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Bob Eisenberg <bob.eisenberg@gmail.com>

Re: One more thing

Bob Eisenberg <beisenbe@rush.edu> **Tue, Mar 8, 2011 at 7:38 AM**
Reply-To: beisenbe@rush.edu
To: Yoichiro Mori <ymori@umn.edu>
Cc: Chun Liu <liu@math.psu.edu>, Bob Eisenberg <bob.eisenberg@gmail.com>

Dear Yoichiro

One more thing to mention about inputs and outputs.

Both are designed to have ZERO irrelevant interaction terms,

the input is designed to have ZERO effect on the system it connects to. An ideal (voltage) amplifier does not perturb the system it connects to at all. It does not even draw the charge needed to create a potential (hence an ideal amplifier violates Coulomb's law and is impossible. In engineer speak an ideal amplifier has "zero input capacitance" and that is impossible)

An output of a system is designed to be controlled ONLY by the voltage of the input and to be entirely independent of what is connected to the output. This too is impossible because maintaining a fixed voltage would require infinite power and charge if the "resistance to ground" is too low.

This last point is in fact the limiting factor in the refresh time of your computer screen or the ability of your TV (if you have one!) to follow fast moving images. In these cases, everything has been optimized to deliver the maximum power possible to the million or so transistors in the screen. Grapics units on computers draw so much power so they can deliver the charge to the screen faster. Moore's law has NOT applied to the amount of power a transistor can deliver. It is only about 10x what it was when you were born.

As ever
Bob
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Bob aka RS Eisenberg

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On Mon, Mar 7, 2011 at 8:51 AM, Bob Eisenberg <beisenbe@rush.edu> wrote:

> Dear Yoichiro
>
> What a joy working with you!!!!!
>
> I forgot to mention one thing that may
> amuse you as you delve into engineering.
>
> What is the difference between the input
> and output of an amplifier? after all they
> both are specified by voltages.
>
> Many anwers are possible and they all
> look at the same elephant different ways
>
> a) The input is a Neumann (homogeneous in fact)
> Bounday condition on the electrical potential (i.e., voltage)
> The output is an inhomogeneous
>
> b) The input is infinite impedance and the output is a zero
> impedance voltage source
>
> c) the input draws no current, the output supplies whatever current
> is needed to maintain the voltage
>
> d) the input is passive (using no energy); the output is active, using

energy and supplying (and in that sense creating) charge

e) the input can be described (ideally only) as an equilibrium no flow type system; the output does not exist if the system is an equilibrium no flow device. By definition, the output must be able to supply flows. Thus a thermodynamic analysis is in principle impossible.

Hope you find this amusing and helpful.

As ever
Bob
Diriclet condition on the voltage.
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Return Address for email: beisenbe@rush.edu

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