

Zeo Raw Data API

BaseLink

Listens to the data coming from the serial port connected to Zeo.

The serial port is set at baud 38400, no parity, one stop bit. Data is sent Least Significant Byte first.

The serial protocol is:

- AnclLLTtsid
 - A is a character starting the message
 - n is the protocol “version”, ie “4”
 - c is a one byte checksum formed by summing the identifier byte and all the data bytes
 - ll is a two byte message length sent LSB first. This length includes the size of the data block plus the identifier.
 - LL is the inverse of ll sent for redundancy. If ll does not match ~LL, we can start looking for the start of the next block immediately, instead of reading some arbitrary number of bytes, based on a bad length.
 - T is the lower 8 bits of Zeo’s unix time.
 - tt is the 16-bit sub-second (runs through 0xFFFF in 1second), LSB first.
 - s is an 8-bit sequence number.
 - i is the datatype
 - d is the array of binary data

The incoming data is cleaned up into packets containing a timestamp, the raw data output version, and the associated data.

External code can be sent new data as it arrives by adding themselves to the callback list using the `addCallback` function. It is suggested, however, that external code use the `ZeoParser` to organize the data into events and slices of data.

class `ZeoRawData.BaseLink.BaseLink(port)`

Runs on a separate thread and handles the raw serial communications and parsing required to communicate with Zeo. Each time data is successfully received, it is sent out to all of the callbacks.

addCallback(*callback*)

Add a callback that will be passed valid data.

error(*msg*)

Function for error printing.

run()

Begins thread execution and raw serial parsing.

Parser

This module parses data from the BaseCapture module and assembles them into slices that encompass a range of data representative of Zeo's current status.

There are two different callbacks. One for slice callbacks and one that the module will pass events to.

class ZeoRawData.Parser.**Parser**

Interprets the incoming Zeo data and encapsulates it into an easy to use dictionary.

addEventCallback(*callback*)

Add a function to call when an Event has occurred.

addSliceCallback(*callback*)

Add a function to call when a Slice of data is completed.

clearSlice()

Resets the current Slice

update(*timestamp, timestamp_subsec, version, data*)

Update the current Slice with new data from Zeo. This function is setup to be easily added to the BaseLink's callbacks.

Utility

A collection of general purpose functions and datatypes.

ZeoRawData.Utility.**dataTypes**

A dictionary containing all types of data the base may send.

0x00 : *'Event'*

An event has occurred

0x02 : *'SliceEnd'*

Marks the end of a slice of data

0x03 : *'Version'*

Version of the raw data output

- 0x80 : *'Waveform'*
Raw time domain brainwave
- 0x83 : *'FrequencyBins'*
Frequency bins derived from waveform
- 0x84 : *'SQI'*
Signal Quality Index of waveform (0-30)
- 0x8A : *'ZeoTimestamp'*
Timestamp from Zeo's RTC
- 0x97 : *'Impedance'*
Impedance across the headband
- 0x9C : *'BadSignal'*
Signal contains artifacts
- 0x9D : *'SleepStage'*
Current 30sec sleep stage

`ZeoRawData.Utility.eventTypes`

A dictionary containing all the types of event that may be fired.

- 0x05 : *'NightStart'*
User's night has begun
- 0x07 : *'SleepOnset'*
User is asleep
- 0x0E : *'HeadbandDocked'*
Headband returned to dock
- 0x0F : *'HeadbandUnDocked'*
Headband removed from dock
- 0x10 : *'AlarmOff'*
User turned off the alarm
- 0x11 : *'AlarmSnooze'*
User hit snooze
- 0x13 : *'AlarmPlay'*
Alarm is firing
- 0x15 : *'NightEnd'*
User's night has ended
- 0x24 : *'NewHeadband'*
A new headband ID has been read

ZeoRawData.Utility.filter60hz(A)

Filters out 60hz noise from a signal. In practice it is a sinc low pass filter with cutoff frequency of 50hz.

ZeoRawData.Utility.frequencyBins

A dictionary containing all of the frequency bins.

0x00 : '2-4'

Delta

0x01 : '4-8'

Theta

0x02 : '8-13'

Alpha

0x03 : '13-18'

Beta

0x04 : '18-21'

Beta

0x05 : '11-14'

Beta (sleep spindles)

0x06 : '30-50'

Gamma

ZeoRawData.Utility.getInt16(A)

Creates a signed 16bit integer from a 2 item array

ZeoRawData.Utility.getInt32(A)

Creates a signed 32bit integer from a 4 item array

ZeoRawData.Utility.getUInt16(A)

Creates an unsigned 16bit integer from a 2 item array

ZeoRawData.Utility.getUInt32(A)

Creates an unsigned 32bit integer from a 4 item array

ZeoRawData.Utility.sleepStages

A dictionary containing the sleepstages output by the base.

0x00 : 'Undefined'

Sleepstage unsure

0x01 : 'Awake'

Awake

0x02 : *'REM'*

Rapid eye movement(possibly dreaming)

0x03 : *'Light'*

Light sleep

0x04 : *'Deep'*

Deep sleep