



PIP v1.1  
by neutral labs



## Manual

Hello, owner.

PIP is a dual clocked CV generator and recorder/complex LFO that lets you morph between predefined CV waveforms and even morph your recorded CV.

## Specifications

- Width: 8 HP
- Supply voltage: +12V/-12V (Eurorack 10-pin header)
- Current draw:
  - +12V: 60 mA
  - -12V: 30 mA
  - 5V: unused, 0 mA
- CV inputs: 4x 0V to 5V usable, -12V to 12V absolute

## Connecting PIP to Eurorack power

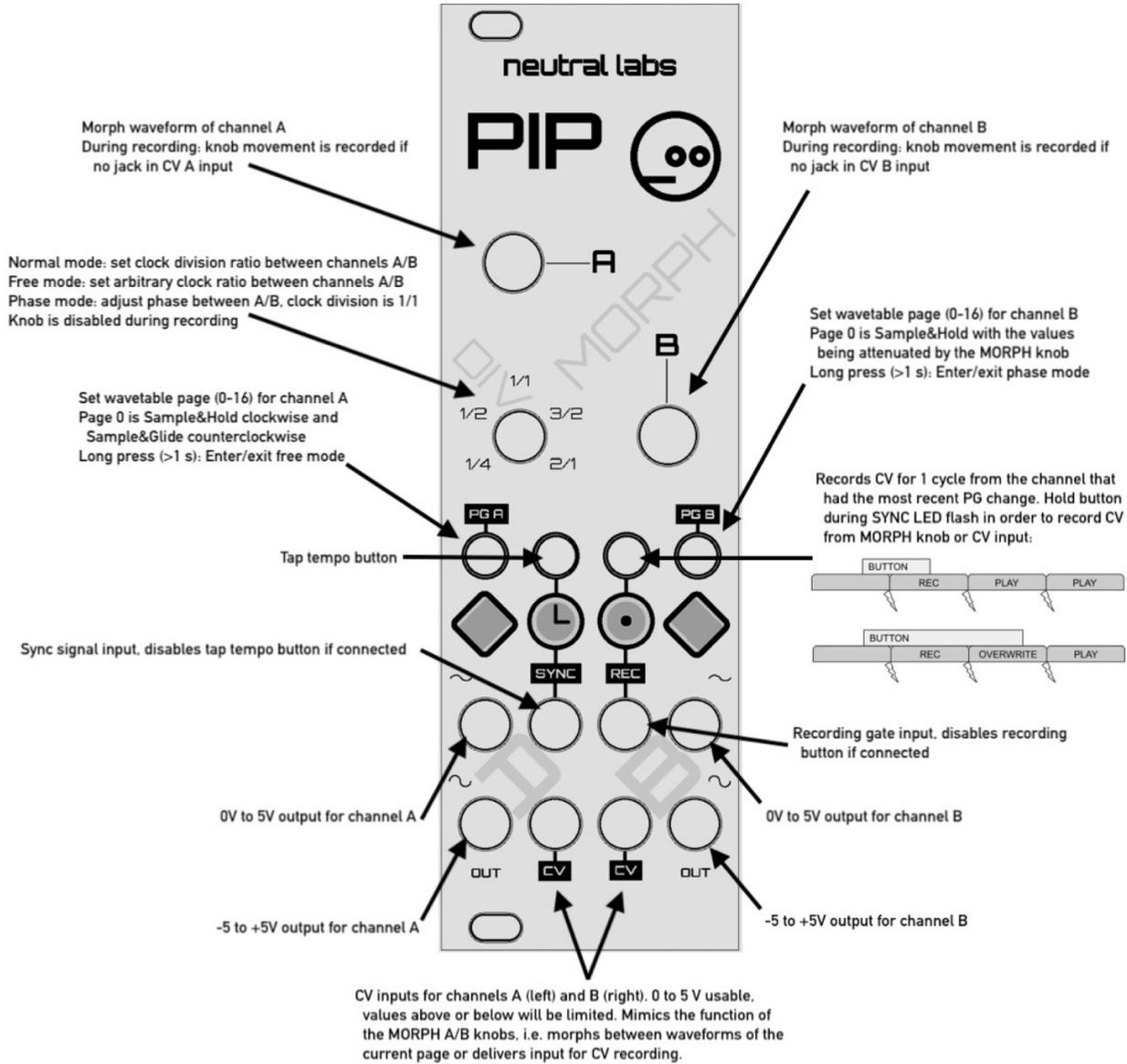
Connect a 10 pin Eurorack power cable to the 2x5 power header on the back of the module. There is an arrow indicator next to the word STRIPE on the circuit board. Unsurprisingly, the red stripe side of the cable goes on the side that says STRIPE. The module (and your power supply) is protected in case you should ever connect it the wrong way around, but it won't turn on if you do.

## Module Function

PIP simultaneously generates two CV waveforms, one per channel. Channel B is the master channel and it is synced to an internal or external clock. The clock of channel A depends on that of channel B: You can either set a fixed clock division, a free (arbitrary) ratio or you can adjust the phase relationship between channel B and channel A.

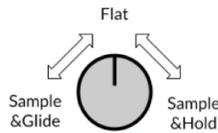
The waveforms are arranged into rows and pages (PG). Each channel has 16 wavetable pages with 3 waveforms per page that can be morphed into each other using the MORPH knobs. In addition, each channel has a special random (sample&hold/sample&glide) page. It is possible to record incoming CV or knob movements onto each channel. The recorded waveform replaces the middle waveform of the current page and can then be morphed as well.

The next page shows an overview of PIP's main functions that could be printed out for reference. For a more in-depth view, refer to the detailed description further below.

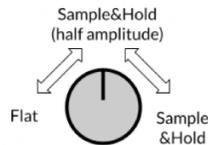


**MORPH knob functions:**

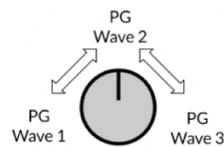
**PG 0 Channel A**



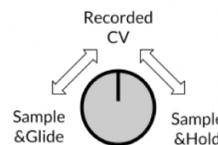
**PG 0 Channel B**



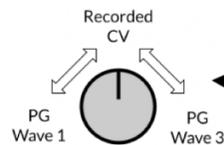
**PG 1-16**



**PG 0 Channel A with CV recording**



**PG 1-16 with CV recording**



## Control Voltage (CV) Outputs

There are 4 outputs, 2 per channel. The upper output is unipolar, it outputs a waveform ranging from 0V to +5V, while the lower one is bipolar and outputs the same waveform scaled to a range of roughly -5V to +5V.

Both waveforms are output simultaneously, which makes it possible to drive multiple modulation destinations without having to split the signal using a buffered multiple or stacked cables. You could e.g. modulate channel B's CV input from the unipolar (upper) channel A output, while also modulating another module's CV input from the bipolar (lower) channel A output.

## Controls

Control	Function
MORPH A/B	<p>These knobs morph the output signal (for channel A or B respectively) between waveforms. Each page (selectable with the <b>PG A</b> and <b>PG B</b> buttons) has 3 waveforms. One corresponds to the counterclockwise knob setting, one to the middle setting and one to the clockwise setting. The waveforms can be viewed in the appendix of this manual.</p> <p>If any CV recordings have been made on either the A or B channel, the middle waveform of the channel's current page will be replaced by the CV recording, so you can morph your recorded CV by turning the knob to either side.</p>
DIV	<p>In normal mode, this sets the clock division between channels A and B. The fractures printed on the front panel correspond to the A/B ratio, e.g. 1/4 means that the waveform on channel A will be replayed 4 times during 1 cycle on channel B. Channel B is the master and always synced to the clock, so changing the setting of this knob affects channel A only.</p> <p>In free mode (see <b>PG A</b>), channel A's tempo can be adjusted independently of the predetermined clock division ratios. At the counterclockwise setting, its tempo will still roughly correspond to 1/4 of channel B's tempo and with the clockwise setting to roughly 2/1 (or 2 times) channel B's tempo. The</p>

	<p>ratios printed in between are no longer accurate, as the progression indicated on the front panel is not linear. They're close enough for orientation though. In this mode, if the internal clock changes (by tapping the <b>SYNC</b> button or changing the incoming sync signal), the currently set ratio between channel A and B will remain, meaning both channels will still speed up or slow down simultaneously.</p> <p>In phase mode (see <b>PG B</b>), this knob determines the phase relationship between channel A and B. The clock division ratio is now fixed at 1/1, but instead you can shift channel A's output in time against that of channel B. With the fully counterclockwise setting, both channels are in phase. Channel A begins to move forward in time while turning the knob clockwise, until they are in phase again at the fully clockwise setting.</p>
<p><b>PG A</b></p>	<p>This button selects the wavetable page for channel A. Press the button and release it quickly to cycle through the available pages. Page 0 (selected at startup) is a special random page: Move the <b>MORPH A</b> knob counterclockwise for sample&amp;glide and clockwise for sample&amp;hold, with the amplitude increasing the further you turn the knob. This can also be used to easily find page 0 when cycling through pages: Set the <b>MORPH A</b> knob to the middle position and repeatedly press the <b>PG A</b> button until the LED indicates a constant voltage.</p> <p>Press the button for approximately 1 second in order to switch to free mode (see <b>DIV</b>). A long press will not change the current wavetable page and will switch into free mode if the module is currently in normal or phase adjustment mode. It will switch into normal mode if the module is currently in free mode.</p>
<p><b>PG B</b></p>	<p>This button selects the wavetable page for channel B. Press the button and release it quickly to cycle through the available pages. Page 0 (selected at startup) is a special random page: Move the <b>MORPH B</b> knob clockwise for sample&amp;hold, with the amplitude increasing the further you turn the knob. This is especially useful in order to modulate channel A from channel B: You will get a slightly (or radically) different waveform on channel A with each cycle, with the maximum deviation determined by the <b>MORPH B</b> knob setting. This can also be used to easily find page 0 when cycling through pages: Set the <b>MORPH B</b> knob to the counterclockwise position and repeatedly press the <b>PG A</b> button until the LED indicates a constant voltage.</p> <p><b>It is not possible to record CV onto channel B's random page.</b></p>

	<p>Press the button for approximately 1 second in order to switch to phase mode (see <b>DIV</b>). A long press will not change the current wavetable page and will switch into phase mode if the module is currently in normal or free mode. It will switch into normal mode if the module is currently in phase mode.</p>
<p><b>SYNC</b></p>	<p>This button is used in order to tap in the clock tempo. Tap the button at least twice at your desired clock rate. The master tempo will be adjusted accordingly and the sync LED will display short light pulses at the current tempo.</p> <p>The minimum clock rate is approximately 10 Hz (100 ms period) and the maximum clock rate is approximately 0.0083 Hz (2 minute period).</p> <p>The master clock is always set for channel B. Channel A's tempo depends on channel B according to the current mode (normal synced mode, free mode or phase adjustment mode, see <b>DIV</b>).</p>
<p><b>REC</b></p>	<p>When the button is held down during the <b>SYNC</b> LED flash, a CV recording will be initiated for the duration of the cycle that starts with said <b>SYNC</b> LED flash. Both channels can record CV. The recording will always be initiated on the channel that had its page last changed by the respective <b>PG</b> button. At module startup, channel A is selected. <b>Channel B cannot be recorded on while the Sample&amp;Hold page (page 0) is selected.</b></p> <div data-bbox="609 1155 1144 1375" data-label="Diagram"> <p>The diagram consists of two horizontal timelines. The top timeline shows a 'BUTTON' press starting at the beginning of a 'REC' phase, which then transitions to 'PLAY' and continues through another 'PLAY' phase. The bottom timeline shows a 'BUTTON' press that starts during a 'REC' phase, continues through an 'OVERWRITE' phase, and ends during a 'PLAY' phase. In both cases, lightning bolt symbols indicate the start of each phase.</p> </div> <p>As indicated, the button may be kept pressed for longer than one cycle, in which case the previous recording gets overwritten. Recording will stop at the end of that cycle during which the <b>REC</b> button is released and looped playback of the CV recording will start immediately.</p> <p>The CV recording will be stored as the middle waveform of the channel's current page, so you can morph your recorded CV by turning the knob to either side. Remember to set the knob to the middle position (or send ca. 2.5V as CV if a jack is inserted into the corresponding CV input) if you want to play back your CV recording unaltered.</p>

**Attention!** The **SYNC** LED indicates the cycle boundaries for the master channel (B). While on a **DIV** ratio other than 1/1, or in phase or free mode, these boundaries may differ from those of channel A. Recording for channel A will be stopped/started on the actual channel A boundaries, so if in doubt, record to channel A in normal mode with the **DIV** ratio set to 1/1.

The module will record CV between 0 and +5 V, with a resolution of 128 steps per cycle, for one cycle. Very fast moving CV at low clock rates may thus be distorted. Record fast moving CV at high clock rates to prevent this.

If no jack is connected to the selected CV input, the movement of the **MORPH** button will be recorded instead. During recording, the incoming CV or movement of the knob will be sent to the channel output in order to be monitored. It is not possible to change the current wavetable page, clock tempo or **DIV** ratio while a CV recording is in progress.

To stop playback of the recorded waveform, there are 2 options: Either press the channel's **PG** button in order to move on to the next wavetable page (this will erase the current CV recording - it won't be available after you cycled through all pages to the same page again), or start a new recording on the same channel with the **REC** button (which overwrites the current CV recording).

## Control Voltage (CV) Inputs

Input	Function
CV A	<p>Any input voltage corresponds to a setting on the <b>MORPH A</b> button: 0V corresponds to the fully counterclockwise setting, and +5V corresponds to the clockwise setting, values in between are interpreted accordingly. Voltages below 0V or above +5V are limited to stay within this range. Applying voltages outside the range will not harm the module.</p> <p>The <b>MORPH A</b> knob is without function as long as a jack is inserted into the <b>CV A</b> socket.</p>
CV B	<p>This has identical functionality to <b>CV A</b>, only for the B channel.</p>

<b>SYNC</b>	<p>A positive voltage pulse on this input has the same function as a press of the <b>SYNC</b> button. The input is usually not used as a tap tempo input though, but a continuous sync signal input from e.g. a sequencer. A pulse may be arbitrarily long in duration and the rising edge may not be steep, so input from an LFO is also possible. Negative voltages are ignored, but any voltage between -12V and +12V is safe and will not harm the module.</p> <p>The <b>SYNC</b> button is without function as long as a jack is inserted into the <b>SYNC</b> socket.</p>
<b>REC</b>	<p>A persistent voltage above +1.5V on this input has the same function as a press of the <b>REC</b> button. Negative voltages are ignored, but any voltage between -12V and +12V is safe and will not harm the module.</p> <p>Use this to automate CV recordings. During a live session, you could e.g. leave a recording of incoming CV running by keeping this input high (the incoming CV will be passed through), and set the input low in case you want to repeat a CV sequence for a couple of cycles.</p> <p>The <b>REC</b> button is without function as long as a jack is inserted into the <b>REC</b> socket.</p>

## LEDs

<b>LED</b>	<b>Function</b>
<b>A/B</b>	<p>These bicolor LEDs indicate the current CV output level at the respective bipolar output: Green is for positive voltages, red is for negative voltages. The LED brightness corresponds to the (absolute) amplitude. The unipolar output follows the bipolar output, but is scaled to a range from 0V to +5V.</p>
<b>SYNC</b>	<p>The white LED with a clock icon flashes briefly at each internal clock pulse for the master channel B, or external clock pulse if a SYNC cable is connected. Channel A's clock pulses are not indicated. They are identical to channel B's in normal mode while the clock division is set to 1/1.</p>
<b>REC</b>	<p>The orange LED will light up as long as the REC button is pressed or a positive voltage is applied to the REC input. (The</p>

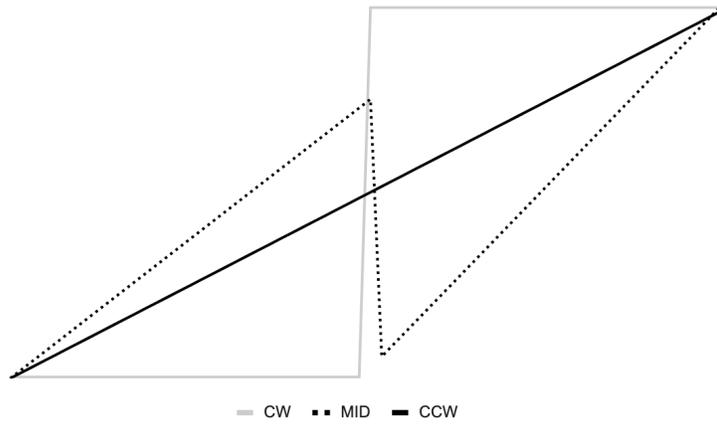
	random sample&hold page on channel B does not permit recording, but the LED will light up nevertheless, as it is triggered directly from the button or input.)
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### Appendix: Wavetable pages

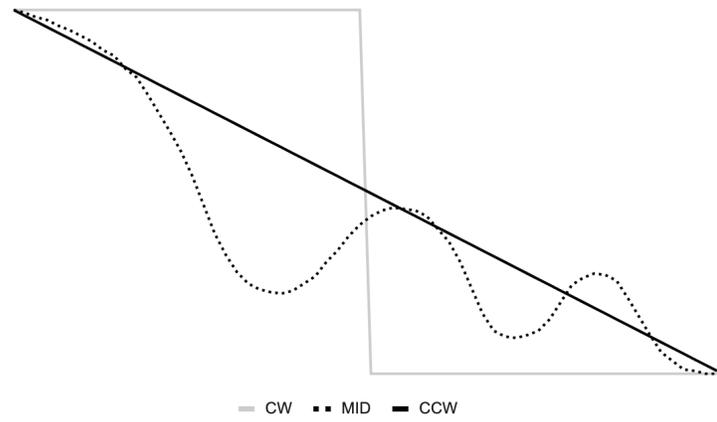
The following table lists the waveforms for all the available wavetable pages (CW - clockwise, MID - middle position, CCW - counterclockwise). At startup, both channels have page 0 selected.

Page	Waveforms
0 (channel A)	Sample&glide counterclockwise, sample&hold clockwise. The middle position outputs a constant value. When using this page to record CV onto the middle position waveform, turning the MORPH A knob clockwise or counterclockwise will alter the recorded waveform with increasing randomness.
0 (channel B)	Constant value counterclockwise, sample&hold clockwise. This page is ideal for randomly modulating the waveform of channel A: Insert a cable from the upper output socket for channel B to the CV input for channel A. The MORPH B knob setting then sets the level of randomness.  It is not possible to record CV onto this page.
1	<p style="text-align: center;">— CW    ··· MID    - - - CCW</p>

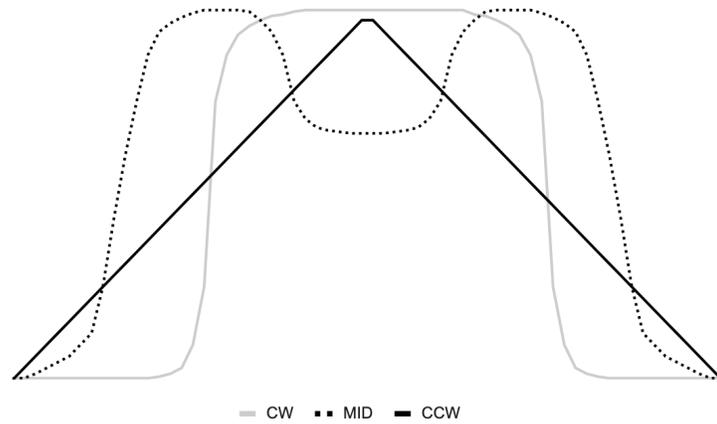
2



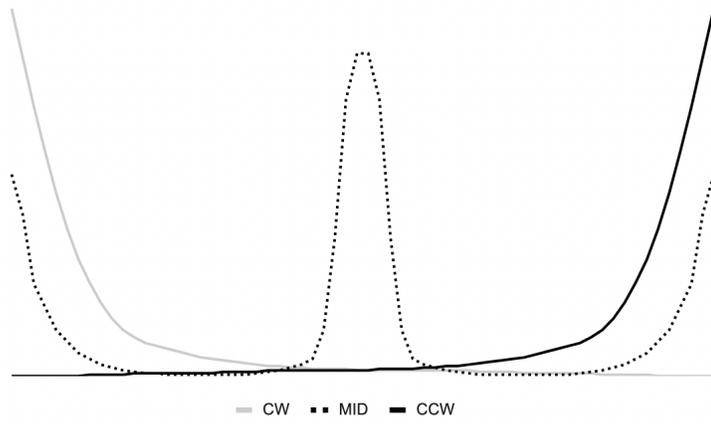
3



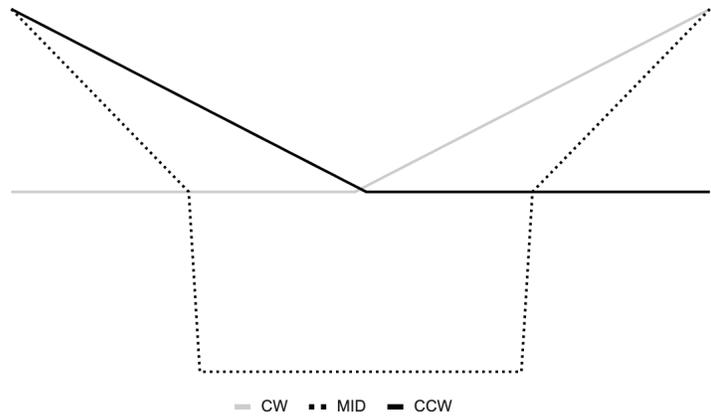
4



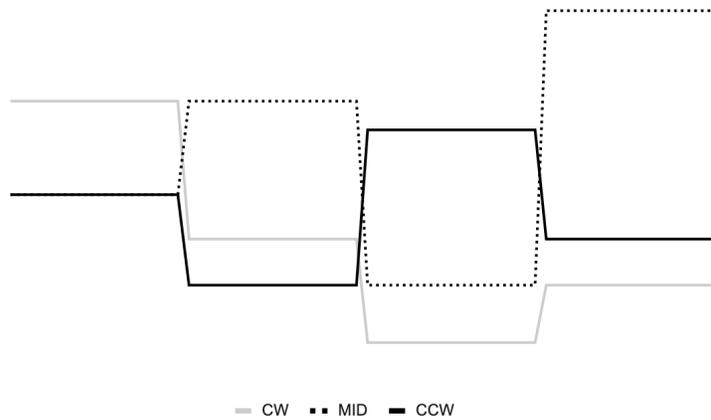
5



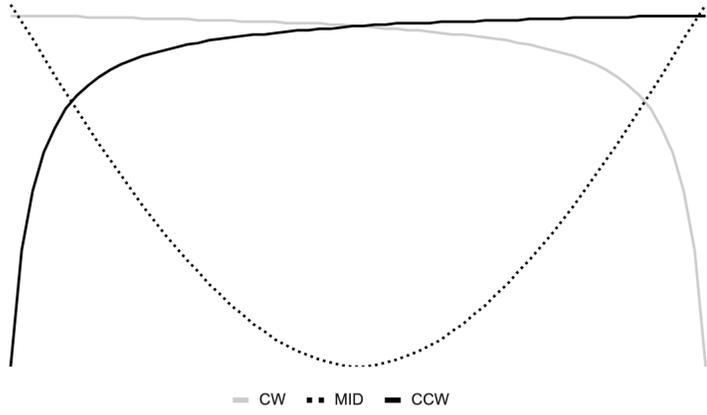
6



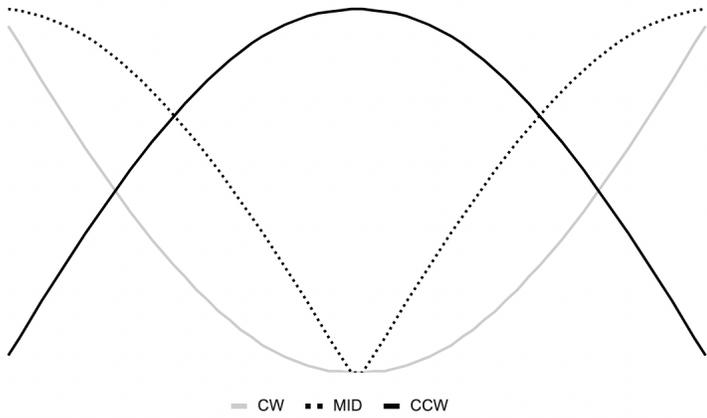
7



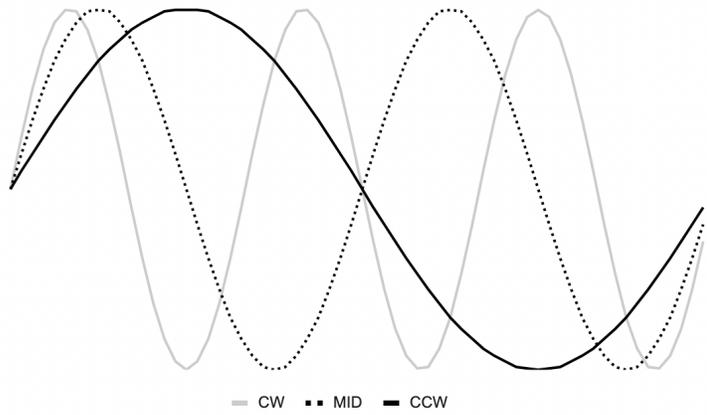
8



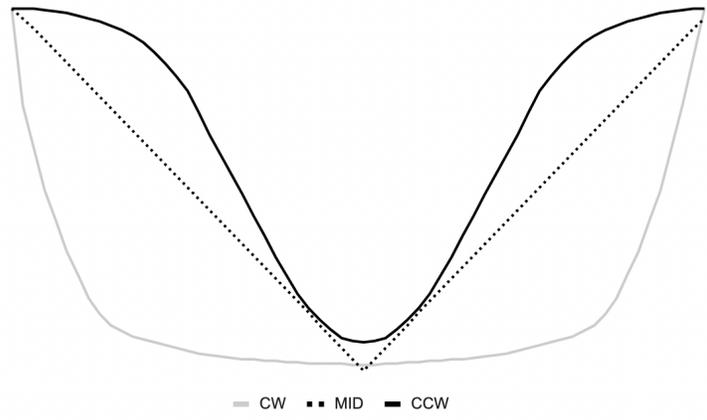
9



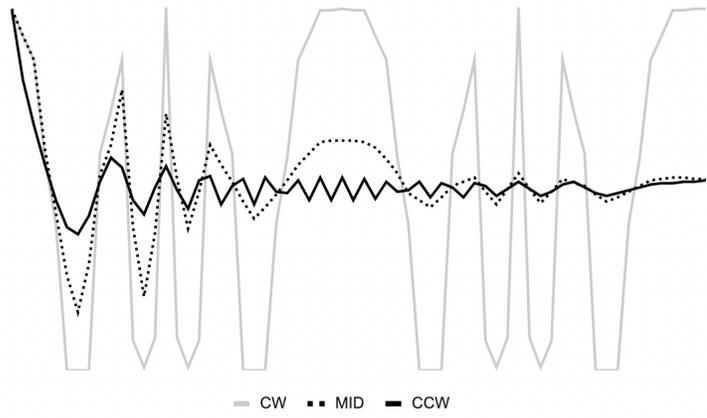
10



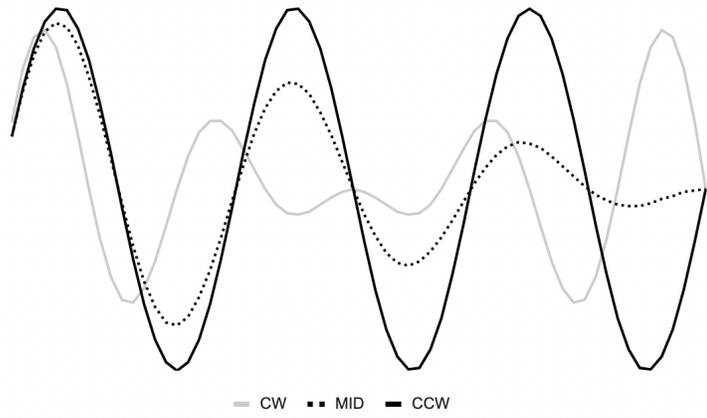
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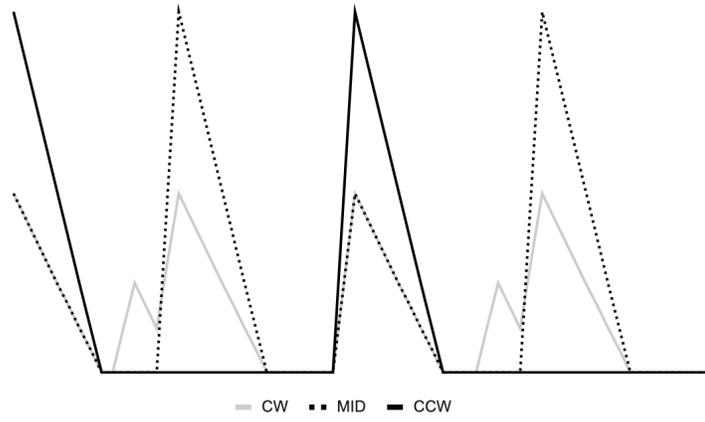
12



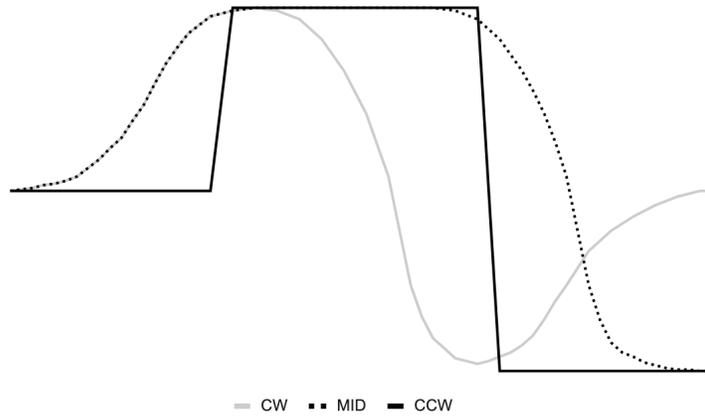
13



14



15



16

