Subject: Cornerhorn approaches
Posted by Wayne Parham on Mon, 07 May 2001 05:54:12 GMT
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The Klipschorn is a truncated folded basshorn that makes use of the room corner to reduce response ripple. It also runs midrange frequencies well above middle C through the labyrinthene passages of the horn folds. Its strength is its horn loading which reduces excursion and therefore reduces distortion. Its weaknesses are compromised horn loading because of truncation, dependence on corner quality to improve horn loading, ripples in bass response because the horn is truncated, midrange passes through basshorn, ripples in midrange response because it passes through the basshorn up to 400Hz and standing waves develop within the passageways, incoherent summing due to path length delay, and ripples in response near crossover points due to incoherent summation.That list may make it sound like I don't like Klipschorns but that's not true at all. In fact, it is what inspired the Pi cornerhorn design. I like the idea of launching sound from the corners because it imposes a maximum 90 degree radiation angle over the entire audio band, providing 9dB increase over freespace. It makes a good position for placing controlled directivity loudspeakers to provide uniform coverage throughout the room. But when I looked at the list of strengths and weaknesses of using a truncated basshorn, I decided to remove the horn and use an overdamped direct radiator instead. I like horns, but if the disadvantages outweigh the advantages, it's time to ditch the horns. That was my conclusion in this case.If you think about it, the Klipschorn bass bin forms the compression chamber and throat of the basshorn, but the room's walls form the larger part of its body. That's a pretty good approach, but it does bring in the complications I mentioned above. If it were only used to around 100Hz and blended with a midhorn that could cover the low midrange up, that would be a vast improvement, in my opinion. But then there is still the matter of path length, and I think the midhorn and tweeter would need some delay to get summing right. And since the bass bin is really just the throat anyway, it occured to me that using the corner's expansion from the apex as the horn in toto might be a useful simplification. After all, the corner expansion has the shape of a horn too, albeit a conical horn. It is very simple to implement, increases sound by way of reduced angular coverage, and provides a useful launch point. These were my thoughts when coming up with the Pi cornerhorn approach.The strengths of the Pi cornerhorn bass bin are simplicity, small path length and relative independence on corner quality. It is an overdamped vented cabinet with gradual rolloff that conjugates room gain nicely. As such, if used in a corner that is not optimal, there will be less impact on overall response. You may not have the same amount of bass, but what you have won't be peaky like a truncated basshorn is. Some would make the argument that room modes swamp the response anyway, but I think that's a cop out. All rooms are different, and not all rooms have modal problems that approach the peaks and valleys that a truncated basshorn can make. I think it is probably better to make a speaker with nice smooth response to start with.One of my personal preferences is to make use of good quality drivers with flux-stabilized motors. The magnetic circuit is a crucial part of a good quality loudspeaker. It isn't just a matter of using a strong magnet and putting a voice coil in the gap - the best drivers pay careful attention to the magnetic circuit so that flux surrounding the voice coil is symmetrical and that the flux surrounds it with equal intensity no matter the drive level or position of the voil along its travel. This is not a trivial matter, and the difference in quality levels between the best and the worst is probably 1000-fold in terms of linearity. Even when looking at good drivers, you'll see a 50x difference in distortion between similar drivers just by adding a shorting ring to reduce flux modulation. So my preference is to get the best motors you can afford.