Claw Device Controller

Generated by Doxygen 1.16.0

Chapter 1

claw

Raspberry pico 2 code to drive stepper motor driven claw

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 3

File Index

3.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 4

Class Documentation

4.1 stepper_state Struct Reference

Structure to hold stepper motor state.

Public Attributes

- int **current_position**

  Current position in steps.
- int **target_position**

  Target position in steps.
- int **step_period**

  Step period in TIMMER_INTERVAL_US units.
- bool **moving**

  Is the stepper currently moving.
- bool **enabled**

  Is the stepper enabled.

4.1.1 Detailed Description

Structure to hold stepper motor state.

The documentation for this struct was generated from the following file:

- claw.c

Chapter 5

File Documentation

5.1 claw.c File Reference

Firmware to control a claw device with stepper motors via USB serial commands.

```
#include <stdio.h>
#include "pico/stdlib.h"
#include "hardware/timer.h"
#include <string.h>
#include "pico/assert.h"
#include <stdlib.h>
#include "hardware/gpio.h"
#include <ctype.h>
```

Classes

- struct stepper_state

  Structure to hold stepper motor state.

Macros

- #define **LED_DELAY_MS** 1000
- #define **TIMER_INTERVAL_US** 10
- #define **DEFAULT_STEPPER_PERIOD** 4
- #define **MIN_STEPPER_PERIOD** 4
- #define **STEPPER_STEP_PIN** 2
- #define **STEPPER_DIR_PIN** 3
- #define **STEPPER_ENABLE_PIN** 4
- #define **STEPPER_ENABLE_PIN_INVERTED** true
- #define **STEPPER_DIRECTION_FORWARD** 1
- #define **STEPPER_DIRECTION_BACKWARD** 0
- #define **STEPPER_STEPS_PER_REV** 3200
- #define **STEPPER_MAX_REVOLUTIONS** 15
- #define **MAX_STEPPER_POSITION** (STEPPER_STEPS_PER_REV ∗ STEPPER_MAX_REVOLUTIONS)
- #define **MIN_STEPPER_POSITION** 0
- #define **MAX_COMMAND_LENGTH** 50

- #define **LED_PERIOD_COMMAND** "led_period "
- #define **SET_STEPPER_PERIOD_COMMAND** "set_stepper_period "
- #define **SET_STEPPER_ZERO_COMMAND** "set_stepper_zero"
- #define **MOVE_STEPPER_ABSOLUTE_COMMAND** "move_stepper_absolute "
- #define **MOVE_STEPPER_RELATIVE_COMMAND** "move_stepper_relative "
- #define **STOP_STEPPER_COMMAND** "stop_stepper"
- #define **GET_STEPPER_STATUS_COMMAND** "get_stepper_status"
- #define **ENABLE_STEPPER_COMMAND** "enable_stepper"
- #define **DISABLE_STEPPER_COMMAND** "disable_stepper"

Typedefs

- typedef struct stepper_state **stepper_state_t**

Functions

- bool stepper_init (stepper_state_t ∗stepper, int initial_position, int step_period)

  Initialize the stepper state.
- bool stepper_set_target_position (stepper_state_t ∗stepper, int target_position)

  Set the target position for the stepper motor.
- bool stepper_set_step_period (stepper_state_t ∗stepper, int step_period_us)

  Set the step period for the stepper motor.
- bool stepper_stop (stepper_state_t ∗stepper)

  Stop the stepper motor, setting target position to current position.
- bool stepper_get_status (stepper_state_t ∗stepper)

  Get the current status of the stepper motor, printing to stdout.
- bool stepper_enable (stepper_state_t ∗stepper, bool enable)

  Enable the stepper motor.
- int pico_led_init (void)

  Initialise the LED.
- void pico_set_led (bool led_on)

  Turn the LED on or off.
- bool process_stepper_movement (stepper_state_t ∗stepper)

  Process stepper movement.
- void process_led_tick (void)

  Process LED timing tick.
- bool timer_callback (struct repeating_timer ∗t)

  Millisecond timer callback.
- int process_command (const char ∗cmd, stepper_state_t ∗stepper)

  Process a command string.
- char ∗ process_stdin_input (void)

  Process stdin input.
- int main ()

  Main function.

Variables

- volatile int led_period = LED_DELAY_MS

  LED blink period in milliseconds.
- volatile int ten_us_ticks_count = 0

  Global ten microsecond ticks count.
- volatile int ms_ticks_count = 0

  Global millisecond ticks count.
- const char * help_message

  Help message.

5.1.1 Detailed Description

Firmware to control a claw device with stepper motors via USB serial commands.

Author

Jon Wade

Date

19 Dec 2025

Copyright

Command interface for controlling stepper motors and other functions associated with the claw device. This file implements a simple command interface over USB serial to control the claw device.

5.1.2 Function Documentation

5.1.2.1 main()

```
int main ()
```

Main function.

Parameters

	none

Returns

: none

5.1.2.2 pico_led_init()


```
int pico_led_init (
            void )
```

Parameters

	none

Returns

: PICO_OK on success error code on failure

5.1.2.3 pico_set_led()

```
void pico_set_led (
            bool led_on)
```

Turn the LED on or off.

Parameters

led_on	true to turn on, false to turn off

Returns

: none

5.1.2.4 process_command()

```
int process_command (
            const char * cmd,
            stepper_state_t * stepper)
```

Process a command string.

Parameters

cmd	pointer to command string
stepper	pointer to stepper state structure

Returns

: 0 on success, error code on failure

5.1.2.5 process_led_tick()

```
void process_led_tick (
            void )
```

Process LED timing tick.

Parameters

	none

Returns

: none

5.1.2.6 process_stdin_input()

```
char * process_stdin_input (
            void )
```

Process stdin input.

Note

: This function reads characters from stdin, builds commands, and processes them when a newline is received.

This function has a simple lock to prevent re-entrancy.

Parameters

	none

Returns

: none

5.1.2.7 process_stepper_movement()

```
bool process_stepper_movement (
            stepper_state_t * stepper)
```

Process stepper movement.

Parameters

stepper	pointer to stepper state structure

Returns

: true if stepper is still moving, false if it has reached target

5.1.2.8 stepper_enable()


```
bool stepper_enable (
            stepper_state_t * stepper,
            bool enable)
```

Parameters

stepper	pointer to stepper state structure, must not be NULL
enable	true to enable, false to disable

Returns

: true on success, false on failure

5.1.2.9 stepper_get_status()

```
bool stepper_get_status (
            stepper_state_t * stepper)
```

Get the current status of the stepper motor, printing to stdout.

Parameters

stepper	pointer to stepper state structure, must not be NULL

Returns

: true on success, false on failure

5.1.2.10 stepper_init()

```
bool stepper_init (
            stepper_state_t * stepper,
            int initial_position,
            int step_period)
```

Initialize the stepper state.

Parameters

stepper	pointer to stepper state structure to initialize, must not be NULL
initial_position	initial position in steps must be between MIN_STEPPER_POSITION and MAX_STEPPER_↩ POSITION
step_period	step period in TIMER_INTERVAL_US must be greater than 1 ms

Returns

: true on success, false on failure

5.1.2.11 stepper_set_step_period()


```
bool stepper_set_step_period (
            stepper_state_t * stepper,
            int step_period_us)
```

Parameters

stepper	pointer to stepper state structure, must not be NULL
step_period	step period in microseconds must be greater than MIN_STEPPER_PERIOD

Returns

: true on success, false on failure

5.1.2.12 stepper_set_target_position()

```
bool stepper_set_target_position (
            stepper_state_t * stepper,
            int target_position)
```

Set the target position for the stepper motor.

Parameters

stepper	pointer to stepper state structure, must not be NULL
target_position	target position in steps must be between MIN_STEPPER_POSITION and MAX_STEPPER↩ _POSITION

Returns

: true on success, false on failure

5.1.2.13 stepper_stop()

```
bool stepper_stop (
            stepper_state_t * stepper)
```

Stop the stepper motor, setting target position to current position.

Parameters

stepper	pointer to stepper state structure, must not be NULL

Returns

: true on success, false on failure

5.1.2.14 timer_callback()

```
bool timer_callback (
            struct repeating_timer * t)
```

Millisecond timer callback.

Parameters

t	pointer to repeating_timer struct

Returns

: true to keep repeating, false to stop

5.1.3 Variable Documentation

5.1.3.1 help_message

```
const char* help_message
```

Initial value:

```
                    =
"Available commands:\n"
"  led_period <ms>               - Set the LED blink period in milliseconds\n"
"  set_stepper_period <us>       - Set the stepper motor step period in us\n"
"  set_stepper_zero              - Set the current position to zero\n"
"  move_stepper_absolute <steps> - Move the stepper to an absolute position\n"
"  move_stepper_relative <steps> - Move the stepper by a relative number of steps\n"
"  stop_stepper                  - Stop the stepper motor\n"
"  get_stepper_status            - Get the current status of the stepper motor\n"
"  enable_stepper                - Enable the stepper motor\n"
"  disable_stepper               - Disable the stepper motor\n"
"  help                          - Show this help message\n"
"-----\n"
```

Help message.

This message is displayed when the user requests help or enters an unknown command.

5.1.3.2 led_period

```
volatile int led_period = LED_DELAY_MS
```

LED blink period in milliseconds.

This variable can be modified via command interface to change the LED blink rate.

5.1.3.3 ms_ticks_count

```
volatile int ms_ticks_count = 0
```

Global millisecond ticks count.

This variable is incremented by the timer callback every 100 calls (1 ms = 100 $*$ 10 us) and decremented in the main loop to track when the millisecond tasks should run.

5.1.3.4 ten_us_ticks_count

```
volatile int ten_us_ticks_count = 0
```

Global ten microsecond ticks count.

This variable is incremented by the timer callback and decremented in the main loop to track when the ten microsecond tasks should run.

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