The Neuronumerous Group Presents:

Build a Lie Detector / Beat a Lie Detector

With your hosts
Rain
And
J03b34r

Introduction by:
Int80

Start to Finish

- History of Deception Detection
- The History of the Polygraph
- How We Built our DIY Polygraph
- Trying to Beat the DIY Polygraph
- The Data Aftermath

History of Deception Detection

Trial by ordeal

- a primitive method of determining a person's guilt or innocence by subjecting the accused person to dangerous or painful tests believed to be under divine control

Trial by combat

- an ancient dispute resolution method where those in dispute would fight one another until submission or death.

History of Deception Detection (cont.)

Trial by torture

- an act where severe pain is intentionally inflicted on a person to obtain a confession of guilt.

The "third degree"

- a euphemism used for trial by torture when used by the police.

The adversarial justice system

- two-sided structure under which criminal trial courts operate.

History of the Polygraph

1920s

- Modern polygraph developed

- **1930s**
  - Polygraph starts its move into private sector

1940s to 1950s

- Polygraph meets Cold War America

History of the Polygraph (cont.)

1960 to 1970s

- Polygraph spreads rapidly in both government and private sector

1980s

- Polygraph Protection Act passed

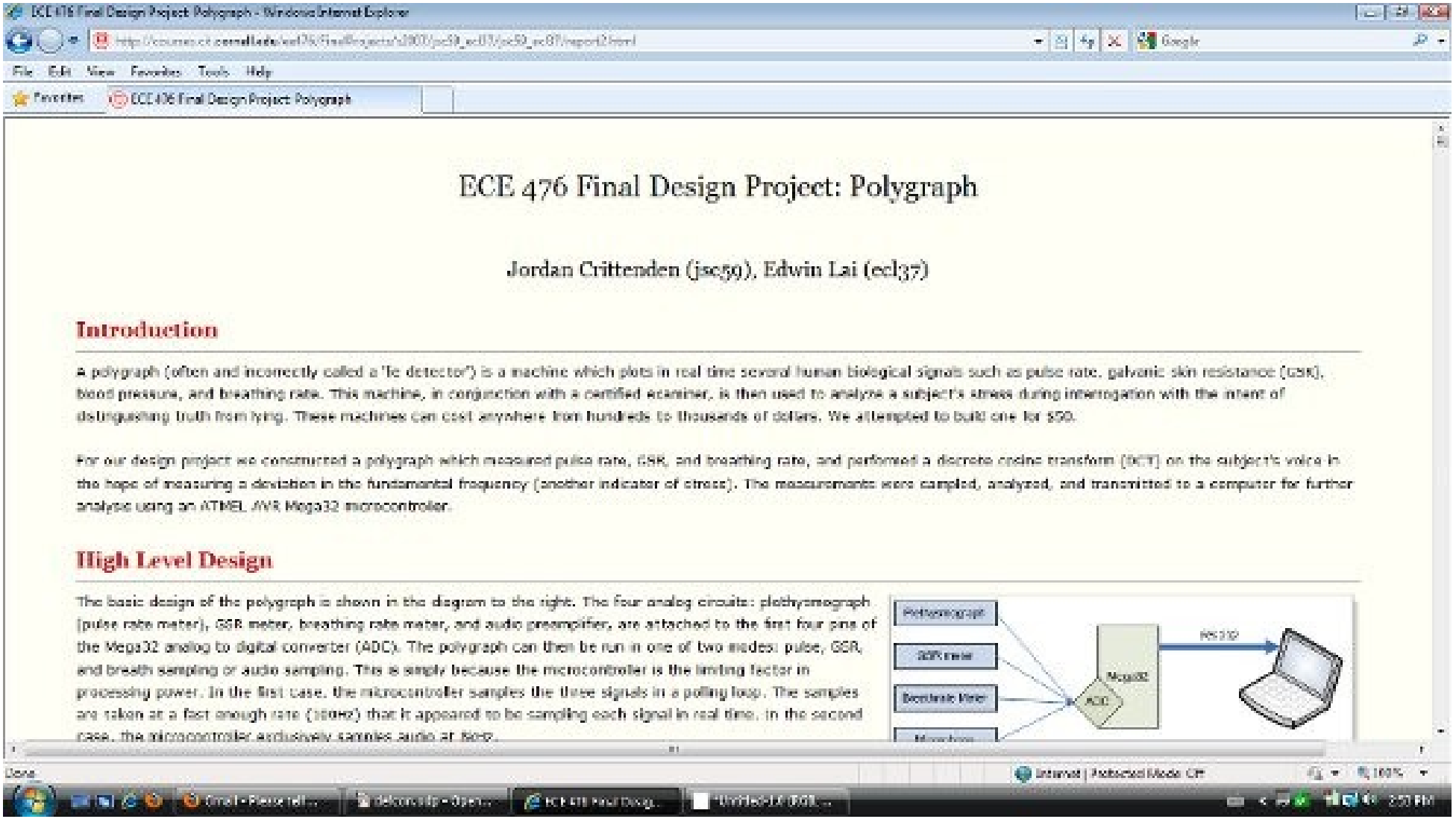
1990s to Today

- Polygraph Redux

How We Built our DIY Polygraph

- Gotta start somewhere
- Respiratory rate
- Galvanic skin response
- Pulse

http://courses.cit.cornell.edu/ee476/FinalProjects/s2007/jsc59_ecl37/jsc59_ecl37/report2.html



ECE 476 Final Design Project: Polygraph

Jordan Crittenden (jsc59), Edwin Lai (ecl37)

Introduction

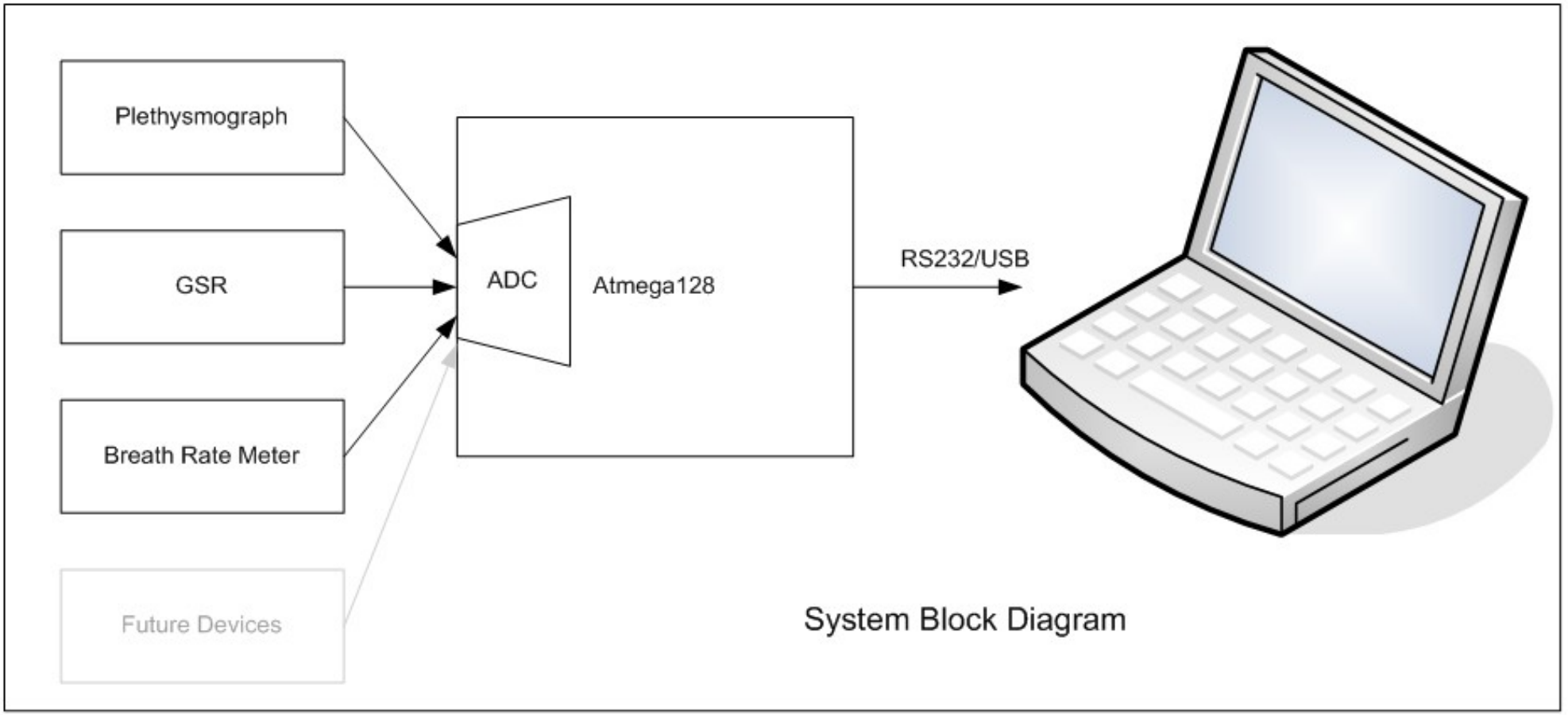
A polygraph (often and incorrectly called a "lie detector") is a machine which plots in real time several human biological signals such as pulse rate, galvanic skin resistance (GSR), blood pressure, and breathing rate. This machine, in conjunction with a certified examiner, is then used to analyze a subject's stress during interrogation with the intent of distinguishing truth from lying. These machines can cost anywhere from hundreds to thousands of dollars. We attempted to build one for $50.

For our design project we constructed a polygraph which measured pulse rate, GSR, and breathing rate, and performed a discrete cosine transform (DCT) on the subject's voice in the hope of measuring a deviation in the fundamental frequency (another indicator of stress). The measurements were sampled, analyzed, and transmitted to a computer for further analysis using an ATMEL AVR Mega32 microcontroller.

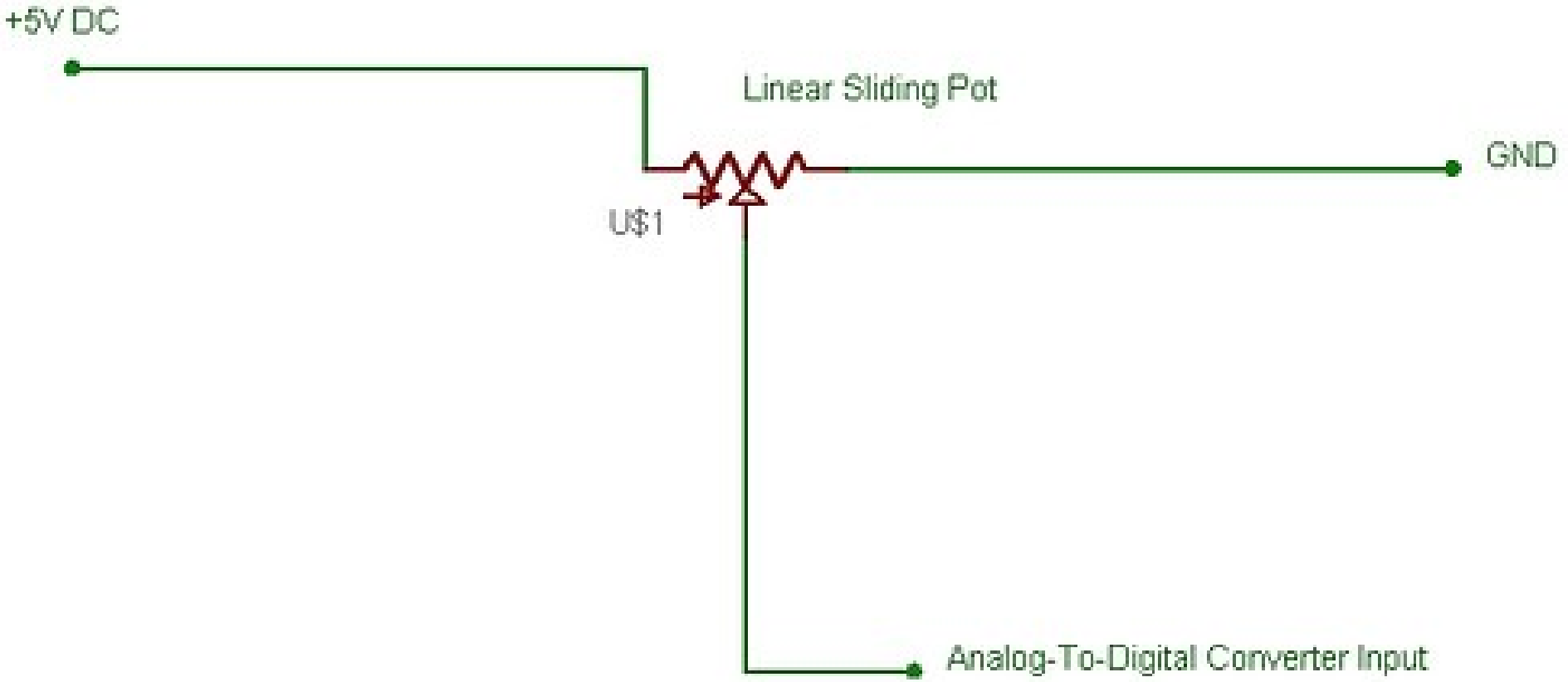
High Level Design

The basic design of the polygraph is shown in the diagram to the right. The four analog circuits: plethysmograph (pulse rate meter), GSR meter, breathing rate meter, and audio preamplifier, are attached to the first four pins of the Mega32 analog to digital converter (ADC). The polygraph can then be run in one of two modes: pulse, GSR, and breath sampling or audio sampling. This is simply because the microcontroller is the limiting factor in processing power. In the first case, the microcontroller samples the three signals in a polling loop. The samples are taken at a fast enough rate (100Hz) that it appeared to be sampling each signal in real time. In the second case, the microcontroller exclusively samples audio at 8kHz.

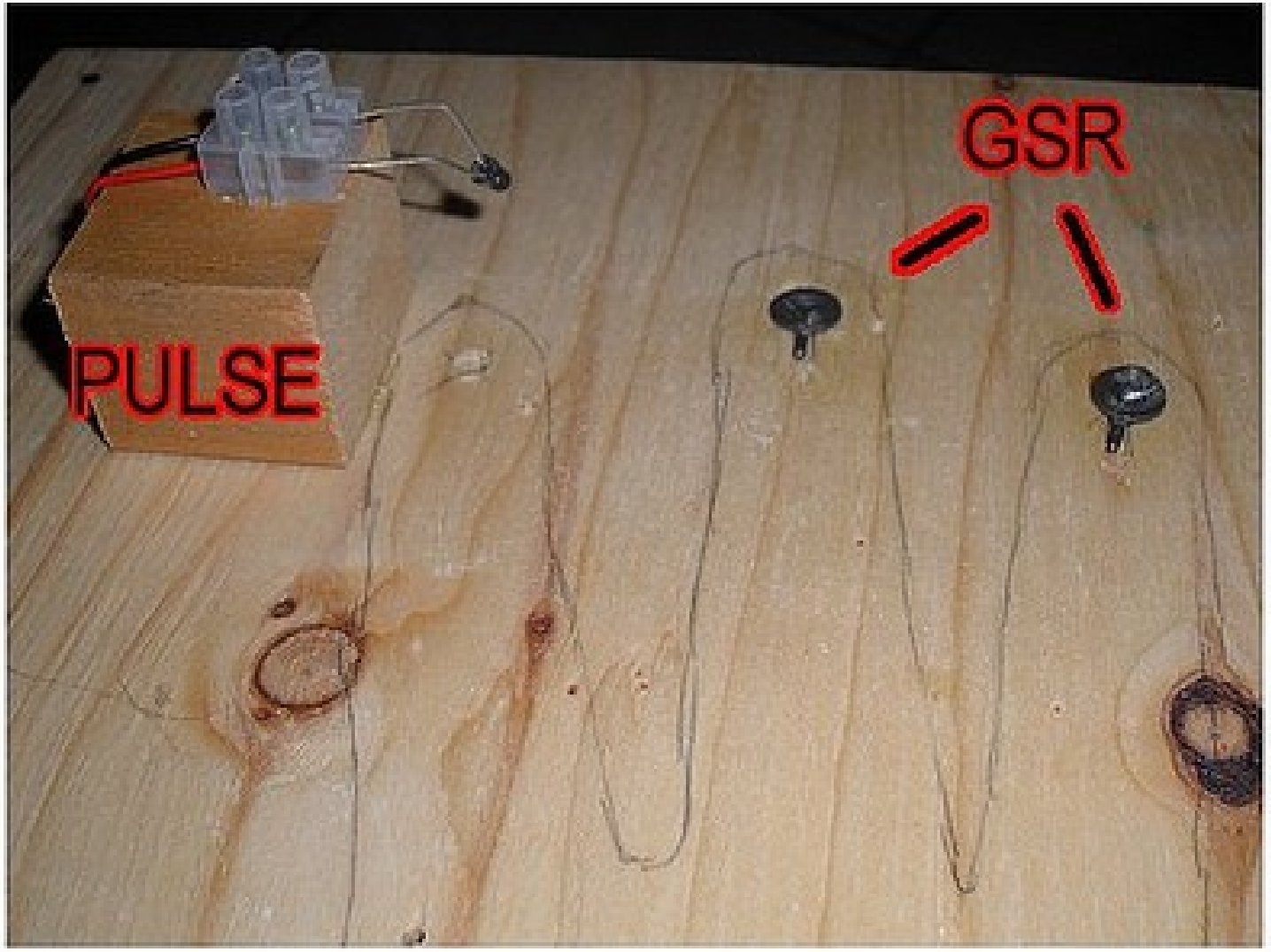
How it Works


Plethysmograph
GSR
Breath Rate Meter
Future Devices
ADC
Atmega128
RS232/USB
System Block Diagram

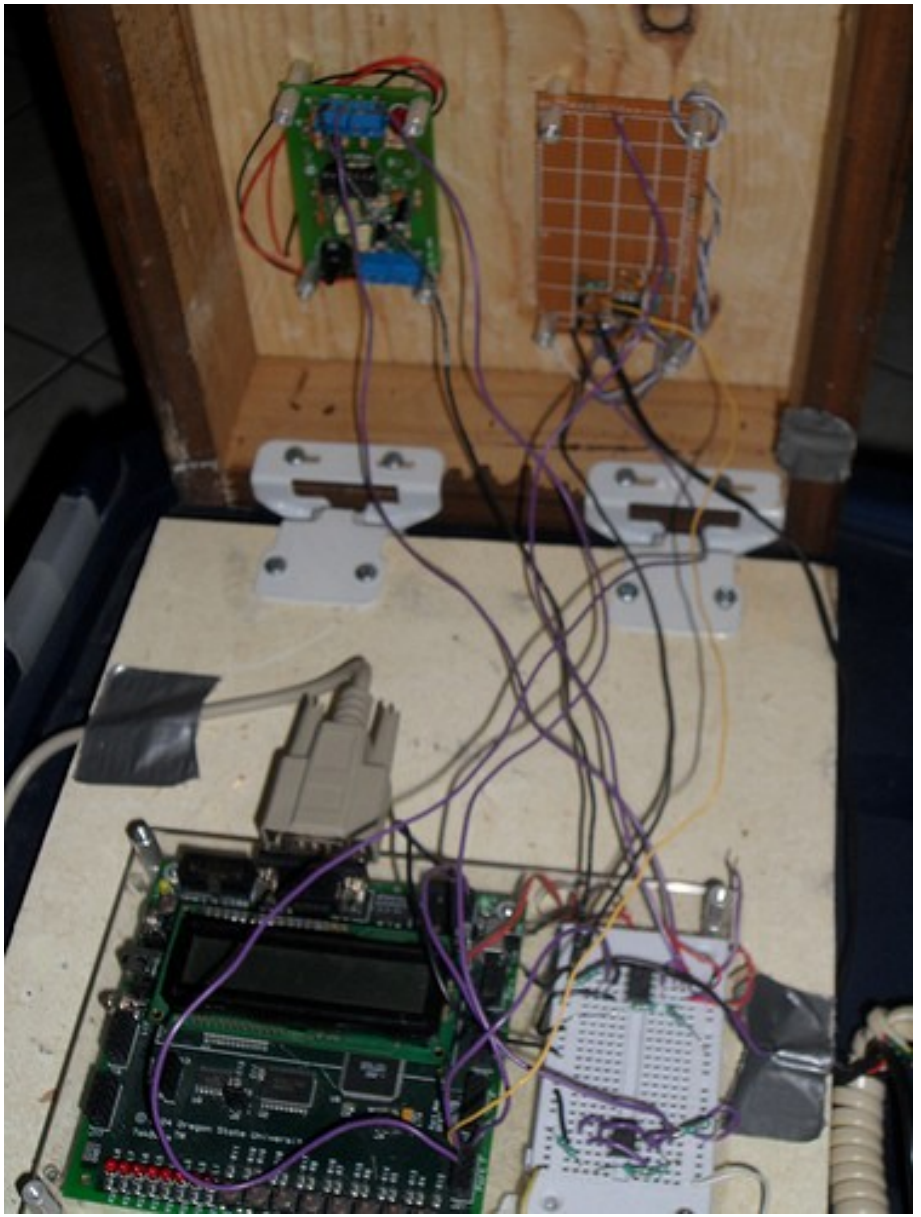
Oldgrover's Super Sweet Breathing Band



Outside the Box



Inside the Box



Trying to Beat the DIY Polygraph

- The numbers test
- Breathing strategy
- Biting tongue
- Contracting anal sphincter muscle

The Data Aftermath

- What went right
- Surprises and pitfalls
- Future jumping of points

Shoutouts and Thanks!

Psychedelicbike, Oldgrover, Christian Gruber, Int80, Dead Addict, Anonymous, Brad Smith, Seth Hardy and of course the rest of the Neuronumerous group.
(I love you guys!)