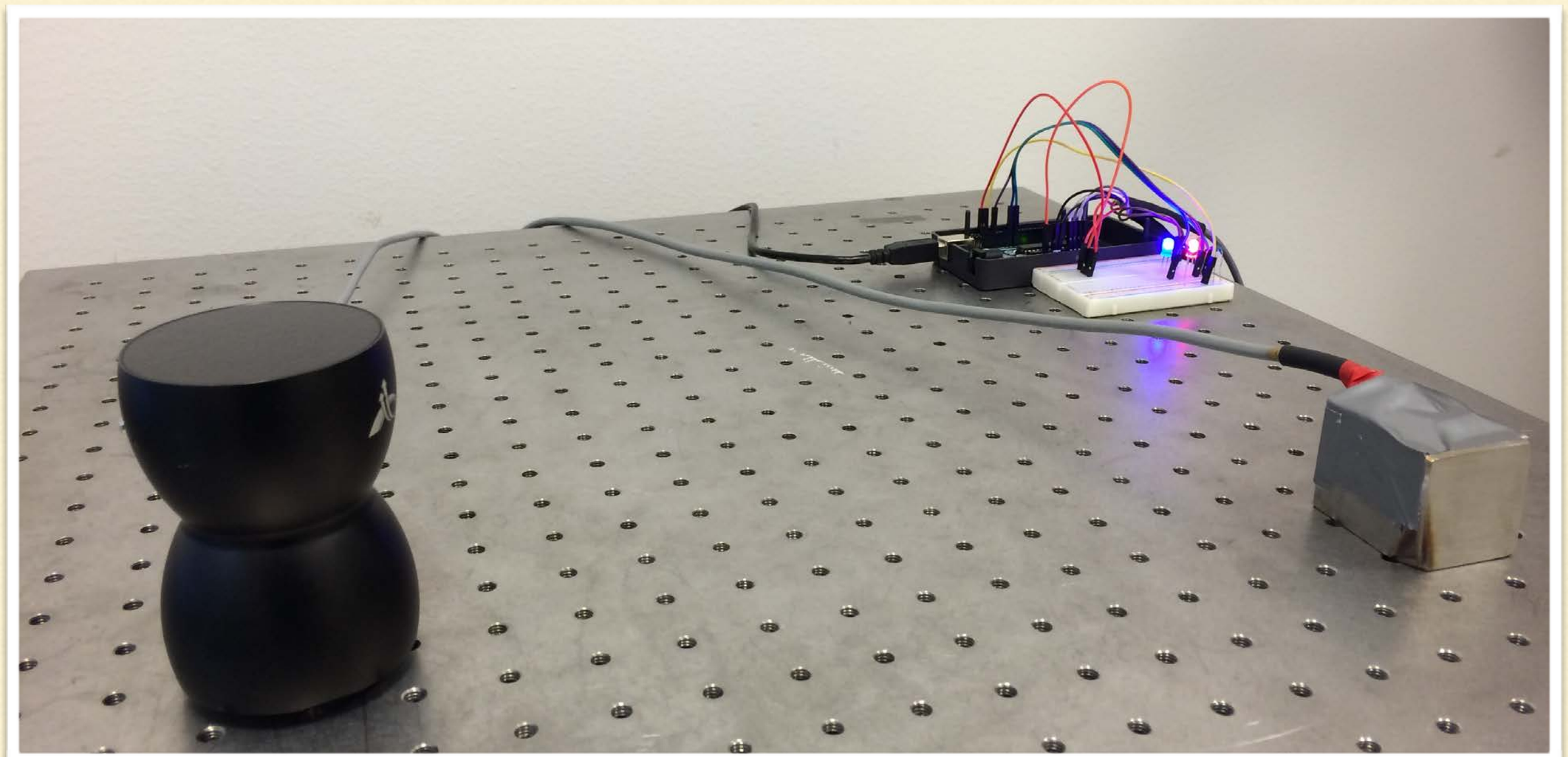

MEASURING MECHANICAL VIBRATIONS USING AN ARDUINO AS A SLAVE I/O TO AN EPICS CONTROL SYSTEM

Adam Hjort & Måns Holmberg

Supervisor: Volker Ziemann & Konrad Gajewski

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GOALS OF THE PROJECT

- Arduino Slave
  - Connect accelerometers
- Serial communication
  - Protocol design
- Matlab analysis of data
  - Transfer function
- EPICS integration

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HARDWARE

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ARDUINO SLAVE

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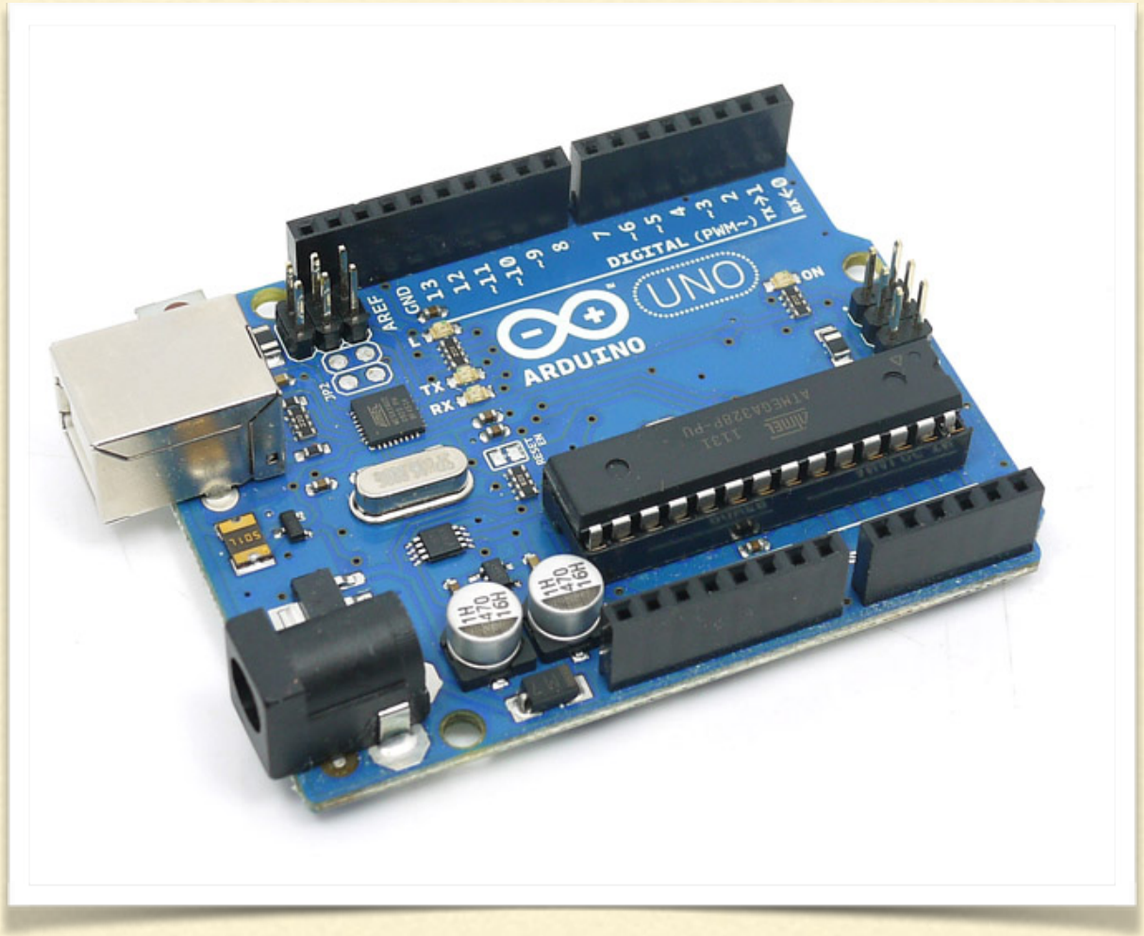
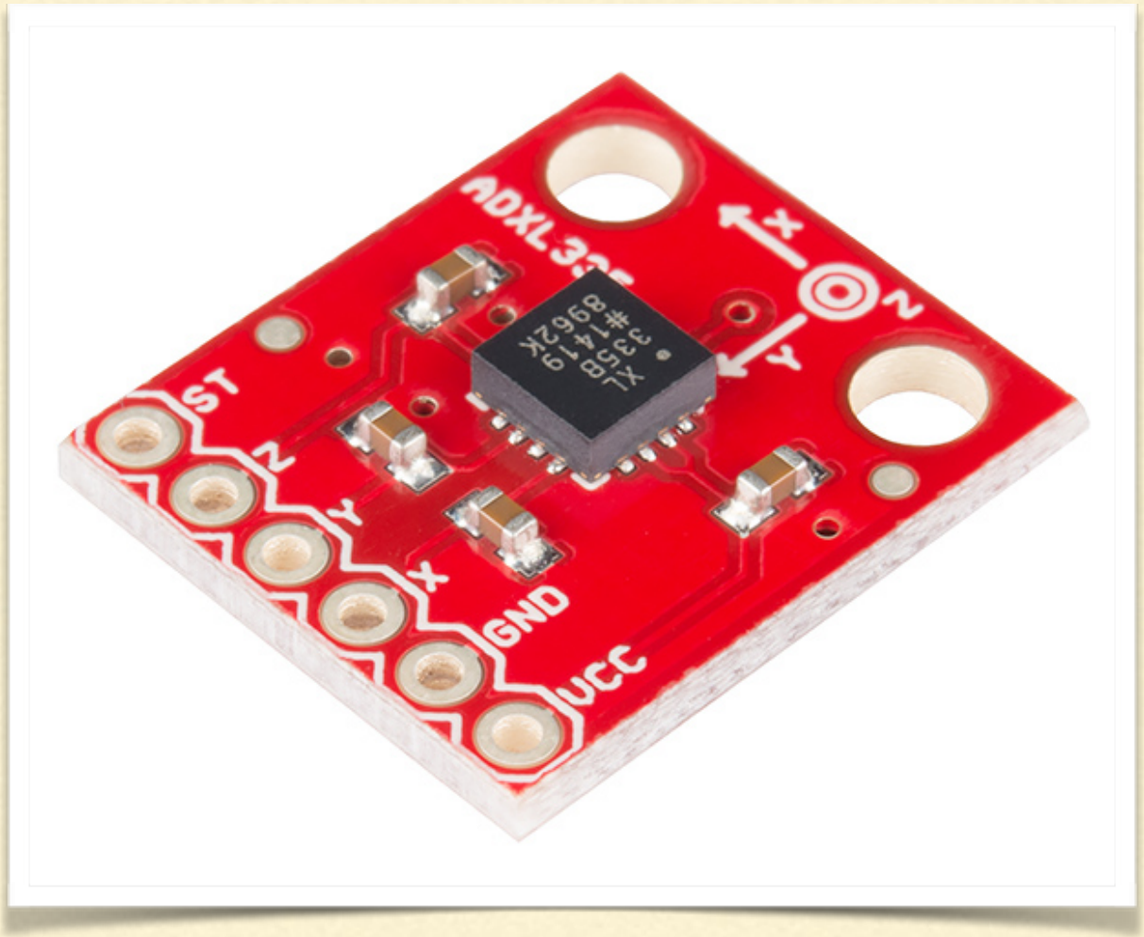


- Arduino UNO
- 8-bit microcontroller
- ATmega328
- 2 kb SRAM memory 8-bit microcontroller
- Sampling frequency of 1 kHz
- Custom made serial protocol for easy implementation

ADXL335 - ACCELEROMETER



- 3 axis analog accelerometer
- ± 3 g
- 25-1600 Hz sampling rate
- Low cost (~15$)

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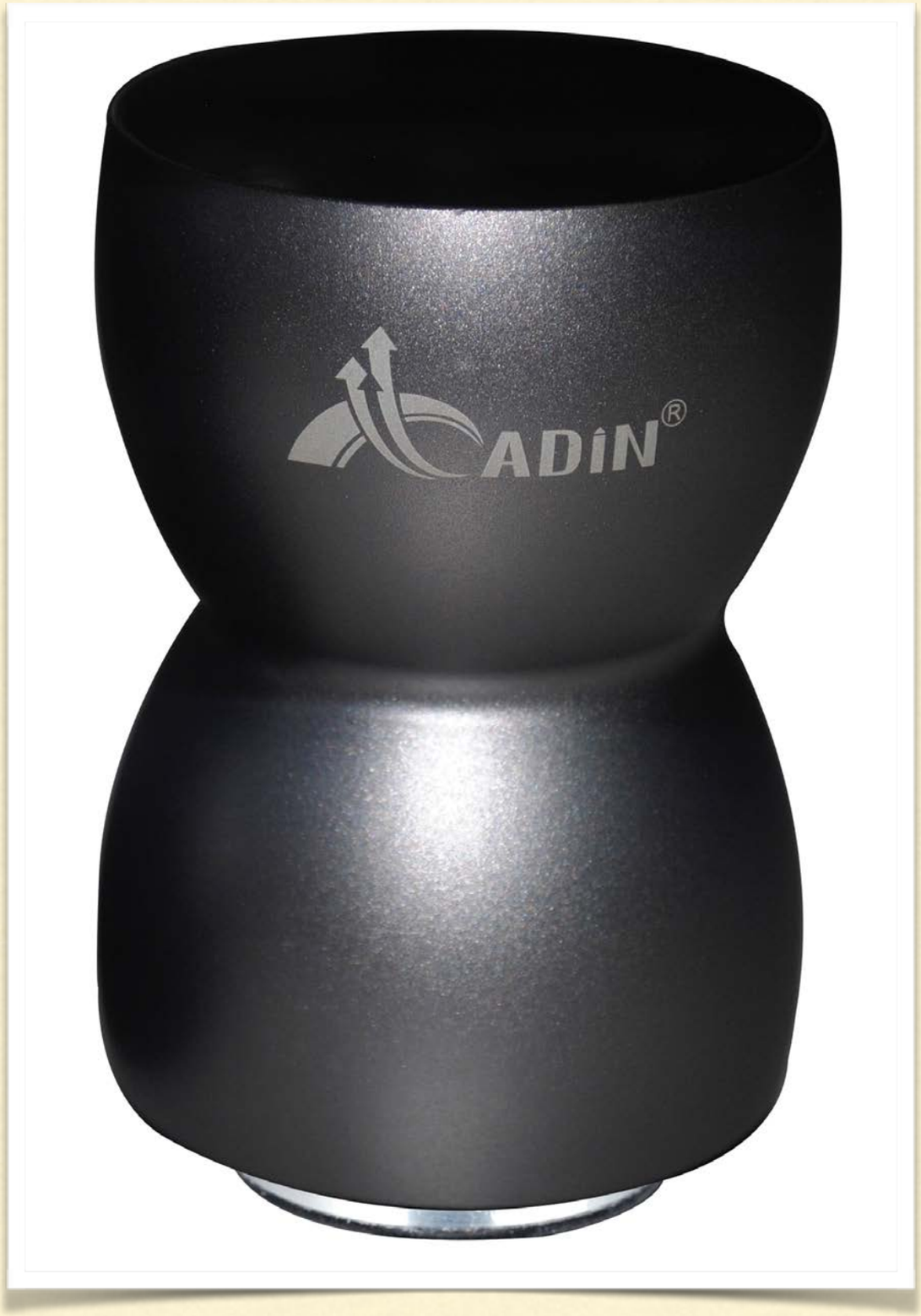
TONE GENERATOR

- Adin 26W vibration speaker
- Bluetooth



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SOFTWARE

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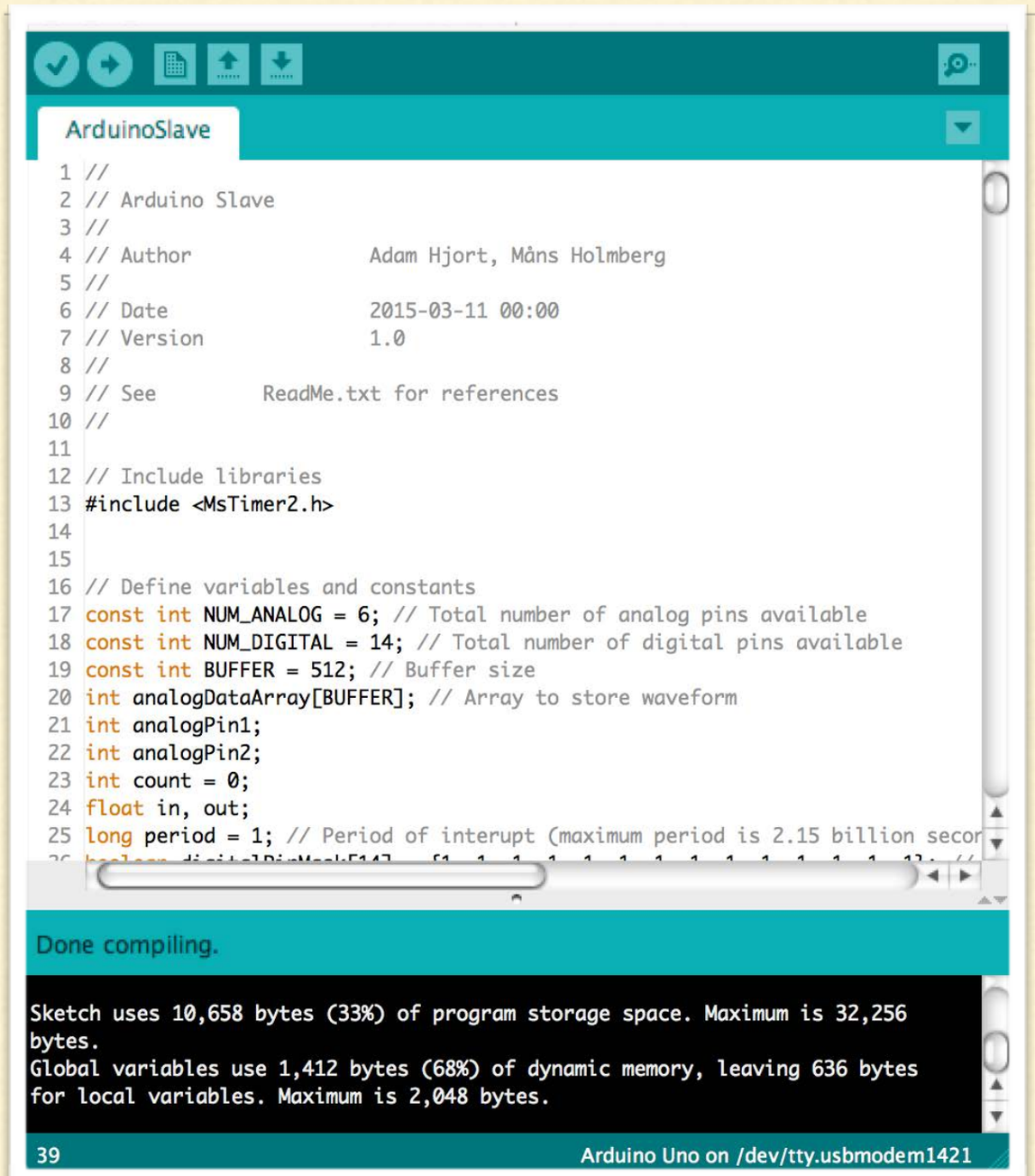
ARDUINO PROGRAMING



- User Friendly
- Based on C/C++
- setup() and loop()

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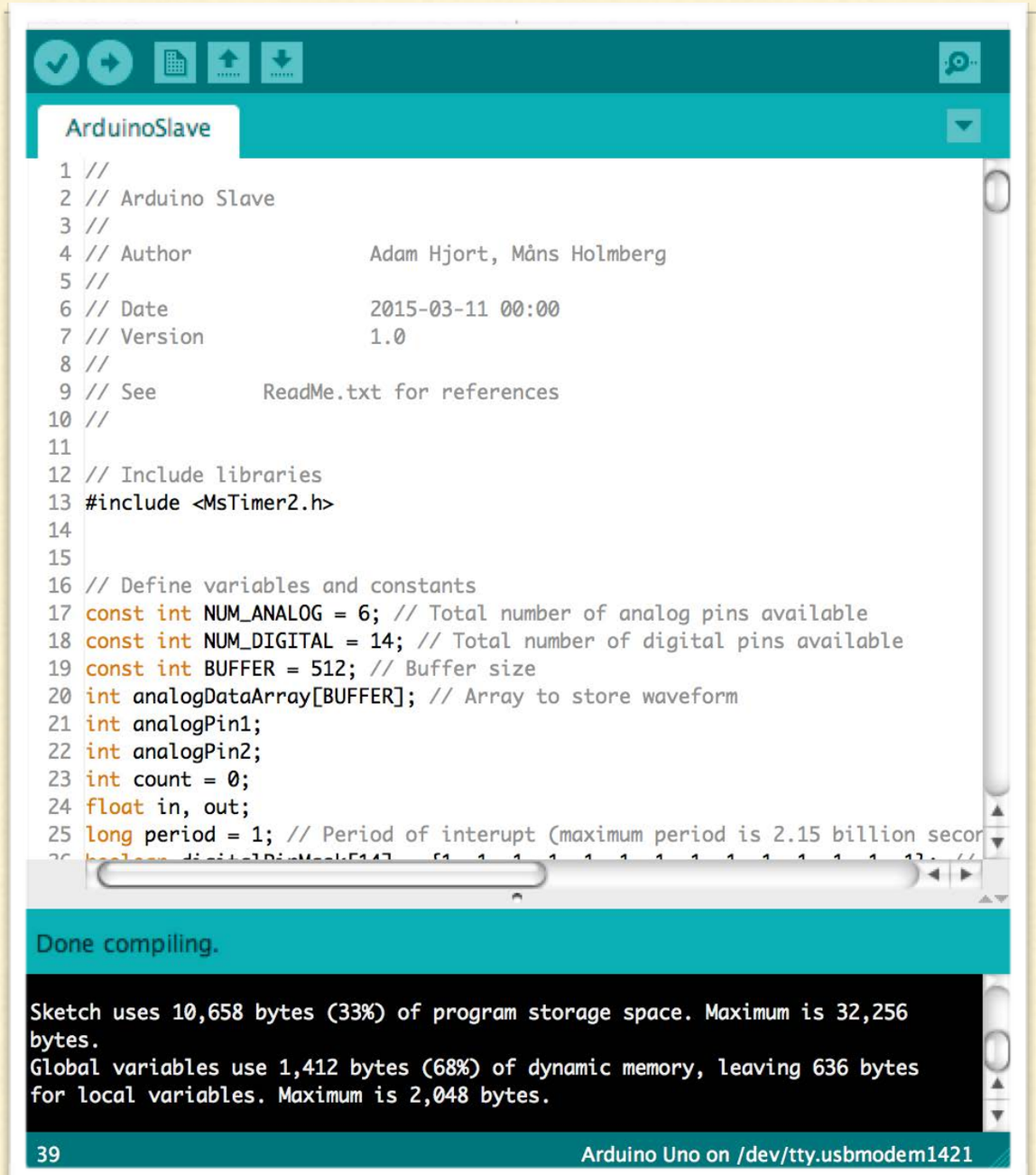
ARDUINO INTERRUPTS



- MsTimer2
  - Triggered by timer overflows
  - 1 ms resolution
    - 1 Khz sampling

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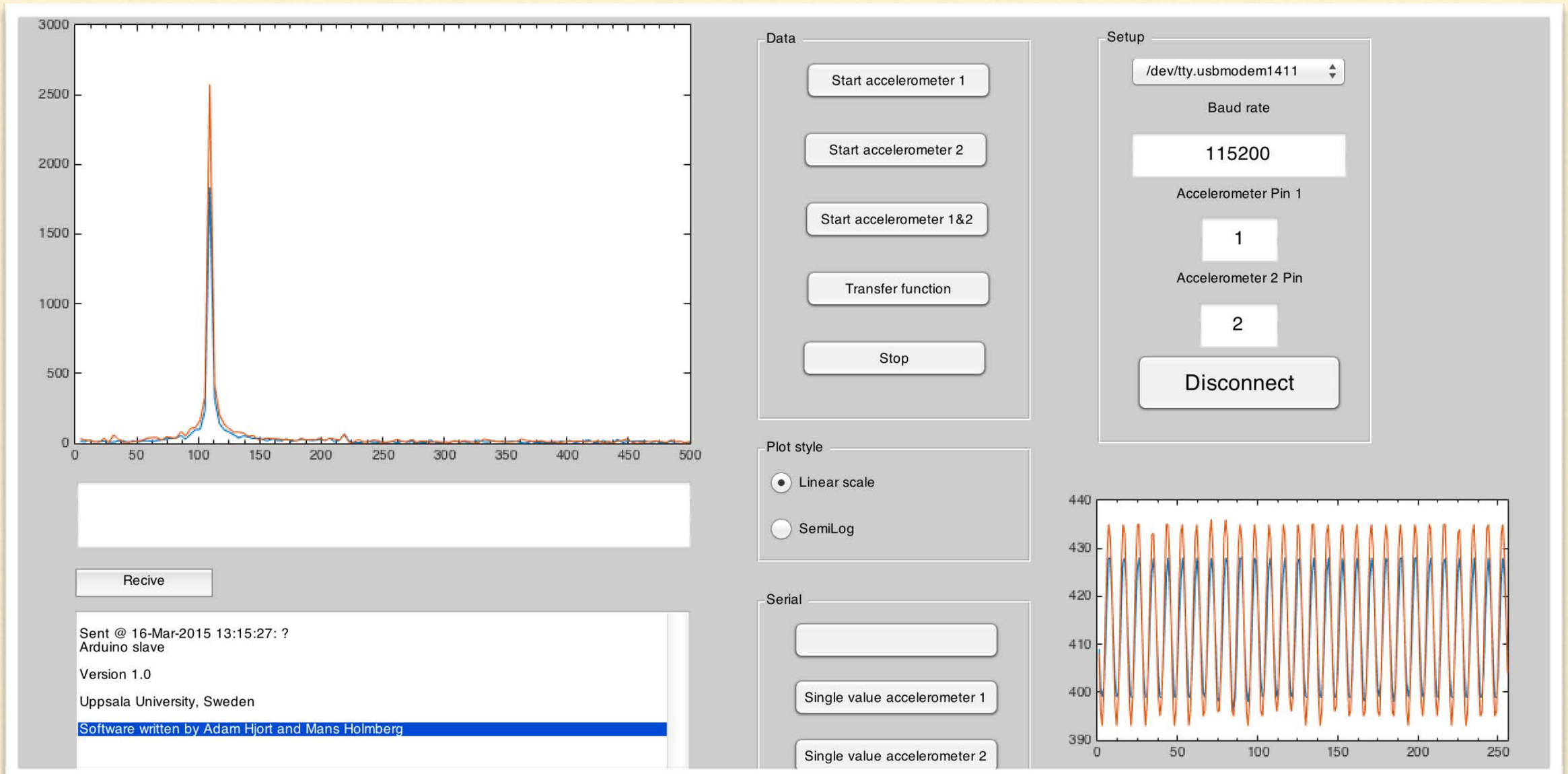

MATLAB ANALYSIS

GUI for easy testing

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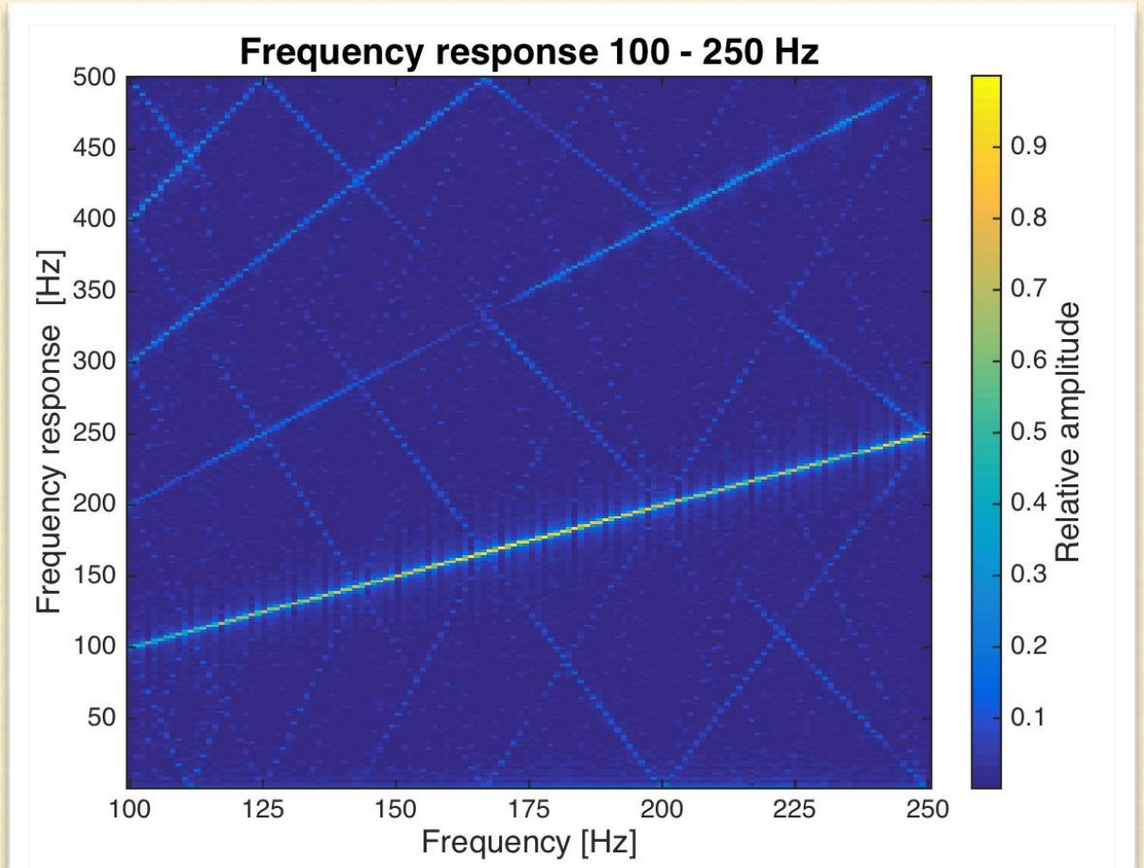
ACCELEROMETER RESPONSE TEST



- Linear chirp 100-250 Hz
- Linear response
- Visible harmonics due to table

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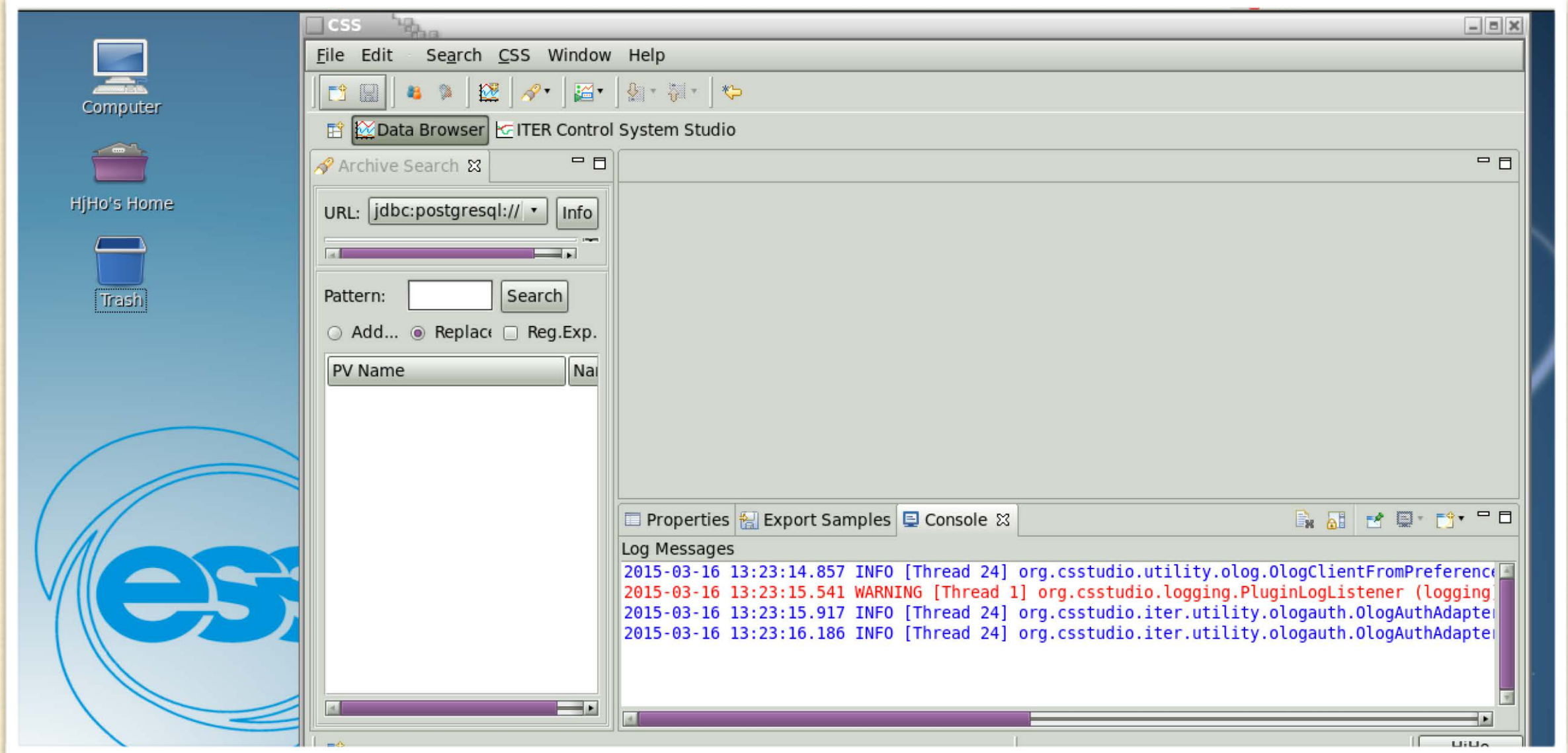

EPICS INTEGRATION

Implement protocol in EPICS database-file.

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EPICS

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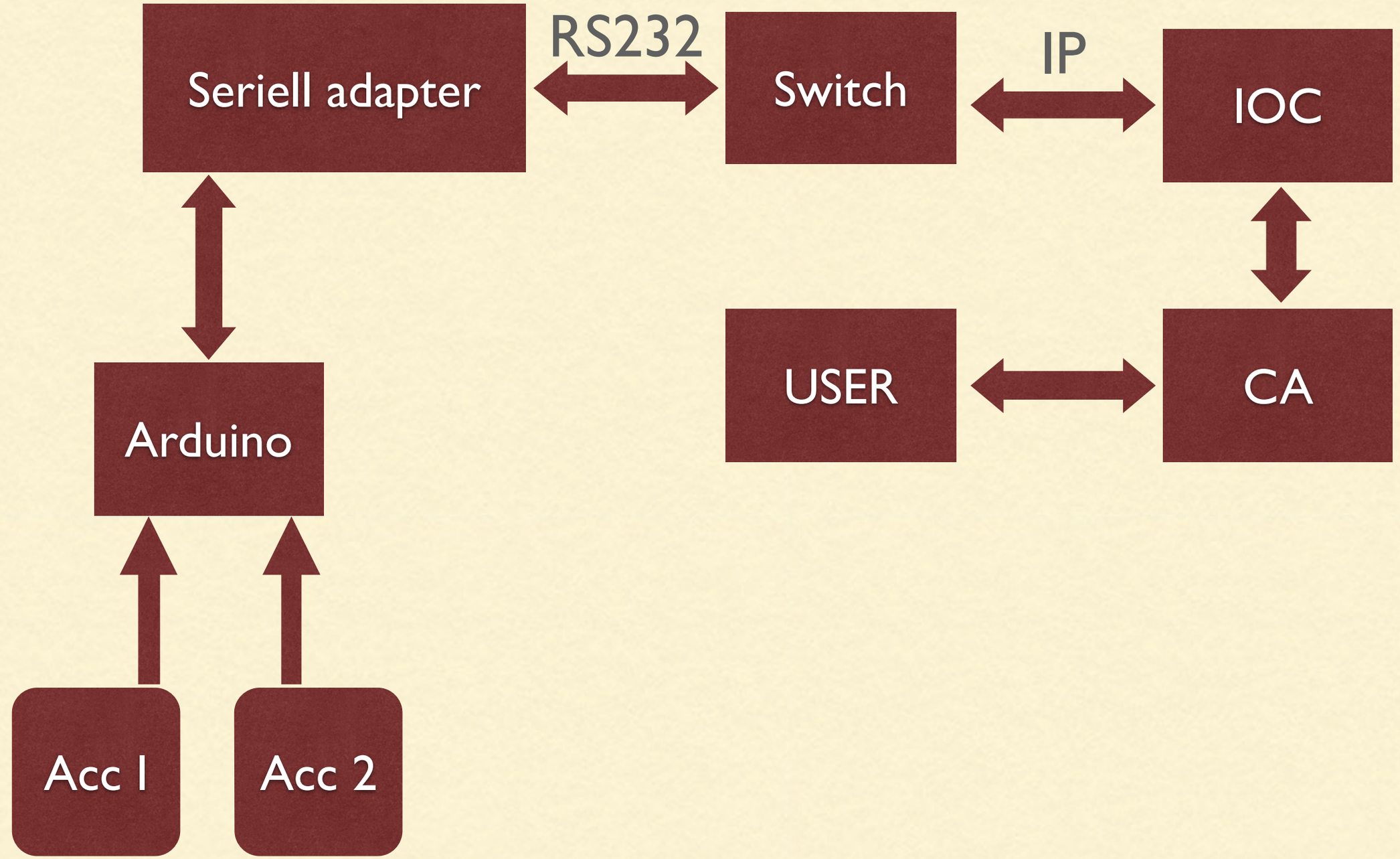

EPICS

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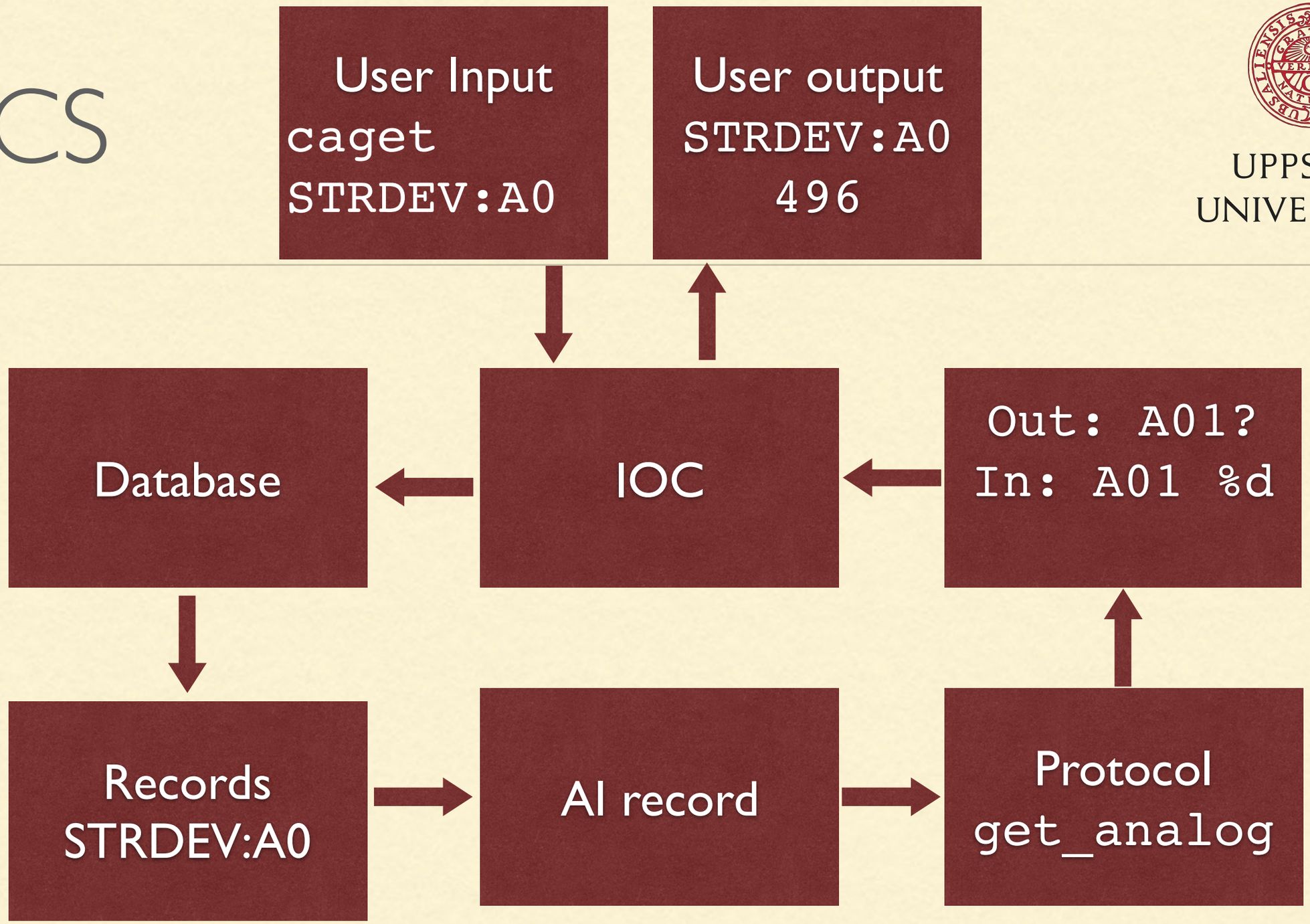

EPICS

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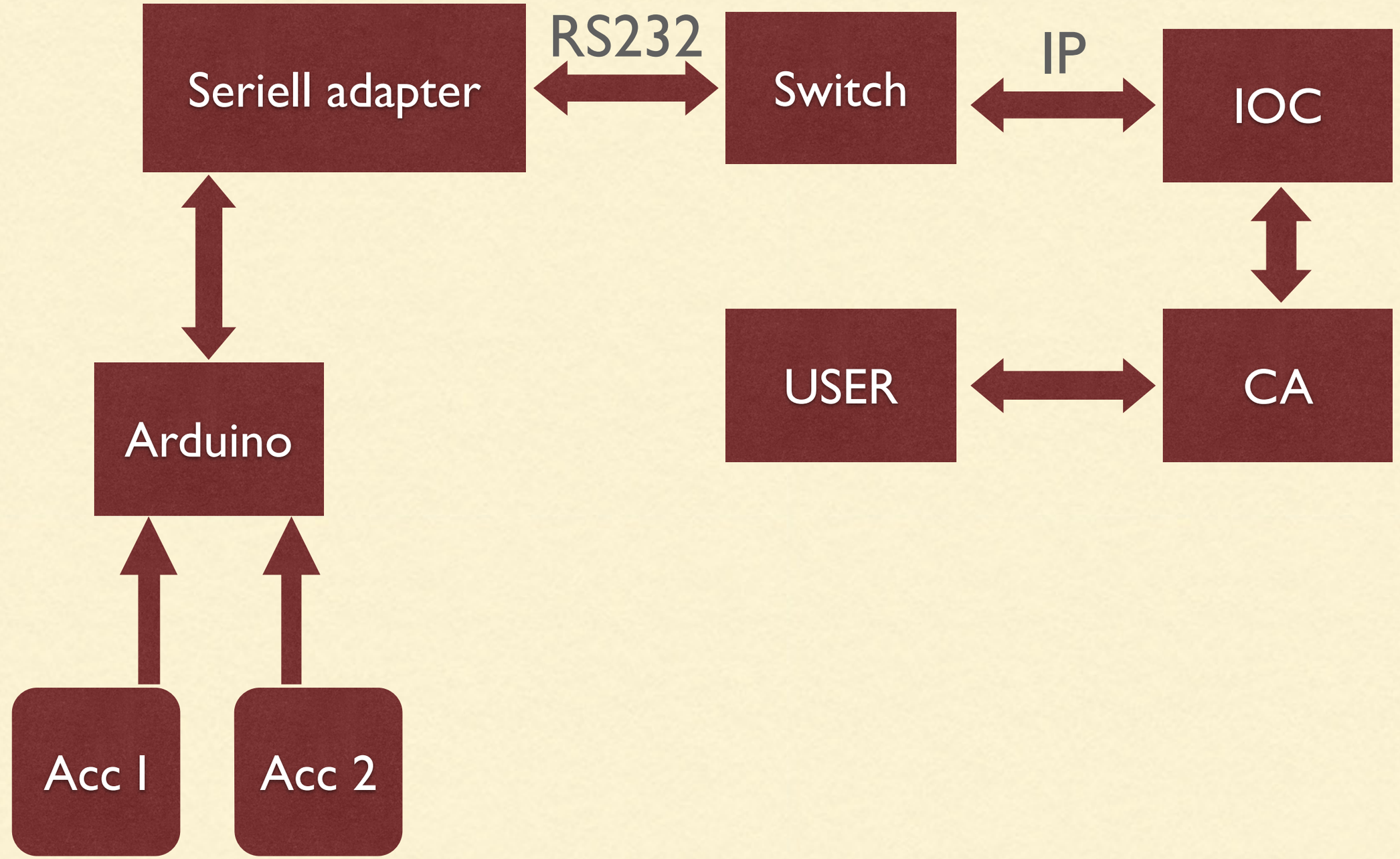

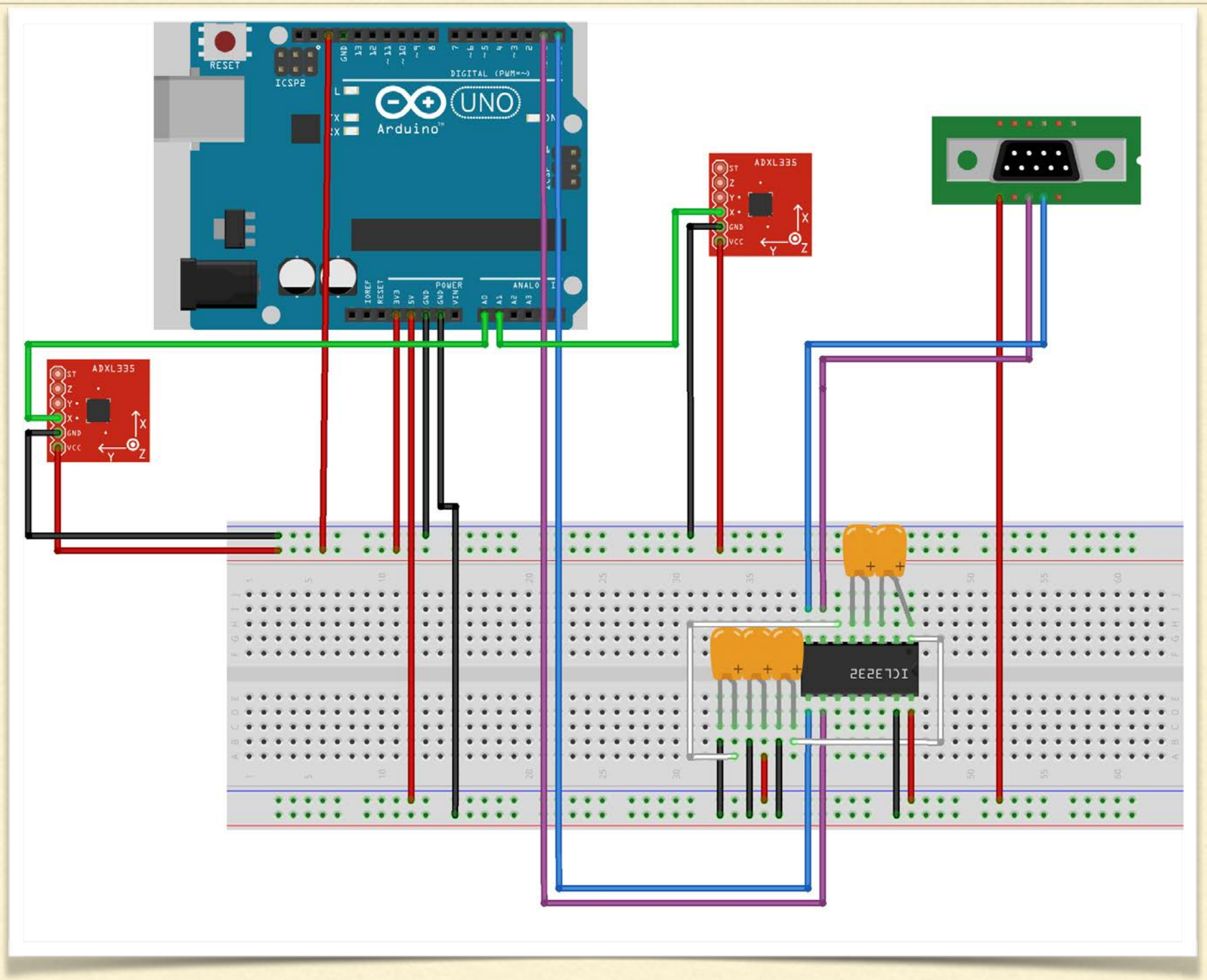

ELECTRONIC SCHEMATIC

MAX232 IC to connect to serial switch

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FOR FUTURE STUDENT TO DO

- GUI
- Wireless

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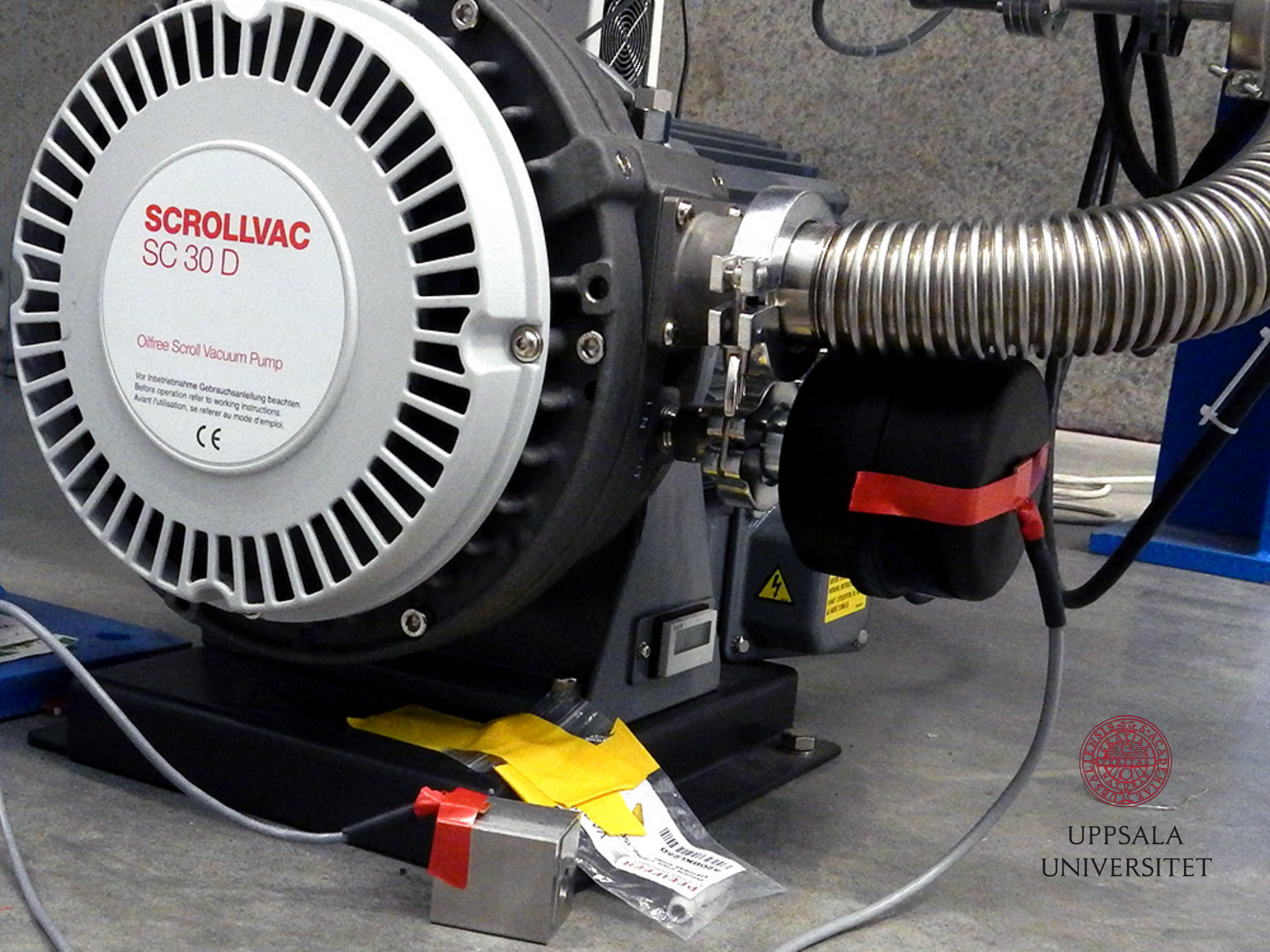

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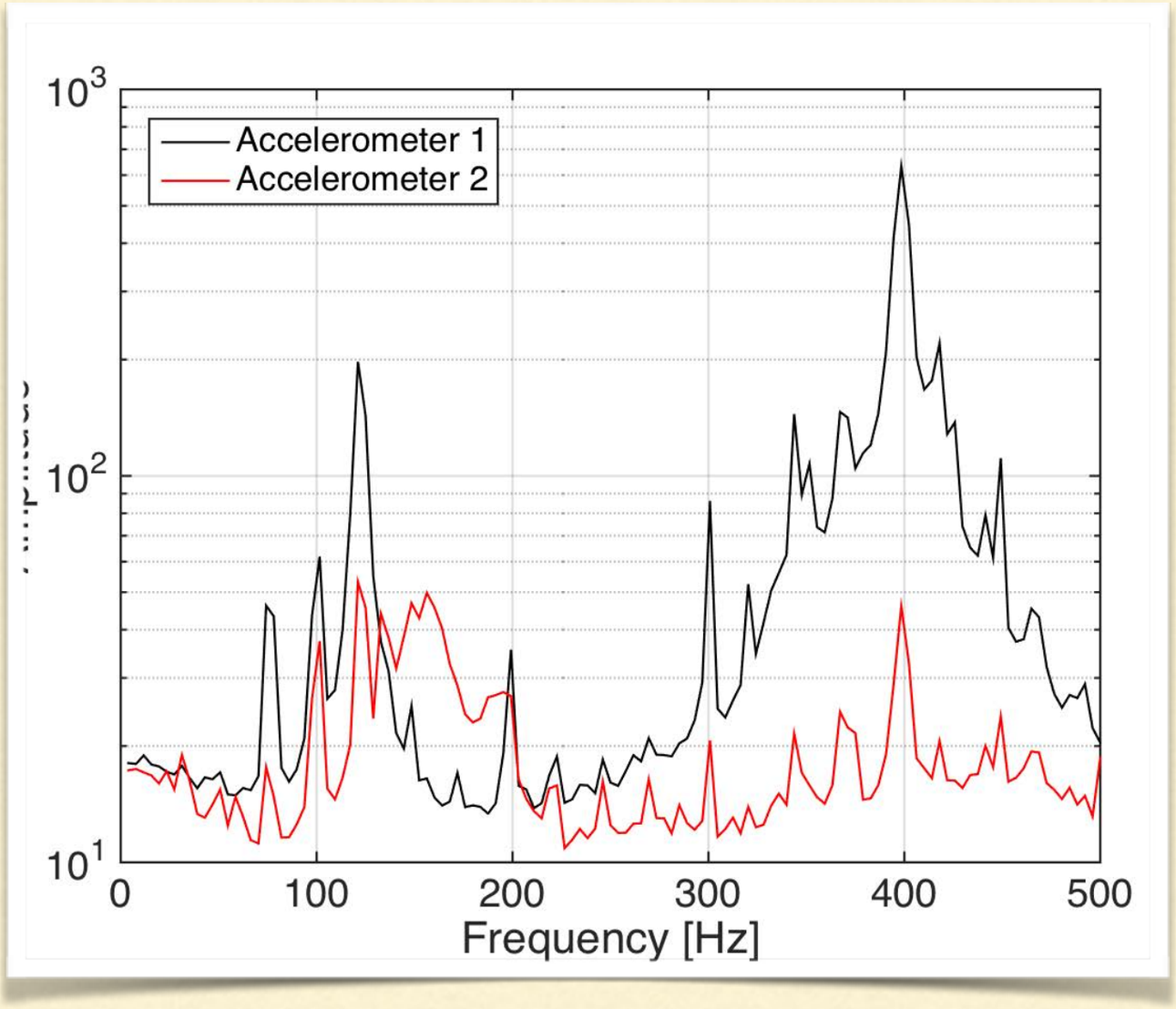
VACUUM PUMP



- 30 minutes of sampling
- Accelerometer 1 on pump
- Accelerometer 2 on floor
  - FFT
  - Corelate

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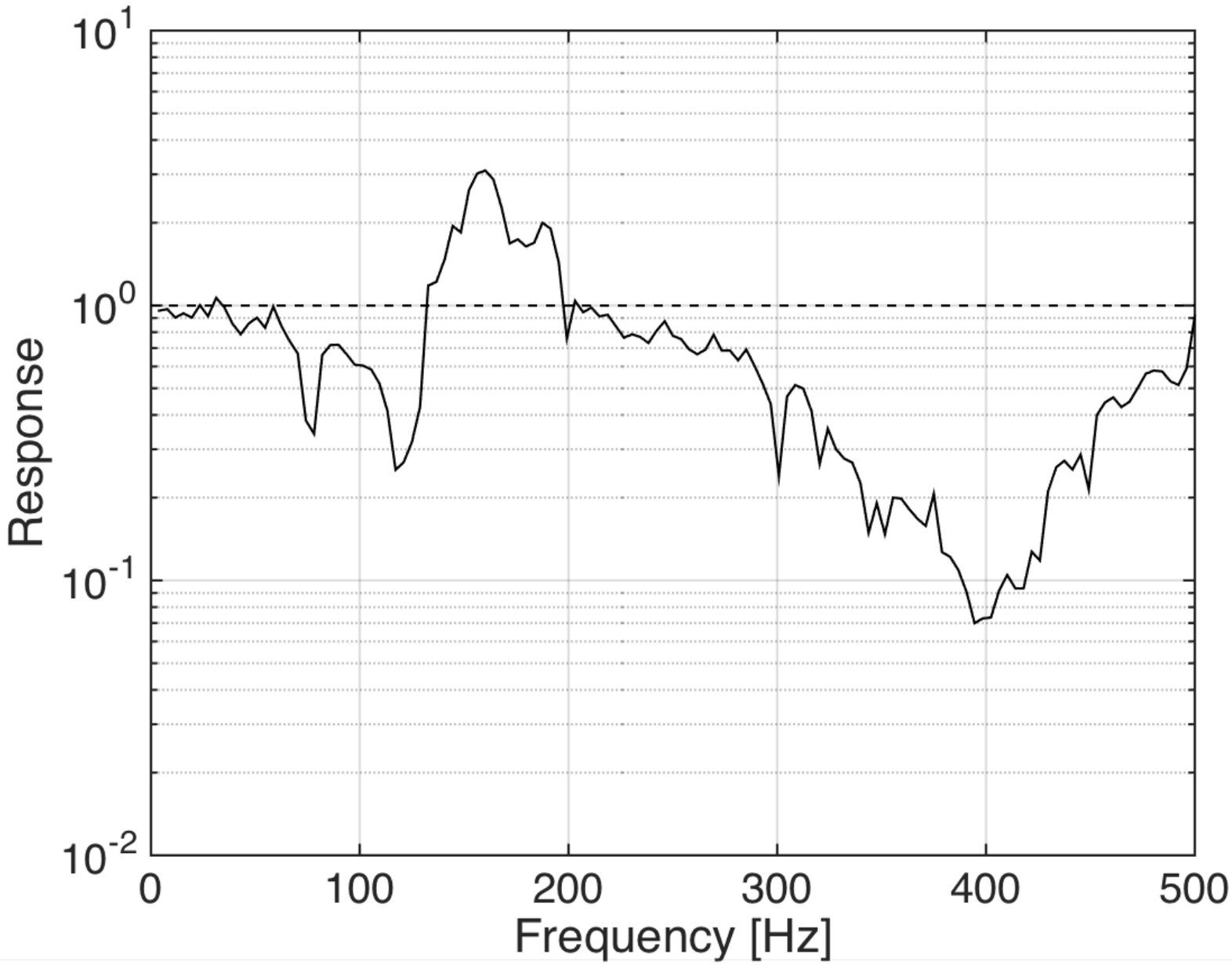

TRANSFER FUNCTION

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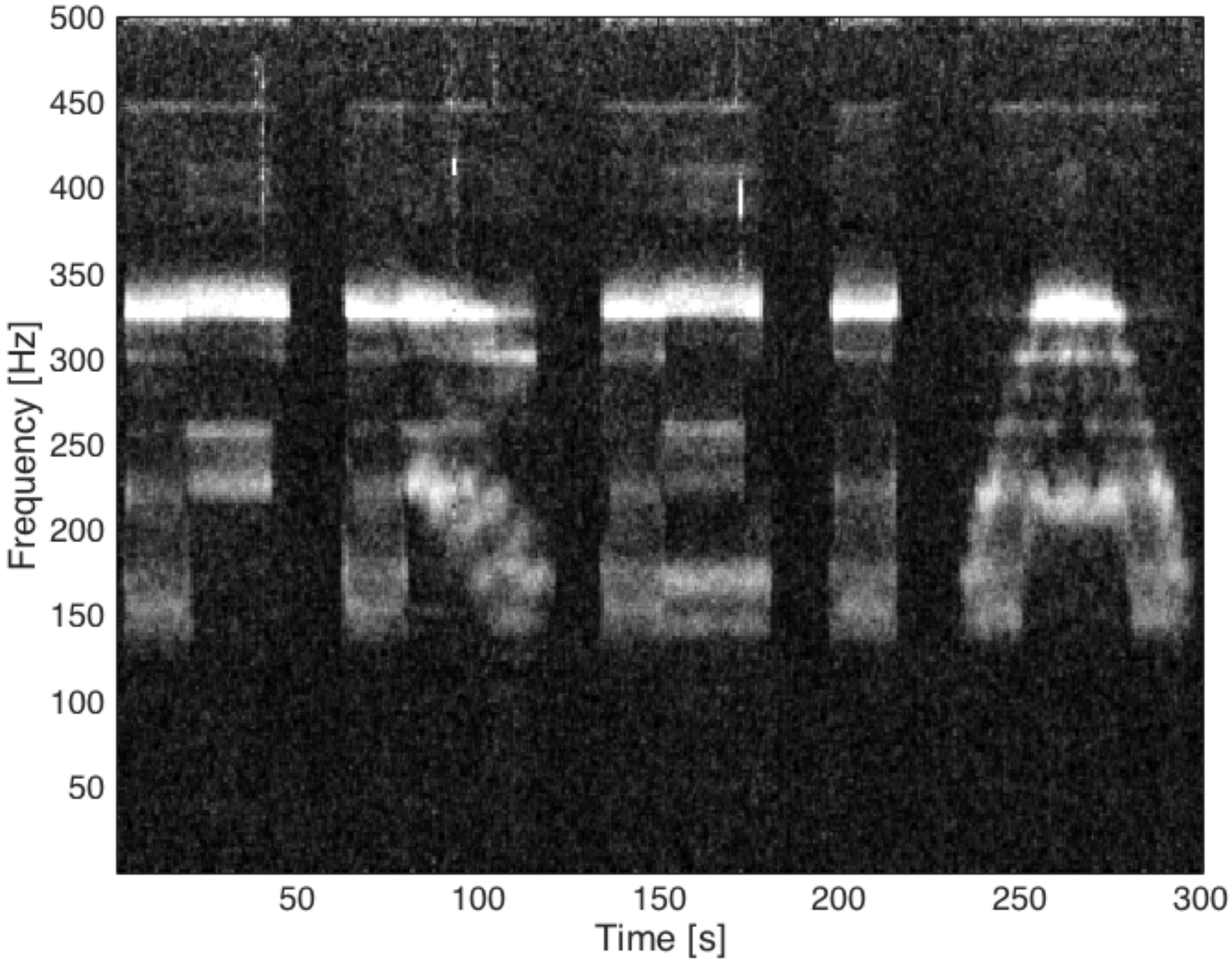

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QUESTIONS?