Claims

1. A method of obtaining a spatial power spectrum from L sound signals captured during a time interval by L respective sound sensors, the method comprising:

deriving a covariance matrix **R** of the sound captured by the L sensors;

for each direction of a predetermined set of directions,

(i) deriving a respective steering vector **e**, wherein the steering vector **e** is a vector with a number of components equal to the number of sensors L, and with each component indicating the relative phase with respect to a reference point in an array, of a wavefront propagating in that direction, and

(ii) obtaining a set of L weights $\boldsymbol{w}$ which minimize $\boldsymbol{w}^H\boldsymbol{R}\boldsymbol{w}$ subject to a constraint which is a function of the steering vector and a covariance matrix of sound captured by the sensors, wherein the constraint is in the form $\boldsymbol{w}^H\boldsymbol{e}\boldsymbol{e}^H\boldsymbol{w} + \beta\boldsymbol{w}^H\boldsymbol{R}_Q\boldsymbol{w} = c$, where β is a control variable, c is an arbitrary constant, and $\boldsymbol{R}_Q$ is a noise covariance matrix; and

(iii) using the weights **w** to obtain a power value for the direction.

2. A method according to claim 1, further comprising generating the quiescent noise covariance matrix $\mathbf{R}_Q$, and generating a matrix **B** as a function of **e**, **R**, $\mathbf{R}_Q$, and a control parameter β, said weights **w** being generated as the eigenvector of **B** having the minimum eigenvalue.

3. A method according to claim 2 in which $\boldsymbol{B} = \left(\beta\boldsymbol{R}_Q + \boldsymbol{e}\boldsymbol{e}^H\right)^{-1}\boldsymbol{R}$.

4. A method according to claim 1, further comprising generating a matrix **B** as a function of **e**, **R**, and a control parameter β, said weights **w** being generated as the eigenvector of **B** having the minimum eigenvalue.

5. A method according to claim 4 in which $\boldsymbol{B} = \left(\beta\boldsymbol{I} + \left(\boldsymbol{e}^H\boldsymbol{R}^{-1}\boldsymbol{e}\right)^{-2}\boldsymbol{R}^{-1}\boldsymbol{e}\boldsymbol{e}^H\boldsymbol{R}^{-1}\right)^{-1}\boldsymbol{R}$.

6. A method according to claim 3 or claim 5 in which β is set according to $\beta = \rho\frac{\boldsymbol{e}^H\boldsymbol{R}^{-1}\boldsymbol{e}}{\sigma_v^2}$ where ρ is a scalar >0 and σ_v is a value representative of ambient noise.

7. A computer system comprising a processor and a data storage device storing program instructions operative, when performed by the processor, to cause the processor to perform a method according to any of claims 1 to 6.

5

8. A computer program product, such as a tangible recording medium, comprising program instructions operative, when performed by a processor, to cause the processor to perform a method according to any of claims 1 to 6.