

Who believes in audio quality?

Making circuits that the industry don't sell!

Marcelo Johann



~30 min listening

Including:

- Classical and pop music recorded in Porto Alegre by Sfoggia
- Selected tracks, passages
- Most with ADAT, op27 preamps, tube mixer



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Audio Quality : Slide 2

More Interesting, perhaps:

You are just listening to

- 16-bit, 44.1KHz, Non-OverSampling
- PhilipsTDA1543, economy DAC from 1991
- THD between -60 and -70dB
- Noise around -70dB
- Home made, of course

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Audio Quality : Slide 3

Outline

- Preamble and Goals
- History 1: Hi-Fi evolution, references
- History 2: A dentist in Porto Alegre
- History 3: How I got involved
- The industrial/commercial approach
- DIYers, audiophiles, engineers, mods
- Measurements, listening, subjective quality
- The sound of components
- Brands, sites, links, advices
- Final messages, and open for discussion

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Audio Quality : Slide 4

Preamble

- Like in a painting
- The image starts rough
- It makes more sense as it is being completed
- Don't be too alarmed with my bold statements



<http://www.youtube.com/watch?v=j9SRKaJam6U>

Or Beyonce iPad Finger Painting by Kyle Lambert HD

http://www.youtube.com/watch?v=__rPHTWxS4g

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Audio Quality : Slide 5

Preamble

- Bold statements
 - I will make a lot of them...
 - But there are wonderful products
 - There are wonderful people
 - Companies with poor sound quality help a lot
- However:
- My task here is to criticize, not acknowledge
 - Let us reconsider, rethink, learn
 - Don't endorse the "theory of ignorance" (1)

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Audio Quality : Slide 6

Provoking...

- No one is caring about audio quality
- Industry is selling cheap stuff
- Digital is worse than analog
- Transistor is worse than tubes
- And top audio quality has been decreasing in the last decades...
- Remember: all this is relative
- And you don't need to believe me
- Did you ever listen to high-end analog, tube?

Goals and Coverage

1. Hi-Fi History ... Stories

2. Big Messages to us

3. Technical Knowledge

Historical

Economical

Technical

Cultural

CONTEXT

Mechanics

SOUND

Mechanics

Electronics

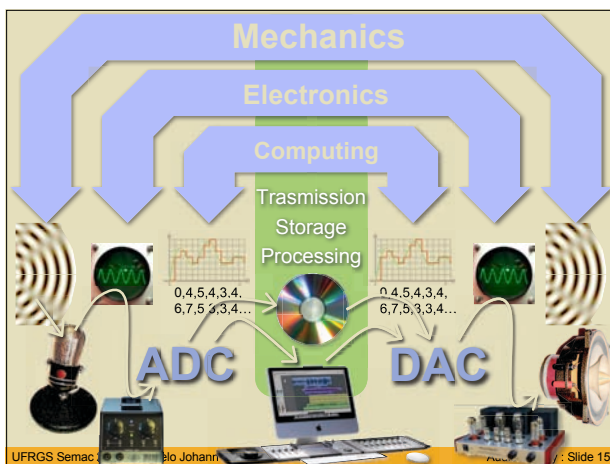
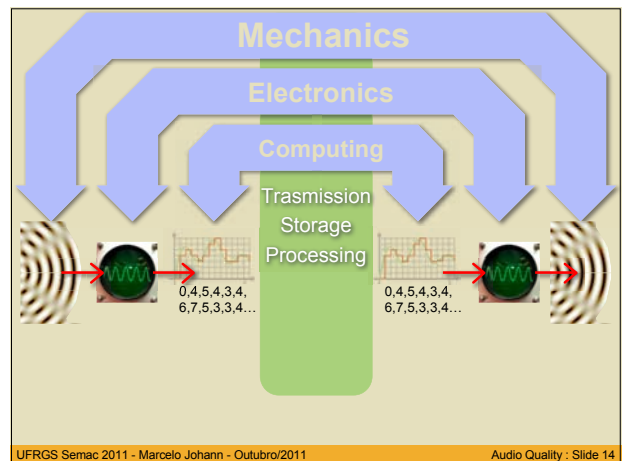
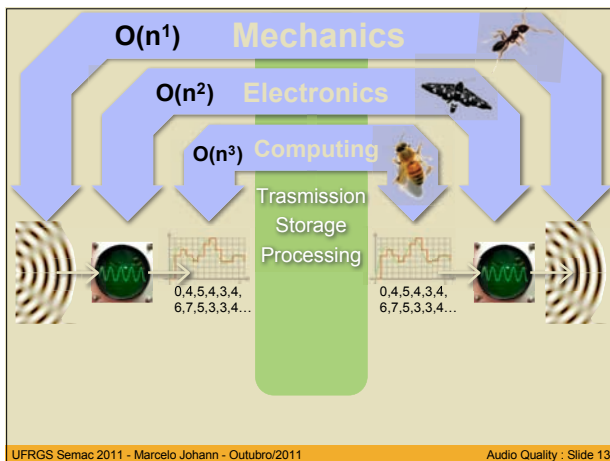
Mechanics

Electronics

Computing

0,4,5,4,3,4,
6,7,5,3,3,4...

0,4,5,4,3,4,
6,7,5,3,3,4...



HISTORY

Part 1

Golden age and references

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The Golden Age of Hi-Fi: 50s

- English school versus American School
- The name of Gilbert Briggs became a reference at the english scene



- More: A Tiny History of High Fidelity
<http://www.nutshellhifi.com/library/tinyhistory1.html>

Wharfedale, from 1932



- High sensitivity speakers
- Alnico magnet and square aluminum coil
- The old english way
- Individually tested and tuned

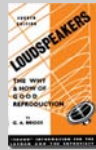


More:

<http://www.gearplus.com.au/products/wharfedale/history/0-history-wharfedale.htm>

Gilbert Briggs as father of Hi-Fi

- He was not the first
- He was not alone, but...
- Briggs famous tour promoting Hi-Fi



More:

<http://www.wharfedale.co.uk/About/History/tabid/66/Default.aspx>

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Audio Quality : Slide 19

Why Hi-Fi?

Is it for millionares?

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Audio Quality : Slide 20

Our awesome auditory system

- Art is sensible
- Why fine cuisine?
- Can we just eat hamburgers?
- But we are going towards it!
- We are on it!
- "Theory of Ignorance" - part 2

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Audio Quality : Slide 21

HISTORY

Part 2

A dentist in Porto Alegre

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Audio Quality : Slide 22

What happened in Porto Alegre?

- A dentist followed Briggs and other masters, as well as his own experiments

Marcello Sfoggia

- Since he was young
- Passion, dedication
- Spent many decades building circuits
- Became a famous recording expert



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Audio Quality : Slide 23

What are Sfoggia's main guidelines

- Custom
- Analog and tubes
- Simple - less is better
- Oversized - no compromise
- Quality components
- Testing and Tuning
- Don't rely on price
- Dedicated PSUs
- It is the sound

...my personal view

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Audio Quality : Slide 24

Everyone involved with music in POA knows him



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Audio Quality : Slide 25

Some of Sfoggia's stories

- It must be the **green** one
- Taking piano's top out
- Blankets
- Coins + screw
- Watch's chain
- Mic at floor
- How to fix this room?



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Audio Quality : Slide 26

HISTORY

Part 3
How I got involved

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Audio Quality : Slide 27



Trying to build a top-quality studio



Hit the wall w/ US\$2K ADC/DAC

My problems

- I was listening to the ULN-2 in the living-room
- And it ruined my analog sound at the studio

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Audio Quality : Slide 30

Cooperation: 1

Marcello Sfoggia

- He needed a computer!!!
- I already implemented a mixer with his help
- Now I needed to solve my new problems



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Audio Quality : Slide 31

Cooperation: 2

Márcio Chiaramonte

- (EE, UCS @ Bento)

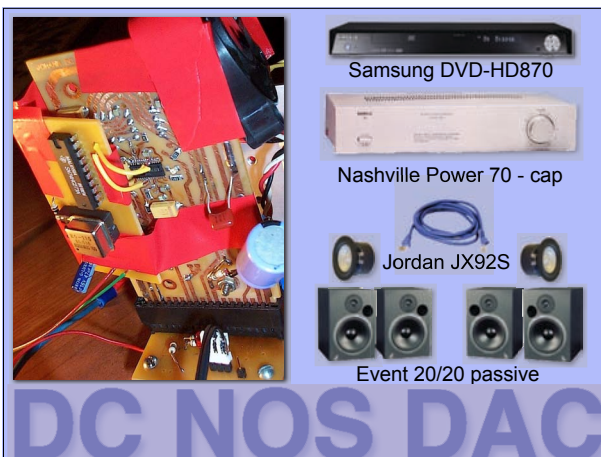
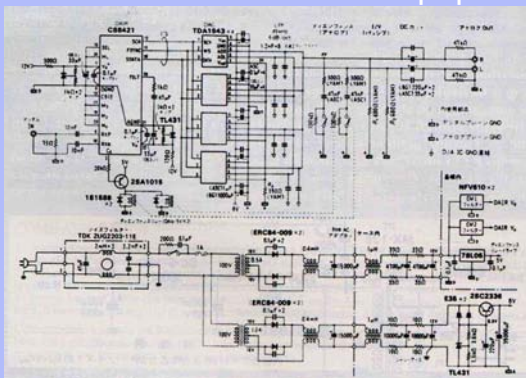


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Audio Quality : Slide 32

Home made DACs

Started to become more popular after Mr. Kusunoki's MJ/96 paper



How does it work?

In a nutshell

- Phillips TDA1543
- 4 in parallel, 8.5V
- Non Over Sampling (filterless)
- Passive I/V
- Texas DIR9001 (low jitter)
- Good PSU (150.000uF)
- Direct Coupled (my contribution)

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Audio Quality : Slide 35

Now back to Sfoggia's problem...

...and also mine:

- How to find a good interface (AD/DA)?
- For "the master"!!!

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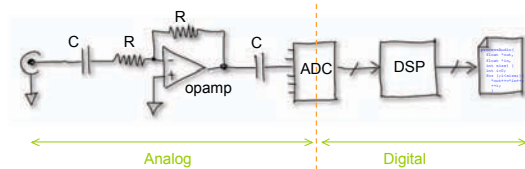
Audio Quality : Slide 36

What is there available

- Audio Interfaces
- AD/DA, 2ch, 8ch
- Protocols
- M-Audio, MOTU, Echo, TCE, Focusrite, ... Digidesign, Apogee, RME, Metric Halo, Lynx...
- And Behringer!

What they have inside?

- Caps, Res, opamps, converter, DSP, SW



Quality and Price for components

- Capacitors
 - \$0.015
 - \$0.65
 - \$59.83
 - \$1,216.90
 - Resistors
 - \$0.008
 - \$0.60
 - \$2.95
 - \$27.95
 - Opamps
 - \$0.19
 - \$2.79
 - \$6.50
 - \$42.95
 - ADC chips
 - \$1.67
 - \$3.00
 - AK4620BV (\$16.45)
 - ???
- (~4-8\$ each)

Example of entry level interface

- PreSonus AudioBox-USB

- \$149 for 2ch
- 24-bit 48KHz
- Guess which Caps
- Guess which Opamps
- Good converter chips



Professional 24-bit converters
Most USB recording devices operate at 16-bit sample rate and use converters with dynamic range of less than 90dB. This translates into a pinched and relatively small sound. The AudioBox USB uses professional-grade analog to digital converters with dynamic range of 102dB and 24-bit sample rate so that the digital conversion is big, quiet and musical.

- Nice!

Example of “pro” studio interface

- SSL Alpha Link AX
 - \$2699.00 for 24ch
 - 24-bit 96KHz MADI
 - Guess which Caps
 - Guess which Opamps
 - Good converter chips
 - newer
 - Better specs...
 - Not necessarily better sounding
 - Inside...
- Nice!!!



XLogic Alpha-Link Audio Converters

The XLogic Alpha-Link range is a family of fully featured multi-channel Audio Converters for Studio, Live and Broadcast Applications. They offer bi-directional audio conversion between our high quality AD/DA converter circuitry and either MADI Optical, AES or ADAT Optical digital connections.



The industrial/commercial approach

- What you find inside a \$200 interface
 - Cheapest caps and res
 - “audio” opamps
 - Good converter chips
- What you find in a \$2000 interface
 - Cheapest caps and res
 - Most the same “audio” opamps, long path?
 - New converter chips
- Is there a \$20000 interface?
 - Only if you build one (DIY, mods, custom)
 - Remind: there are exceptions...

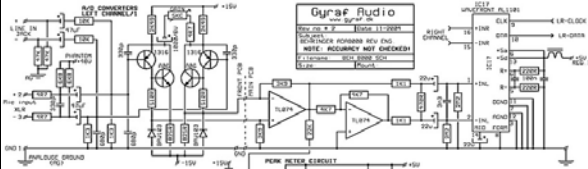
Really?

- Yes, and a computer guy like me can take a \$200 unit, change a few components, and make it sound much better than a \$2000 one!
- Hard to explain why the industry does not
- Or easy...
- Let's see it:

www.inf.ufrgs.br/~johann/ada8000

MODIFYING THE ADA8000

by Marcelo Johann

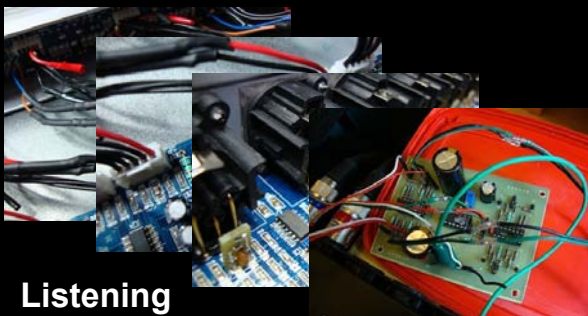


Gyrat Audio
Rev. 01.0 - 11/2009
REVISÃO: REVISÃO REV. 01.0
NOTA: REVISÃO NÃO CHECKEIN
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L.100: 100KΩ, 100KΩ, 100KΩ

- Replacement of ceramic caps at the power supply for high isolation voltage ones;
- installation of a fan on the top cover to cool down the regulators that run very hot;
- bypass the input mic preamps, going directly to the main board with some resistors;
- opamps replacement: I put LT1359 at the inputs and OPA4134 at the outputs;
- uncrossing the outputs, because the positive passed through two opamps, and the negative, only one.

MODIFYING THE ADA8000

by Marcelo Johann



Listening

Can I do the same with other gear?

YES!

Why engineers don't do it for me? :o(

Title - Who believes in audio quality?

- People don't accept this too easy
- Let's try to see why

(no one is caring about quality)
(we seek features and low cost)

Trying to explain...

- Industry needs profit
 - Maximize sales and minimize production costs
 - They will always use the cheapest component
 - True for consumer, true for pro
 - Even for niche markets - the charge you the name
- Users are equally responsible
 - We bargain for the lowest cost
 - We seek features, robustness
 - We force "quality companies" to sell cheaper stuff
- Remember: there are exceptions...

Exceptions

- Mercenary Audio
very uncommon
my “methodology”
- John Hardy
- David Royer
- JCF
- ...



Mods and Custom

- Black Lion Audio
- Audio Upgrades
- Like guitar amp mods
- People like Sfoggia in some countries
NYC, London, Denmark, ...



Break

back in 10 min

Trying to explain: engineering facts

- Is it so expensive to make a better sound?
- Not all modifications are expensive...

Two theories:

1. Engineers know and could do better
Burson Audio
2. Engineers only care for specifications
Rod Elliot
3. Or Digital Rupture

Subjectivity

1 The Big Debate

Different cultures, views,
communities

1. Professionals

robust, known, for market

2. Audiophiles

Eternal search for perfection

3. Engineers

Better specs, numbers

They do
exaggerate!

They all
Fight,
really!

2 Learning (1)



Sense of presence
Placement
Depth of field
Want to hear more
Low level detail
Forget the speakers
Brings a smile
Relaxed

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3 Learning (2)

The sound of each component

1. Resistors
<http://www.altavistaaudio.com/resistors.html>
2. Capacitors
<http://www.humblehomemadehifi.com/Cap.html>
3. OpAmps
4. Everything

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4 Importance (again)

If the difference is so small
does it matter at all?

1. LAYERS
Long signal paths
2. LAYERS
Mixing adds up errors
3. LAYERS
Listening for hours

A/B test?

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5 How to design

What is the right balance
between specifications and
listening?

Old Phillips methodology

Friend or Foe?
High-End designers reassess
the importance of audio measurements
BY MYLES B. ASTOR
ULTIMATE AUDIO, Spring 1999

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Technical

Many other issues

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Words, just words Numbers, just numbers

- Pro
- High-quality
- Pristine
- Digital transparency
- 24/96
- -120db SNR
- “name” as a value to sell

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Why transistor?

- cheap

:o)

Why digital?

- From dbx 386's manual

Promise
Factual

- Digital = practical
And this is very nice! :o)))

Clock

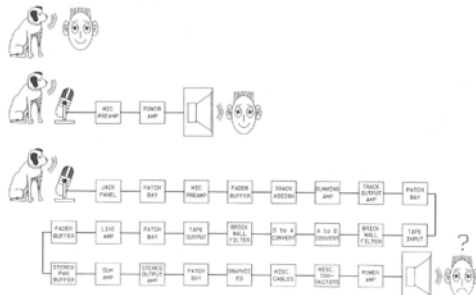
- Synch signal
- Time reference
- Digital amplitude
- But an analog signal in time!!!

A problem posed to programmers

- Analog mixing
- Digital addition sounds bad!
- Floating point arithmetic vs 80-bit integers

Simplicity

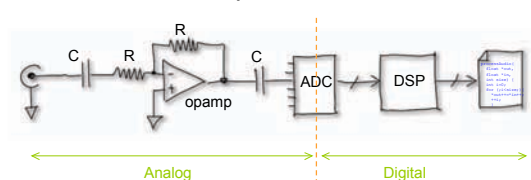
- From John Hardy's M1 manual



www.johnhardyco.com

Simplicity: going further

- Can I remove this part?



- How does it sound?



Exceptions again: DC

- Metric Halo's "new" interfaces
- John Hardy preamps
- JCF
- Any other?

PSU

- Very important
- Size, caps, diodes,
- "cheap" rule again
- Interaction
- Sound uses all the PSU

- Example
BMC DAC
www.bmc-audio.de



Power Supply

Any digital or analogue circuit has a sonic dependency on the power supply. Due to the fact that different power supplies have different influence on the music reproduction B.M.C. offers the DIY customer different power supply options.

The first available power supply is equipped with a solid selection of parts. A R-Core transformer represents a very good combination of AC power filtering and low magnetic noise. 10 double 10A Schottky-diodes used for rectification are extremely fast switching without overshooting. Due to the large dimensioning the voltage loss is minimised. 34 "Balanced-Current" capacitors sum up to 75,000 µF of storage capacity which would be respectable for a power amplifier. Those capacitors are second-to-none concerning sonic performance. Due to their specific design, cleanliness, precision, power-feeling and sonic colours are on an exciting performance level.



Cables

- This is part of the debate...
Be prepared to fight over, against
- Test: if you don't hear, there is no problem
- The volume pot is much worse, anyway
- Try both!

Audiophile stuff

- Well built electronics
- The best components
- VPI's db-5: magic brick
- Gold, teflon, \$nK cables

Please, stop somewhere in between

...to...

- Science fiction!



Concluding

Big Messages to us

- Industry seeks profit only
- You can always do better at home
- We must educate ourselves, learn, listen
- We must know and follow the references
- There is nothing like a perfect system
- We need to find an acceptable balance
- But we cannot tolerate "miserable" sound
- It can be wild, but always inspiring
- New social and economic model

Messages to musicians

- Learn, listen...
- Care a little bit about quality - not too much
- Know a little bit about technology
- Do not simply trust industry
- Try for yourself, trust your ears
- Don't put the load on the editing

Messages to programmers

- Learn, listen...
- Digital is not better than analog: is easier
- Digital is not even free from errors
- 32-bit float is not 32-bit
- Clock is not digital
- Help us to find why the computer does not make an addition correctly...
...or don't use it, much easier!

Messages to engineers

- Learn, listen...
- Audio is not easy
- Audio is not "solved"
- Transistor is not better than tube: is cheaper
- Models are models: Cap, VDC, PSU...
- Know the sound of each component
- Try, change, listen (Phillips way)

Messages to audio professionals

- Learn, listen...
- Don't pay too much for words/brands
- Know who is speaking
- Look for mods
- Care for the cables
- Care for the PSUs
- Keep it simple (short)
- Let the knobs at center

My Current Activities in Audio

- C&M courses
- LAC - CNPq
- 4 undergrads
 - Audio and Computer Music
- Making DC ins outs, Texas ADC
- Mixers, preamps
- Lots of perspectives
 - AD/DA simplifications
 - Changing opamps everywhere
 - Making better PSUs

The Institute Marcello Sfoggia

- Proposed by Hique Gomez
- Preserve principles, equipment, techniques, recordings
- Interviews, learning from him



Open for Discussion...

LETS TALK!

Who believes in audio quality?

Making circuits that the industry don't sell!

Marcelo Johann

www.inf.ufrgs.br/~johann

johann@inf.ufrgs.br

Thank you!

.inf
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DE INFORMÁTICA
UFRGS

16ª
SACOMP
semana acadêmica da computação



UFRGS
UNIVERSIDADE FEDERAL
DO RIO GRANDE DO SUL