Subject: DSP technology used to function in MIMO audio and vertically arrayed loudspeaker systems (second dra
Posted by John MacBain on Tue, 01 Nov 2005 00:05:14 GMT
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DSP technology used to function in MIMO audio and vertically arrayed loudspeaker systems (second draft)I am looking for information and advice to help me in finding the best user friendly programmable audio grade dsp's available today. Or a least a clearer understanding of how to compare them and then choose the appropriate ones required, based on their designs and the applications I intend to use them for, while learning to know in advance the many trade offs involved. I am not a programmer or a mathematician so I want to start with simple intuitive programming methods, and I am also seeking help and support regarding these and other not yet mentioned topics. As I am researching some of the ideas and methods used to construct high grade MIMO speaker and audio management systems based on dsp technology. I want the finished unit to be able to manage approximately 8 inputs by 40 outputs, as there are many new processing functions I want to include that are not available in any commercial system controllers that I am aware of. I am also interested in finding open source code that can save me time in building some of these dsp functions, maybe there are others out there of a DIY nature, that are as I, unsatisfied with the rhetoric of some, Audio manufacturing firms claiming to have built the holy grail of sound devices, just plug in our system tunings you downloaded from us and install them into your fancy new system controller and your troubles are over, but its just not that simple. Don't get me wrong I love the idea of being able too, from a users point of view, call up and apply useful and relative system control programs that will help the audio tech achieve great sound for everyone at whatever event, I just happen to believe we have along way to go in making this a repeatable and consistent reality. My best measuring tools thus far have been my ears and body, and they are telling me to keep trying, it ain't over till the fat lady singing the songs, sounds great to everyone, everywhere, all the time.If you believe we can achieve far greater success then what is being accomplished today; by…. not over ruining the market place with more one run-off novelty gadgets and possibly replacing these ideas and items with ones that become useful, powerful, expandable, and upgradeable tools that are constructed by applying synergistic concepts that can prove themselves both from a how to, and a results based point of view, as well as from a more scientifically investigative and confirmation process. Regardless of the methods used, we can find out all the reasons as to why some of this stuff works better later, after we have a working proven system in which to set the measurement bar from. I mean this is all about making better sound, right, so regardless of all the formulas and concepts being applied if we are not reaping enough benefit from our endeavors, then we have further to go. We must consider many conflicting issues, it's true for many problems will arise when trying to design and make better sound systems, with more user friendly functions available to the producer and operators alike. We should not be limiting our ideas to out dated concepts and upholding the status quo of days gone by, unless they still hold relevancy to what we know now and are not in conflict with what we are trying to accomplish today, (but not if they are holding us back, from achieving these goals). For example: There are better ways to build digital filters that are not based on the limitations of being only copies of there analog counter parts. Another could be, not falling for the misconceived belief that the geometry and shape of many modern vertical line arrays, are the only shapes that can propagate wave fields that can be predicted, simulated while being able to, produce flat Isophasic style wave fronts or more importantly. That the array should be able to produce a stable somewhat manipulate able vertical dispersion of a curved wave front that can be aligned and beam steered to where the nulls and lobs can be shaped and smoothed out with in our required needs. So now that we have expanded the boundaries of what is possible, to where we have some of the tools required, that will allow us the ability to tune the audio system not only to itself, but also in relationship to its environment, possibly tuned as well in the key of the source material, so maybe we can now think of audio systems, that will incorporate low latency, read ahead abilities to include automatic key + pitch tracking, This ones in E minor folks, now has a whole new meaning to the audio sound system and tech/musician/artist/operator/users. The search goes on to construct systems capable of providing audio that is complete and full in bandwidth evenly, on and off axis while retaining near perfect phase response over as much of the audience area as possible. By aligning the individual components that make up the acoustical array, we should then be able to create large near field sweet spots design able over large audience areas, but stay off those floors and ceilings, but what about that nagging back wall that keeps slapping us in the face or the back of the head depending on our orientation, at about 190ms late, still a big problem for many systems in use today. Heck, maybe some day audio systems will be able to track and effect phase issues and their relationship to arrays in time, distance and implication to frequency, and this will become all easily manageable by the user all the while they are being assisted in learning to do so in part from the system itself. Kinda like a guitar that has the ability to teach the student how to play it. The possibilities are never ending maybe their will arise certain situations, where we would want to partially or completely phase cancel this or that part of a complex signal, but only in relationship to its spatial & temporal displacement in time and space, maybe only for a cued part of some given musical passage, or phase reinforce that part or some other part of the signal, under similar or different circumstances, now the audio system starts to respond more along the lines of a musical instrument itself as it should. Call these new devices conductor tools, or what ever I just hope they start materializing soon.Which brings me to another point a little off topic, The modern digital electronic musicians needs are also not being addressed in today’s market place, these people need digital MIMO mixing control surfaces with large analog feeling rotary knobs and faders, over built with strength and serviceability in mind. Not being based on how small we can make these things, type of mentalities, which have little care for the agronomic nightmares they are creating. I won’t dare to go into the issues presently facing modern recording processes now available or not available to us at this time, other than to say we are only scratching the tip of the iceberg, and there is way to many cruddy recordings out there, to bad so sad.This is all very complicated but fun stuff to consider, how far do we want go with it, who knows maybe one day acoustical arrays won’t have to be limited by ideas based on only preconceived notions that we have already solved all the relevant problems associated within these systems, maybe the solutions might lie with opening up are exploration of concepts that will include new insights in regards to more of the real issues that we deal with on a day today basis. Sound engineers and techs have to deal with a lot of complex challenges on a daily bases, the functions involved can be quite difficult to overcome and usually require great amounts of energy, experience, expertise and time to resolve, if they are to be addressed at all. For instance, resolve the trade-offs involved in the problem associated with beam steering, and wave form shaping and the compromises which must me made that can greatly effect the near field zone as well in the transition zone between the near field zone and the far field zone, theirs is a lot of crazy shit going on in these zones and after attending many events where Line arrays have been used, one starts to realize that some of the hype is just that. There are many factors to consider when designing and constructing acoustical arrays, one example being; the differing distances of it elements and their relationship to the frequencies and the phase in regards to the near field zone and the far field zone. Maybe some day in the future not so far from now, we might have the know how, to offer some choices that don’t exist today. Like, Hmmmm…… To far field, or not to far field? This is only part of the question, for if we so chose to have a far field, then what kind of far field should it be? Can we build sound systems that will continue to evolve, there's much to be done; I hope so, better than ever before.I'm not saying there aren't massive amounts of great work being accomplished by many people in the audio community; I take my hat off to you all!.. Yet I still believe there needs to be greater creative awareness and expression incorporated into audio tool making. There needs to be more user influence in the processes of applying more feedback to this know how, like in the relationship that must exist between the test pilot and the engineers that design and build the planes the pilots are testing, they should have mutual understandings based on empathy of knowing each others plight. Certainly we must never give up on trying and improving the state of these unions. I believe many of the answers lie in the act of un-constraining ourselves to many of problems and issues involved in some of the antiquated ideas and the conflicts that arise surrounding the nature of the relationship between traditional crossover designs (the name itself might be part of the problem, I like to think of these devices as "signal splitting processing tools") that must recombine in the geometry of there counterpart acoustical arrays, and of course into an acoustical environment, contain people who are experienced psychoacoustic listeners, we are this and more. Take a moment and look at the physical nature of a hypothetical audio system and all the different devices involved that were and are used to get what ever this source material might contain, be it of acoustic nature, electronic or digital based. They are all complex signals obtained and recorded by some means that of course is going to be relative to the final listening experience, when it all reaches its final destination, the listeners who of course also occupies some given physical space that contains both them and the source material now combined together, where the listener is now experiencing joy and contentment that will be repeatable, so they can now show and share this experience off with their friends, or we are left wanting (and let us not forget about our community or our neighbors and the fact that they want their own space, to be undisturbed from us). There have been many actions applied to the signals by this point that will have effected the original phase and frequency response of any given wave field along this journey that can effect its able ness to produce some desirable or undesirable wave forms in either a working together relationships with the individual components that make up the whole of the array. Consider them as a group of multiple devices that each might contain part or all of the parts that produce and place that part of the signal, they should sum together partially or minus depending on position and the wave forms desired shape as a reconstruction of the true shape of the original signal, unless of course where this signals shape, is just so in need of repairing, then well we got a whole new set of problems to deal with (Yikes). The idea is to have the whole array working together to produce the desired stable wave front, that will cover coherently across most of the audiences area, in alignment, formed synergistically from physical arrangements, based on geometrical relationships, with phase and frequency dependants, that should and do have strong relationships to the algorithms that are or not controlling the individual elements of the array. To be able to produce re-constructible wave forms that can hold their integrity as they travel and disperse in a controlled and predictable fashion, comprised of multiple complex waveforms we are trying to distribute in a uniformed, even nature across the entire audience area. With intent driven designed soundscapes of our choosing, and that we can gain better control over these complex wave fields and their propagation over distances greater or shorter physical measurement, and still be stable to the original impulse is tough to do, and the further we move from the source in the XYZ planes, tougher to do, no doubt. I think we should make audio systems that are designed with greater respect to the source waveform, array geometry, with useful quality built and designed digital processing tools, that can be used in real time due to the low latency of many of their functions, while providing good choices of filter topologies, plus a clearer understanding of their applications within arrays and the acoustical environment and the interaction that takes place modally, spectrally and temporally and psychoacoustic perceptions, along with proper array positioning, and the use of good measurement and simulation tools, then we might stand a chance at resolving some if not all of these challenges. So I'm looking for, Opened minded people that (can tolerate me) and have experienced sound intimately for some time, from both a scientific point of view as well as from a musical point of view and have the wisdom and common sense that only experience and passion can bring. To join forces with me by collaborating in furthering our knowledge and expertise to bring forth a era where products are evolving from self organizing systems capable of greatly improving the advancement of sound propagation theory and it applications. To contribute in architecting a better future with better sound wave control and all the possible advantages these newer systems will be able to support, for instance creating 3D acoustic holographic designed wave fields, and their synthesization, by using the proper mapping tools and system architectures. Presently I am working on a DIY project where I have designed and constructed a series 1 proto type vertical acoustical line array "The Wing Array" (still considered by me as a work in progress, it is far from perfect and has room for improvement and I need help to complete the rest of this project, particularly the control system) this system consisting of; 78 separate loudspeaker elements, is based on some of the previous statements and ideas I have made thou not all are necessarily contained in this document. The following is a brief description of it design and it's limitations due to my lack of expertise and the financial situations, that have occurred.Quasi stereo left and right multi-way DSP controlled vertical loudspeaker array, (eventually I will design and build a center array etc..etc… this is a step by step endeavor)Brief description of each side of the arraysHi's 6 hi powered ribbon drivers (60 watts rms, 2000 short peak, 120 watts rms if I ever can ever get the cooling system required to achieve this spec). Drivers are .163m in length on custom waveguides measuring .2m vertical, eff (1w@1m) 107 db spl, freq res 1khz-30khz, Imp 13 ohms, dc res 12.4ohms less than 5% @ 20 degree cel. Vertical spacing between ribbons @ .048m. Each ribbon driver is on there own amp channel presently using QSC PL 1.4. amps to power these elements. Over all vertical length of ribbon line is 1.89mMids12 high powered transducers (250 watts AES rating). Speakers are 166mm in diameter, Imp 16 ohms, eff (1w@1m) 97 db spl, max 117db, fs 125hz, dc res 11.6 ohm, bl 16.1, xmax +- 2.0mm. Vertical spacing between transducers @ .006m. Speakers driven two per channel, power presently provide by QSC PL 1.8 amps.Overall vertical length of Mid line source array center to center is 2.04m. Horizontal center to center spacing between Mid and Hi line @ .22m.Lows12 high powered transducers (700 watts rms). Speakers are 304.8mm in diameter, Imp 8 ohms, eff (1w@1m) 95 db spl, fs res 39hz, V.C. diameter 101.6mm, bl 17.4, xmax 4.8mm. Vertical spacing between transducers @.045m. Speakers driven two per channel (sometimes three per ch when resources are taped), power presently being provided by Crown MA-5002VZ amps. Overall vertical length of low line source array center to center is 3.97m. Horizontal center to center spacing between low and mid line @ .4mSubs8 high powered transducers (1000 watts rms). Speaker are 429mm in diameter, Imp 8ohms, eff 1w@1m) 94 db spl, fs res 33hz. Speaker driven two per channel, power provided by Crown MA-5002VZ amps, Subs arrayed horizontally, spacing distances are played with to change modal and coupling frequencies. Don't know much more about these speakers or the enclosure design they come in other than to say they are not made by me, but manufactured by a large audio corporation. They move a lot of air, but the ways, in which the enclosures couple to structures physically and to a lesser degree modally are for the most part difficult for me to control at this time, a shame for there is such a large amount of sub base energy that is wasted by the omni directional dispersion patterns. I guess what I'm saying is, KISS this one for a little while longer, don't want to get to ahead of ourselves. I feel I have accomplished a great deal towards completing this project, I have a working sound system and thou far from perfect it’s the best audio tool I’ve used thus far to date. It would be wonderful if I can find the help I need to realize its full potential, and then I can move on; maybe we could collaborate on a series two proto type system or some other original design ideas that are burning inside us, or that this world is asking us to consider by putting it right in our face, that we might feel a whim to create, maybe its in us. This is not a commercial venture I would like to keep this all open source, so if there are any advantages or spin offs, they are shared globally and not controlled by any one entity corporation or individual source. This does not mean that I don’t think we should not give credit to ourselves and each other for contributing by the works of our labors; I’m just not convinced that the present systems in place are in our best interest. Let’s quit making weapons and start making a better World for all of us to live in; we can do it I know we can.Thanks, I Hope this all makes sense there is probably a lot of mistakes in this document as it is only a second draft and like me a work in progress. I have a mountain more of useful info regarding this project for those who are interested although some is still not finished or in a rough and some times hard to understand form, I tend to write from a stream of consciousness type style, I find I have often omitted much information that could be useful in fully understanding what it is I am trying to say. There have been times, when I can’t even understand what it is I am trying to say. CheersJohn MacBainforgetabotit@hotmail.com

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Subject: Re: DSP technology used to function in MIMO audio and vertically arrayed loudspeaker systems (second
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