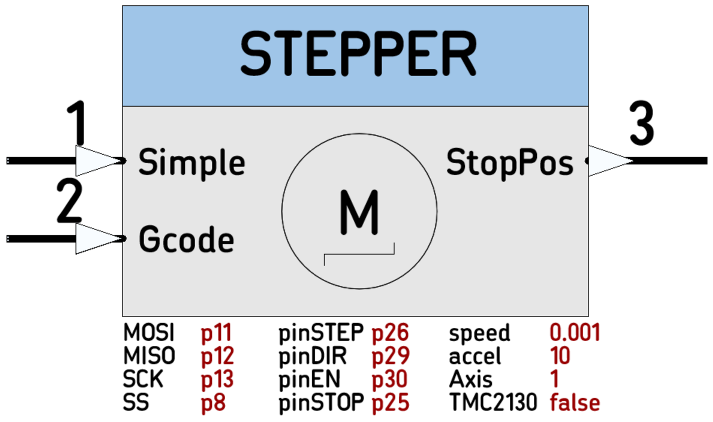
STEPPER

Node for simple to use, feature-rich, Stepping Motor Control.



Will work with: SilentStepstick, StepStick, or a any Step/Dir driven Step Motor driver

> - Category: Motor
> - HAL: mbed
> - Tested: with LPC1768 and TMC2130 Silentstepstick
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Implementation Details

`EndSwitch` Input stops the movement automatically and captures/outputs the `stopPosition` as a number of executed steps.
If TMC2130 driver is used, then Stall Detection and `stopPosition` reporting is supported by connecting TMC2130 DIAG1 pin to `EndSwitch` Input.

Simple commands

For simple use-cases, 4 commands are implemented as in the Input section below for input1 (Schematic pin 1). The same commands are implemented in the DC-Motor control Node L298, so a use-case scenario can be implemented with DC or stepping motor, just changing the motor Node in the Design. Example:

```
[Ticker]-->[Counter]-->[STEPPER]  for stepping-motor
[Ticker]-->[Counter]-->[L298]     for DC-Motor
```

Gcode commands

For more complex use-cases, Gcodes G0 and G1 are implemeted for input 2 (Schematic pin 2).

Motion impementation

The SteppingCounter is set for the desired number of steps. A Motion_Timer is set to the desired stepping frequency. A Motion_Timer ISR is attached to the Motion_Timer. The Motion_Timer ISR pulses the pinSTEP for a single step and decrements the SteppingCounter by 1. When the SteppingCounter reaches value 0 the Motion_Timer is stopped and the motion stops

Stop_Detection

The microprocessor pin assigned for pinSTOP *is connected to an endStop microswitch*, and is configured to create an interrupt. The pinSTOP ISR stops the Motion_Timer (this stops the movement) and Captures the SteppingCounter value to a StopPosition parameter. The next endFrame, outputs the StopPosition to the Node output, creating a Stop event.

Stall_Detection

By configuring TMC2130 registers `TCOOLTHRS` and `GCONF` via SPI, the TMC2130 DIAG1 pin is set to signal the Stall condition. The microprocessor pin assigned for pinSTOP is *connected to TMC2130 DIAG1 pin*. Then when the TMC2130 detects and signals a Stall, the responce is as in the Stop_Detection

Accessing TMC2130 Registers

Registers are accesed with 40bit SPI transactions, sending a 40 bit command and getting back 40 bit status.

Input Connections

```
   * (Schematic pin 1) integer: Value
      * 0 or 0x30 STOP
      * 1 or 0x31 RIGHT  STATE MACHINE: ACTIVATED ONLY IF IN STOP
      * 2 or 0x32 LEFT   STATE MACHINE: ACTIVATED ONLY IF MOVING RIGHT
      * 3 or 0x33 BRAKE
  * (Schematic pin 2) * string: Gcode string
```

Output Connections

* (Schematic pin 2)
   * int: `stopPosition'

Node Parameters

```
 *  PinName: pinMOSI
 *  PinName: pinMISO
 *  PinName: pinSCK
 *  PinName: pinSS
 *  PinName: pinSTEP
 *  PinName: pinDIR
 *  PinName: pinEN
 *  PinName: pinStop: Connect to a microswitch-end-Stop or TMC2130 DIAG1 pin
 *  float:   speed: Default speed in s/step (0.001-->1KHz) limited to min 0.00002(50KHz), max 1 (1Hz)
 *  uint32_t:Accel: The Default acceration
 *  char8_t: Axis: Executes Gcode only for the specified axis: 1=X,2=Y,3=Z,4=E,5=A,6=B,7=C,8=D
 *  bool:    TMC2130
```

Usage Example

```
[GPIN]-->[ValueTrig]-->(1)[STEPPER]

[Ticker]-->[Counter]-->(1)[STEPPER] simple motion demo

[PC_Serial "G0 X100"]-->[StringSerial]-->(2)[STEPPER] executes Gcode
```