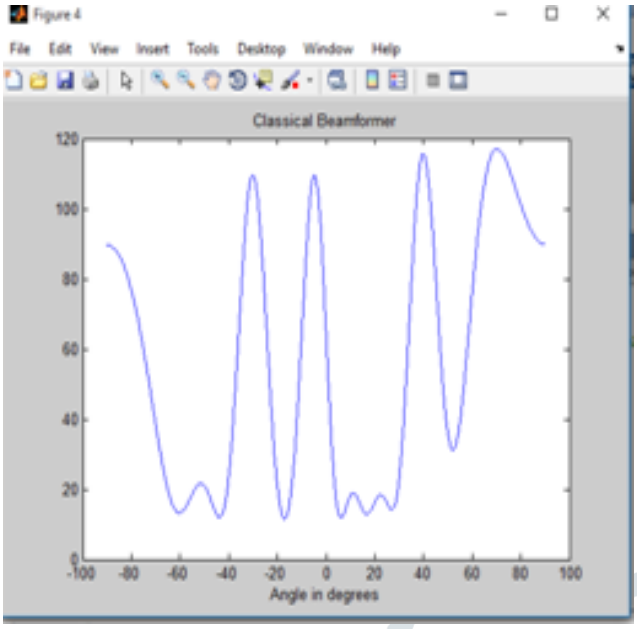


5. CLASSICAL ALGORITHM:

Beam forming is a method used in a array signal mainly for processing the following two goals. To Finding the direction of a desired signal . To Enhancing the desired signal. The algorithm is,

```
Classical (k)=(a1(:,k)'*R*a1(:,k));
```

OUTPUT GRAPH:



MUSIC algorithm gives expected output signal compared to all techniques.

I.**APPLICATION**:

a. Speech detection.
b. Sound enhancement.
c. Speech tracking.

II.**EXISTING METHOD**:

The, SRP-PHAT algorithm has been implemented on a tetrahedral array for outdoor source localization and level retrieval. SRP-PHAT simulations were run to determine its performance in ideal conditions and highlight its drawbacks. Based on the analysis, a Min-SRP-PHAT algorithm was developed. The Min-SRP-PHAT algorithm was then compared to the SRP-PHAT algorithm by running various simulations for the different outdoor conditions. Outdoor measurements were conducted as well as to test the robustness and accuracy of the algorithm in actual outdoor conditions. The measurements results show that the algorithm can indeed be applied for the purpose of outdoor sound map reconstruction, with a higher performance than the regular SRP-PHAT.

III.**DRAWBACKS**:

One of the drawbacks that was detected was the noise floor of the map depends on the highest magnitude source, as such masking of lower level sources can occur.

IV.CONCLUSION:

Here, we got Direction Of Arrival (DOA) for desired signal with reduction of noise using minimum number of antenna in outdoor environment. MUSIC Spectrum gives desired output signal compared to all beam forming technique. The drawback of that experiment is overlapping of signal is over come here. Get clear output desired signal with reduction of noise.

V.REFERENCE:

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