Sound System Modular Concept

This proposal is based on the amplifier and DSP products from Hypex, a company, based in the Netherlands, which produces the finest Class-D amplifiers in the industry.

Their DSP product is the DLCP, which, together with the amplifier modules, allows for the opportunity to put together a very fine active 2-way or 3-way system, using one DLCP. For a 4-way system up to 6-way, two DLCP's must be used.

Hypex, in their company philosophy, is very supportive of the DIY community. The success of some loudspeaker designers addressing this community is proof that many hobbyists find great satisfaction in putting together their own sound system, and are also willing to spend a considerable amount of money in this process. Some of these systems can easily compete with the finest commercial systems, usually at a lower cost.

This proposal is based on a modular approach, giving much more flexibility for the realization of many different systems.

This proposal at the same time also stresses simplicity, especially in the area of the DSP.

A simple system utilizes just one sound source, i.e. a computer, driving a USB to S/PDIF converter, which means the input to the DSP is only one digital signal for the music source. The analog input is only used for measurement and filter design.

For best modularity and flexibility for future enhancements, the DSP is put into its own housing.

The most popular active loudspeaker of today is a 3-way system, consisting of tweeter, midrange and subwoofer. This covers the full frequency range from 20Hz up to at least 20kHz.

Amplifiers

Hypex produces the following amplifier modules available to the DIY community (sometimes through second sources):

UcD180
UcD400
NC400
NC500

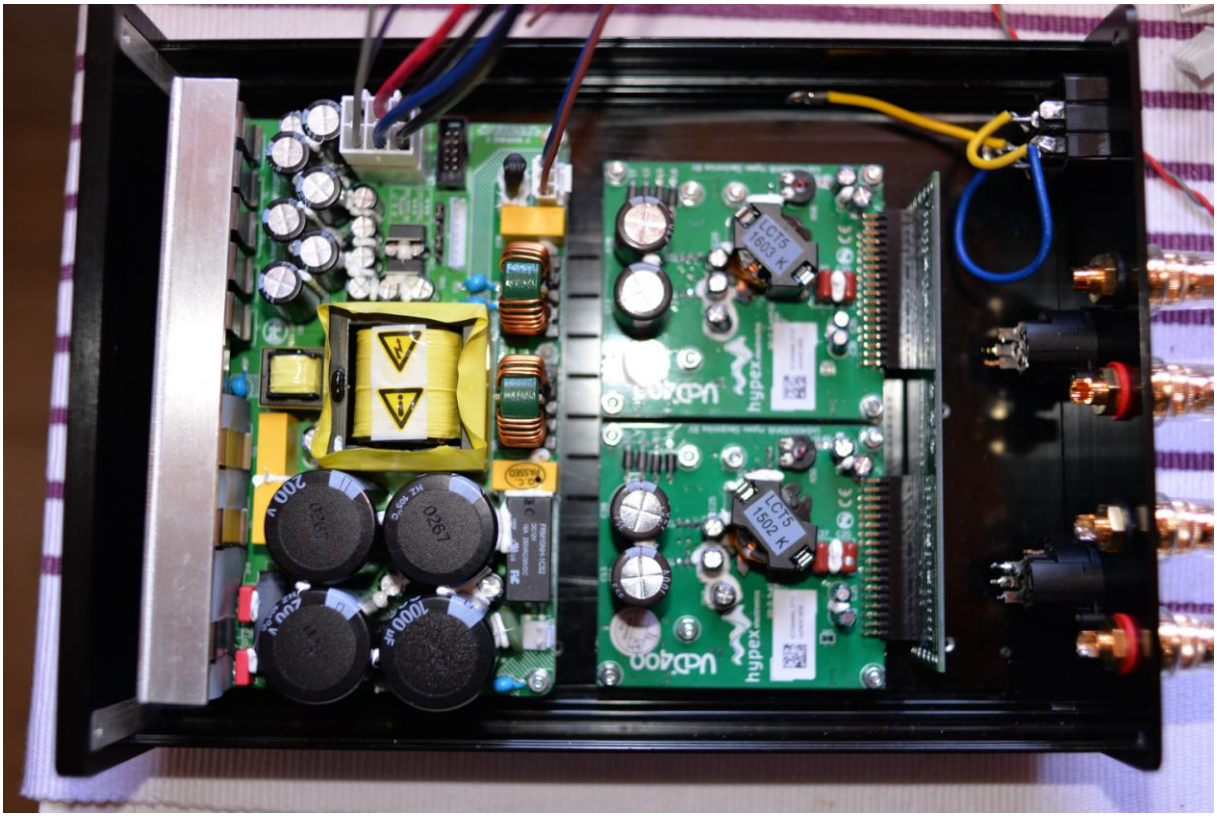
Also the necessary power supplies:

SMPS400
SMPS600
SMPS1200

Apparently the NC1200 is no longer available, at least not for the DIY community.

The most efficient way is the use of **Quad Amplifiers** with four of any of the above amplifier modules.
The preferred version of the UcD modules would be the OEM version, available through second sources.

Example of a Stereo Amplifier with UcD180OEM modules and SMPS400A180 power supply



Example of a Stereo Amplifier using the UcD400OEM modules and a SMPS1200A400 power supply

The above examples show stereo amplifiers, the **Quad amplifiers** would use the same arrangement and would add two more modules, requiring a deeper case.

The choice of different power levels of the amplifiers allows for better matching with the required power for the loudspeaker drivers.

DSP UNIT

Hypex essentially makes only one unit, the DLCP.

The DLCP has 6 channels, allowing for a 2-way or 3-way system.
For 4-way systems up to 6-way systems, a second DLCP needs to be used.

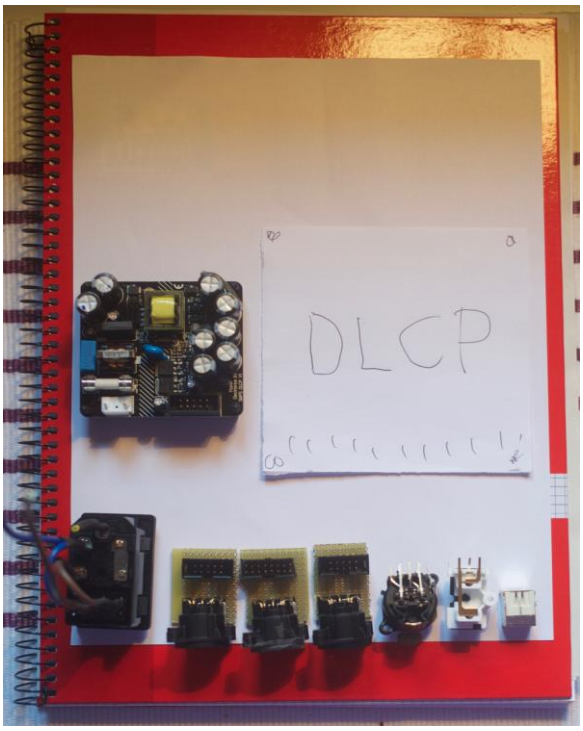
Inputs: 2 XLR Analog balanced inputs for left and right channel
1 Digital S/PDIF input
Outputs: 6 XLR Analog balanced outputs
1 Digital S/PDIF output
Control: USB port for configuration and filter design

The Analog inputs are used for the ability to make measurements of the different drivers during filter design. For music the digital input is preferred, allowing the use of re-clocking.

COMPACT DLCP DESIGN

The use of 5pin XLR connectors brings a lot of advantages not only to the compactness of the DLCP unit, but also to the overall system design of a HYPEX based sound system:

1. All amplifiers are quad amplifiers and use two 5pin XLR connectors for input and two 4pin speak-on connectors for output.
2. The quad amplifiers each use four of the following modules: UcD180, UcD400 (OEM version)
3. For interconnection between the DLCP and the amplifiers only three 5pin cables are needed.



As can be seen from this picture (white is the inside space of the case), there is plenty of room in a case of half-rack width.

BUT……

In a Perfect World

In a perfect world, our DSPs should be so well designed that products like re-clocking would be unnecessary. But it appears that these USB enhancement products are necessary to achieve the ultimate sound quality from USB interfaces, as there are very few, if any, perfect DSPs.

Unfortunately the use of a computer (possibly also other digital devices) with USB as a music server creates artifacts, which can be distracting, annoying and tiring.

My question is:

Is it possible to design a DSP unit, which makes the use of outside add-ons redundant?

It may actually consist of two parts, one connected very close to the computer, which itself is connected via long (3 meters or more) fiber optic cables to the main DSP unit, with its outputs connecting to the different amplifiers, which are in close proximity to the main DSP unit, requiring only short XLR patch cords. The equipment rack should be well positioned making the loudspeaker cables also as short as possible.

So who is going to develop this unit?

Here is an article, describing the artifacts and one possible solution (in German):

Er befreit den Klang von allen digitalen Artefakten. Schon immer hatte mich eine beträchtliche Restschärfe in meinem System gestört, die ich auf mein mittelmäßiges DDC und Rest Jitter zurückgeführt habe. Das führte in meinem Hörerleben dazu, dass ich mich nicht entspannen konnte, egal wie gut die Wiedergabe sonst bezüglich Detailreichtum, Abbildung, Bühne etc. war. Der Klang war scharf und schrill bei manchen Tönen und das hat mich massiv gestört, gerade weil der Rest ja bereits sehr gut war. Mit dem afi+USB nun sind diese Schärfen im Hochton (und auch Störungen und Artefakte in anderen Bereichen, wie ich jetzt hören kann) schlicht abgestellt. Man kann jetzt ganz entspannt hören, weil nichts mehr nervt. Der Klang ist von den störenden, teils regelrecht schmerzenden (Hochton) Artefakten befreit. Das ist einmal das Wichtigste. Aber bei weitem noch nicht alles.
Der Detailreichtum hat zugenommen, insbesondere im Hochton, die Mitten sind extrem klar und entschlackt, der Bass ist z.B. beim akustischen Bass differenzierter weil einfach mehr Obertöne genauer wiedergegeben werden, bei elektronischem Bass ist er in manchen Beispielen schlanker, weil aufblasende Artefakte nun fehlen, an manchen Stellen hört man ganz leise feine Bassläufe, die vorher nie zu hören waren (mehr Details und Nuancen auch im Bass) und an wiederum anderen Stellen erscheint der Bass fetter und solider als zuvor. Insgesamt ist man aber immer überzeugt, dass man erst jetzt in allen Frequenzbereichen die Sache so hören kann wie sie sein sollte, nur man konnte bislang aus technischer Limitierung heraus nicht.

Die Höhen fein und trotzdem nicht nervend, aber auch nicht rund oder sanft per se, nur sanfter als vorher weil nervige Artefakte fehlen, die Mitten klar und rein, entschlackt und trotzdem voller Klangfarben, der Bass differenziert und sauber.
Der afi+USB macht den Klang also nicht rund oder ist ein Schönfärber, nein, er ist im allerbesten Sinne neutral und entfernt einfach alles Störende, alle Artefakte aus dem Klang, und schält dabei gleichzeitig alle Details und Informationen, die da sind, aus der Aufnahme heraus. Die klanglichen Eigenschaften des DACs, der Vorstufe, der LSP bleiben dabei aber vollkommen erhalten. Im Vergleich zu vorher allerdings klingt es schlicht perfekt angenehm, langzeittauglich, ganzheitlicher und gleichzeitig informativer.

If the use of the afi+USB unit is deemed necessary for the overall performance of the system, the digital input and digital output of the DSP unit should use the RJ245 connector, so that an adapter cable is unnecessary.

With just three products (DSP unit, 180W quad, 400W quad) all possible loudspeaker systems could be realized:

2-way	DSP	180W quad	
3-way	DSP	180W quad	400W quad
4-way	DSP+DSP	180W quad	400W quad
5-way	DSP+DSP	three quads	
6-way	DSP+DSP	three quads	

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