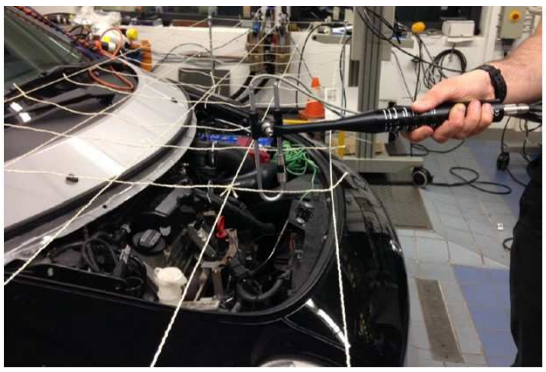
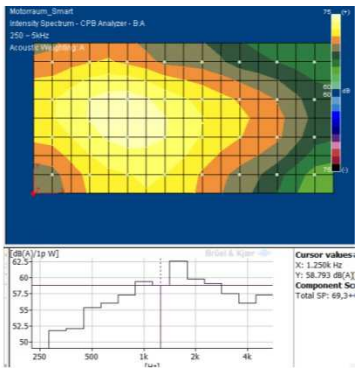
Project idea: Advanced Real-Time Systems
“real time noise analyses command transmitter“

Current situation:

In the laboratory for automotive engineering there is a sound intensity probe (see left figure). With this probe, sound intensity can be determined by using its two microphones. One of the most important applications is the localisation of sound sources. For this purpose, sound intensity maps are created (right illustration). At first a measurement area is defined for the creation of such a map. This is usually built up using an auxiliary construction in order to ensure precise measurements. The entire measuring surface is segmented into multiple smaller areas in which the sound intensity probe is placed. Once placed the sound intensity at that point can be measured (middle image). For this purpose, a remote control is provided for facilitating the handling of the probe, whereby measurements can be started and stopped.

Problem:

The sound intensity probe is connected to the front end ("measuring card"). There are input connections for microphones as well as an RS232 interface for receiving the remote control commands. The software "Pulse Labshop" manages everything. Since the sound intensity probe is older than the front end, the commands of the remote control are no longer supported. Here the protocol type has changed (possibly Unicode instead of ASCII?)

(Pictures from left to right: remote control, RS232 interface, front end, pin assignments)


18-pol. Lemo pin	ZH-0632 RS232 SubD	ZH-0632 Signal Name
1		Dout- (Tx-)
2	*pin 2: Tx+*	Dout+ (Tx+)
3	*pin 5: GND*	DGND
4		n.c.
5		V+, Ch2
6		GND, Ch2
7		GND, Ch1
8		V+, Ch1
9	*pin 4: +5 V*	+15 V (+5 V)
10		DGND
11	*pin 3: Rx+*	Din+ (Rx+)
12		Din- (Rx-)
13		Vpol, Ch2
14		SGND, Ch2
15		Signal, Ch2
16		Vpol, Ch1
17		Signal, Ch1
18		SGND, Ch1

Taste	ZH-0632	ZB-0017
1	|0	x°C
2	|1	°C
3	|2	C
4	|3	C°C

Previous approaches:

The remote control has been modified in the plug so that, like newer remote controls, it transmits data when connected to a PULSE front end as soon as one of the remote control buttons is pressed. No information is disclosed at which baud rate, how much data and stop bits, with which parity and which handshake the serial interface is operated.

When the front-end is switched on, you can display boot and hardware information by connecting the serial port to a terminal program. This works, for example, with the HyperTerminal of WindowsXP. If you create a connection with 9600 baud, 8 data bits, no parity, 1 stop bit and handshake Xon / Xoff, you can view the above information as ASCII text.

The tests regarding the key codes were performed with this setting (9600, 8, N, 1, Xon / Xoff). Unfortunately, a kind of "RS232 analyser" was missing to read out the actual baud rate. A "listening" to the transmission line of the remote control with a different baud rate (e.g., 2400) results in other transmitted characters.

Task:

Design and construction of a "translator", which enables the remote control function and fulfills the following real-time requirements:

The system shall finish sending the respective output-command after having detected the input-command within 15 milliseconds.

These requirements are necessary so that in the case of subsequent measurements, non-important acoustic events are not detected due to delays. This could be the case, particularly in non-stationary processes.

This work provides not only the theoretical construction, but also the construction of the prototype as well as its validation. This prototype should be kept as small as possible and without an external voltage supply.

Project schedule:

1. phase:	Get to know the measuring technology
2. phase:	Testing of a new remote control, which is provided to us by the manufacturer on loan, to see whether it works
3. phase:	Read the protocols and control codes of the borrowed probe and the available probe
4. phase:	Design and construction of the "translator"
5. phase:	Functional check of the "translator" with the existing probe
6. phase:	Validation of the "translator" regarding its real-time requirements

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