CLAIMS

We claim:

1. An ultrasonic phased array comprising:

a plurality of transducers with known relative positions and orientations;

at least one complex activation coefficient representing a magnitude and phase of a driving signal to at least one of the plurality of transducers;

a point of interest;

a processor for:

1) computing a transducer complex field from at least one of the plurality of transducers at the point of interest;

2) multiplying the transducer complex field by an activation coefficient to return a field estimate at the point of interest; ~~and~~

3) incorporating the field estimate into a weighted average~~.~~; and

4) moving the point of interest at a distance composed of a fixed minimum length and a random length;

wherein if the weighted average exceeds a pressure goal, the at least one complex activation coefficient has at least one of its real and imaginary components changed.

2. The ultrasonic phased array as in claim 1, wherein the field estimate is calculated using a squared magnitude.

3. The ultrasonic phased array as in claim 1, wherein the field estimate is calculated using a magnitude.

4. The ultrasonic phased array as in claim 1, wherein the field estimate is acted upon by a function before incorporating function output into a weighted average.

5. The ultrasonic phased array as in claim 1, wherein a plurality of versions of the transducer complex field are stored in the processor so that at least two of the

plurality of versions of the transducer complex field are used with the at least one complex activation coefficient to simultaneously estimate a plurality of points of interest.

6. The ultrasonic phased array as in claim 5, wherein a plurality of points of interest comprise a plurality of virtual microphone locations.

7. The ultrasonic phased array as in claim 6, wherein each of the plurality of virtual microphone captures its own weighted average.

8. The ultrasonic phased array as in claim 7, wherein at least one of the weighted average is calculated using a different function from others of the weighted averages.

9. The ultrasonic phased array as in claim 6, wherein at least one of the plurality of points of interest is changed when at least one weighted average exceeds a goal.

10. The ultrasonic phased array as in claim 1, wherein the transducer complex field comprises a previously calculated version of the transducer complex field.

11. The ultrasonic phased array as in claim 10, wherein the previously calculated version of the transducer complex field to be used is chosen based upon output of a weighted average from at least one virtual microphone.

12. The ultrasonic phased array as in claim 1, wherein the weighted average comprises an average of prior field estimates.

13. The ultrasonic phased array as in claim 1, wherein the weight average comprises a pressure goal divided by a highest virtual microphone pressure.

~~14. The ultrasonic phased array as in claim 1, wherein if the weighted average exceeds a pressure goal, the at least one complex activation coefficient has at least one of its real and imaginary components changed.~~

~~15.~~14. The ultrasonic phased array as in claim ~~14~~ 1, wherein the activation coefficient is changed using a proportional-differential controller.

~~16.~~15. The ultrasonic phased array as in claim ~~15~~ 14, wherein the proportion-differential controller adjusts the at least one complex activation coefficient value based on a squared pressure output value retuned by at least one of a virtual microphone and the weighted average.

~~17.~~16. The ultrasonic phased array as in claim ~~15~~ 14, wherein coefficients of the proportion-differential controller are adjusted to a controlled rate that limits unwanted audio.

~~18.~~17. The ultrasonic phased array as in claim ~~15~~ 14, wherein the proportion-differential controller uses the greater of: 1) a regulation virtual microphone squared pressure output; or 2) a seek virtual microphone squared pressure output.

18. The ultrasound phased array as in claim 1, wherein the random length is not less than the fixed minimum length.