# IDPL108

1.0

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Integrated Design Project Team L108 Source Code Documentation. See IDP Namespace for API.

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## 3.1 Class List

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# Namespace Documentation

## 5.1 IDP Namespace Reference

### Classes

- class ClampControl

  *Manage the actuation of the clamp, as well as the detection and analysis of bobbins for their colour and badness.*

- struct LineSensors

  *Contains the LINE or NO_LINE status of each of the four IR sensors used for line following.*

- class HardwareAbstractionLayer

  *Provide a hardware agnostic interface to the required hardware functionality.*

- class LineFollowing

  *Maintain the robot position correctly with respect to the white line markers, during driving and manouvering.*

- class MissionSupervisor

  *Control the overall robot behaviour and objective fulfillment.*

- class Navigation

  *Find a route from one place to another on the board, and maintain an estimate of the current position.*

- class SelfTests

  *Execute a variety of functionality self tests.*

- class StatusWatchdog

  *Polls the STATUS register of the microcontroller any handles any errors that may arise.*

### Enumerations

- enum BobbinColour { BOBBIN_RED, BOBBIN_GREEN, BOBBIN_WHITE }

*Bobbin colours.*

- enum BobbinBadness { BOBBIN_GOOD, BOBBIN_BAD }

  *Bobbin good or bad.*

- enum LineSensorStatus { LINE, NO_LINE }

  *Line sensor status, LINE or NO_LINE.*

- enum LineFollowingStatus {

  ACTION_IN_PROGRESS, ACTION_COMPLETED, LEFT_TURN_FOUND, RIGHT_TURN_FOUND,

  BOTH_TURNS_FOUND, LOST, NO_TURNS_FOUND }

  *Line following return status codes.*

- enum LineFollowingTurnDirection {

  TURN_LEFT, TURN_RIGHT, TURN_AROUND_CW, TURN_AROUND_CCW,

  MAX_TURN_DIRECTION }

  *Possible turn directions.*

- enum LineFollowingLineStatus { ON_LINE, LOST_LINE, OTHER, MAX_LINE_STATUS }

  *Possible line statuses, used internally.*

- enum NavigationStatus { NAVIGATION_ENROUTE, NAVIGATION_ARRIVED, NAVIGATION_LOST, MAX_STATUS }

  *Current navigation status.*

- enum NavigationLocation { NAVIGATION_BOXES, NAVIGATION_RACK, NAVIGATION_DELIVERY, MAX_LOCATION }

  *Possible locations for navigation to be asked to go to.*

- enum NavigationDirection { NAVIGATION_CLOCKWISE, NAVIGATION_ANTICLOCKWISE, MAX_DIRECTION }

  *Directions around the circuit.*

- enum NavigationNode {

  NODE1, NODE2, NODE3, NODE4,

  NODE5, NODE6, NODE7, NODE8,

  NODE9, NODE10, NODE11, MAX_NODE }

  *Navigation nodes, numbered clockwise from the bottom right corner of the table.*

- enum NavigationTurn {

  STRAIGHT, LEFT, RIGHT, BOTH,

  LEFT_AND_STRAIGHT, RIGHT_AND_STRAIGHT, BOTH_AND_STRAIGHT, END_OF_LINE,

  MAX_TURNS }

  *Possible turns at a node.*

- enum NavigationCachedJunction {
  NO_CACHE, LEFT_TURN, RIGHT_TURN, BOTH_TURNS,
  NO_TURNS }

  *Cached junction information for use while driving over a junction or executing a turn.*

## Functions

- unsigned short int cap_correction (const unsigned short int correction)

  *Cap a line following correction value to MAX_CORRECTION.*

## Variables

- const int MOTOR_MAX_SPEED = 127

  *Highest allowable motor speed in either direction.*

- const int MOTOR_RAMP_TIME = 16

  *How fast to ramp the motors towards the desired speed.*

- const double INTEGRAL_GAIN = 4.0

  *Constant for integral control in line following.*

- const short unsigned int MAX_CORRECTION = 127

  *Maximum differential correction value before it gets capped.*

- const unsigned int LOST_TIMEOUT = 50

  *The number of loop iterations before we count as lost.*

- const unsigned int EDGE_ERROR = 2

  *How much an outer sensor seeing the edge of a line should add to the appropriate error.*

- const NavigationTurn NAVIGATION_NODE_TURNS [MAX_DIRECTION][MAX_NODE]

  *The turns at each node.*

- const NavigationTurn NAVIGATION_TURN_MAP [MAX_DIRECTION][MAX_NODE]

  *Turns that should be taken at each node in each direction.*

- const NavigationNode NAVIGATION_LOCATION_LOOKUP [MAX_LOCATION][2]

  *The lookup table of NavigationLocations to a pair of NavigationNodes indicating the start and end node (with implied direction).*

- const NavigationNode NAVIGATION_ROUTE_MAP [MAX_DIRECTION][MAX_NODE]

  *The route to take, node by node.*

### 5.1.1 Enumeration Type Documentation

#### 5.1.1.1 enum IDP::BobbinBadness

Bobbin good or bad.

**Enumerator:**

***BOBBIN_GOOD***
***BOBBIN_BAD***

Definition at line 30 of file clamp_control.h.

#### 5.1.1.2 enum IDP::BobbinColour

Bobbin colours.

**Enumerator:**

***BOBBIN_RED***
***BOBBIN_GREEN***
***BOBBIN_WHITE***

Definition at line 21 of file clamp_control.h.

#### 5.1.1.3 enum IDP::LineFollowingLineStatus

Possible line statuses, used internally.

**Enumerator:**

***ON_LINE***
***LOST_LINE***
***OTHER***
***MAX_LINE_STATUS***

Definition at line 76 of file line_following.h.

#### 5.1.1.4 enum IDP::LineFollowingStatus

Line following return status codes.

ACTION_IN_PROGRESS indicates that the requested action is still underway.

ACTION_COMPLETED indicates that the requested action has finished.

LEFT_TURN_FOUND, RIGHT_TURN_FOUND and BOTH_TURNS_FOUND indicate that possible turns have been found in the path.

LOST indicates that no line could be seen on any sensors and that this is unexpected.

**Enumerator:**

***ACTION_IN_PROGRESS***

***ACTION_COMPLETED***
***LEFT_TURN_FOUND***
***RIGHT_TURN_FOUND***
***BOTH_TURNS_FOUND***
***LOST***
***NO_TURNS_FOUND***

Definition at line 52 of file line_following.h.

#### 5.1.1.5 enum IDP::LineFollowingTurnDirection

Possible turn directions.

**Enumerator:**

***TURN_LEFT***
***TURN_RIGHT***
***TURN_AROUND_CW***
***TURN_AROUND_CCW***
***MAX_TURN_DIRECTION***

Definition at line 65 of file line_following.h.

#### 5.1.1.6 enum IDP::LineSensorStatus

Line sensor status, LINE or NO_LINE.

**Enumerator:**

***LINE***
***NO_LINE***

Definition at line 32 of file hal.h.

#### 5.1.1.7 enum IDP::NavigationCachedJunction

Cached junction information for use while driving over a junction or executing a turn.

**Enumerator:**

***NO_CACHE***
***LEFT_TURN***
***RIGHT_TURN***
***BOTH_TURNS***
***NO_TURNS***

Definition at line 60 of file navigation.h.

#### 5.1.1.8 enum IDP::NavigationDirection

Directions around the circuit.

**Enumerator:**

*NAVIGATION_CLOCKWISE*

*NAVIGATION_ANTICLOCKWISE*

*MAX_DIRECTION*

Definition at line 35 of file navigation.h.

#### 5.1.1.9 enum IDP::NavigationLocation

Possible locations for navigation to be asked to go to.

**Enumerator:**

*NAVIGATION_BOXES*

*NAVIGATION_RACK*

*NAVIGATION_DELIVERY*

*MAX_LOCATION*

Definition at line 28 of file navigation.h.

#### 5.1.1.10 enum IDP::NavigationNode

Navigation nodes, numbered clockwise from the bottom right corner of the table.

**Enumerator:**

*NODE1*

*NODE2*

*NODE3*

*NODE4*

*NODE5*

*NODE6*

*NODE7*

*NODE8*

*NODE9*

*NODE10*

*NODE11*

*MAX_NODE*

Definition at line 43 of file navigation.h.

#### 5.1.1.11 enum IDP::NavigationStatus

Current navigation status.

**Enumerator:**

*NAVIGATION_ENROUTE*
*NAVIGATION_ARRIVED*
*NAVIGATION_LOST*
*MAX_STATUS*

Definition at line 21 of file navigation.h.

#### 5.1.1.12 enum IDP::NavigationTurn

Possible turns at a node.

**Enumerator:**

*STRAIGHT*
*LEFT*
*RIGHT*
*BOTH*
*LEFT_AND_STRAIGHT*
*RIGHT_AND_STRAIGHT*
*BOTH_AND_STRAIGHT*
*END_OF_LINE*
*MAX_TURNS*

Definition at line 51 of file navigation.h.

### 5.1.2 Function Documentation

#### 5.1.2.1 unsigned short int IDP::cap_correction ( const unsigned short int *correction* )

Cap a line following correction value to MAX_CORRECTION.

**Parameters**

***correction*** The existing correction value

**Returns**

The capped correction value

### 5.1.3 Variable Documentation

#### 5.1.3.1 const unsigned int IDP::EDGE_ERROR = 2

How much an outer sensor seeing the edge of a line should add to the appropriate error.

Definition at line 36 of file line_following.h.

#### 5.1.3.2 const double IDP::INTEGRAL_GAIN = 4.0

Constant for integral control in line following.

Definition at line 20 of file line_following.h.

#### 5.1.3.3 const unsigned int IDP::LOST_TIMEOUT = 50

The number of loop iterations before we count as lost.

Definition at line 30 of file line_following.h.

#### 5.1.3.4 const short unsigned int IDP::MAX_CORRECTION = 127

Maximum differential correction value before it gets capped.

Definition at line 25 of file line_following.h.

#### 5.1.3.5 const int IDP::MOTOR_MAX_SPEED = 127

Highest allowable motor speed in either direction.

Definition at line 21 of file hal.h.

#### 5.1.3.6 const int IDP::MOTOR_RAMP_TIME = 16

How fast to ramp the motors towards the desired speed.

Lower is faster.

Definition at line 27 of file hal.h.

#### 5.1.3.7 const NavigationNode IDP::NAVIGATION_LOCATION_LOOKUP[MAX_LOCATION][2]

**Initial value:**

```
{
        {NODE9, NODE6},
        {NODE7, NODE10},
        {NODE3, NODE2}
    }
```

The lookup table of NavigationLocations to a pair of NavigationNodes indicating the start and end node (with implied direction).

Definition at line 54 of file navigation.cc.

#### 5.1.3.8 const NavigationTurn IDP::NAVIGATION_NODE_TURNS[MAX_DIRECTION][MAX_NODE]

**Initial value:**

```
{
        {STRAIGHT, BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT, BOTH,
            BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT,
            BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT, RIGHT, END_OF_LINE},
        {END_OF_LINE, BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT, RIGHT_AND_STRAIGHT,
            BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT,
            BOTH_AND_STRAIGHT, BOTH_AND_STRAIGHT, LEFT, STRAIGHT}
    }
```

The turns at each node.

Indexed by NavigationDirection and then by NavigationNode

Definition at line 29 of file navigation.cc.

#### 5.1.3.9 const NavigationNode IDP::NAVIGATION_ROUTE_MAP[MAX_DIRECTION][MAX_-NODE]

**Initial value:**

```
{
        {NODE2, NODE3, NODE4, NODE5, NODE6, NODE8, NODE8, NODE9, NODE10,
            NODE11, NODE10},
        {NODE2, NODE1, NODE2, NODE3, NODE4, NODE5, NODE6, NODE7, NODE8,
            NODE9, NODE10}
    }
```

The route to take, node by node.

Definition at line 63 of file navigation.cc.

#### 5.1.3.10 const NavigationTurn IDP::NAVIGATION_TURN_MAP[MAX_DIRECTION][MAX_-NODE]

**Initial value:**

```
{
        {STRAIGHT, STRAIGHT, STRAIGHT, RIGHT, STRAIGHT, RIGHT, STRAIGHT,
            STRAIGHT, STRAIGHT, RIGHT, END_OF_LINE},
        {END_OF_LINE, STRAIGHT, STRAIGHT, LEFT, STRAIGHT, LEFT, STRAIGHT,
            STRAIGHT, STRAIGHT, LEFT, STRAIGHT}
    }
```

Turns that should be taken at each node in each direction.

Indexed by NavigationDirection and then by NavigationNode

Definition at line 43 of file navigation.cc.

# Chapter 6

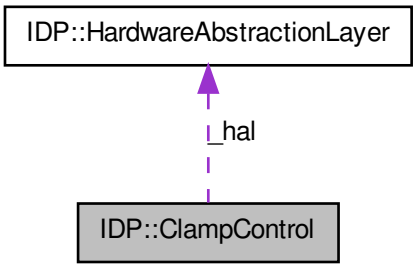
# Class Documentation

## 6.1 IDP::ClampControl Class Reference

Manage the actuation of the clamp, as well as the detection and analysis of bobbins for their colour and badness.

`#include <clamp_control.h>`

Collaboration diagram for IDP::ClampControl:




### Public Member Functions

- ClampControl (HardwareAbstractionLayer *hal)

  *Initialise the class, storing the const pointer to the HAL.*

- void pick_up ()

  *Pick up something using the clamp.*

- void put_down ()

  *Put something in the clamp down.*

- BobbinColour colour () const

  *Check the bobbin colour.*

- BobbinBadness badness () const

  *Check the bobbin badness.*

### 6.1.1 Detailed Description

Manage the actuation of the clamp, as well as the detection and analysis of bobbins for their colour and badness.

Definition at line 39 of file clamp_control.h.

### 6.1.2 Constructor & Destructor Documentation

#### 6.1.2.1 IDP::ClampControl::ClampControl ( HardwareAbstractionLayer * *hal* )

Initialise the class, storing the const pointer to the HAL.

**Parameters**

***hal*** A const pointer to an instance of the HAL

Definition at line 39 of file clamp_control.cc.

### 6.1.3 Member Function Documentation

#### 6.1.3.1 BobbinBadness IDP::ClampControl::badness ( ) const

Check the bobbin badness.

**Returns**

A BobbinBadness value to indicate current bobbin status

Definition at line 75 of file clamp_control.cc.

#### 6.1.3.2 BobbinColour IDP::ClampControl::colour ( ) const

Check the bobbin colour.

**Returns**

A BobbinColour value to indicate current bobbin colour

Definition at line 65 of file clamp_control.cc.

#### 6.1.3.3 void IDP::ClampControl::pick_up ( )

Pick up something using the clamp.

Definition at line 48 of file clamp_control.cc.

#### 6.1.3.4 void IDP::ClampControl::put_down ( )

Put something in the clamp down.

Definition at line 56 of file clamp_control.cc.

The documentation for this class was generated from the following files:

- src/libidp/clamp_control.h
- src/libidp/clamp_control.cc

## 6.2 IDP::HardwareAbstractionLayer Class Reference

Provide a hardware agnostic interface to the required hardware functionality.

`#include <hal.h>`

### Public Member Functions

- HardwareAbstractionLayer (const int robot)
  *Initialise the HAL class.*
- void motors_forward (const unsigned short int speed)
  *Drive both motors forwards at a given speed.*
- void motors_backward (const unsigned short int speed)
  *Drive both motors backwards at a given speed.*
- void motor_left_forward (const unsigned short int speed)
  *Drive the left motor forward at the given speed.*
- void motor_right_forward (const unsigned short int speed)
  *Drive the right motor forward at the given speed.*
- void motor_left_backward (const unsigned short int speed)
  *Drive the left motor backward at the given speed.*
- void motor_right_backward (const unsigned short int speed)
  *Drive the right motor backward at the given speed.*
- void motors_turn_left (const unsigned short int speed)
  *Drive the motors to steer the robot to the left.*
- void motors_turn_right (const unsigned short int speed)

*Drive the motors to steer the robot to the right.*

- void motors_stop ()

  *Stop all motors.*

- char status_register () const

  *Read the status register and return it.*

- void clear_status_register () const

  *Read the status register, discarding its value.*

- const LineSensors line_following_sensors () const

  *Read the I/O port connected to the line following sensors, then return a struct with their current state.*

- bool reset_switch () const

  *Read the reset switch and return its status.*

- bool grabber_switch () const

  *Read the switch mounted on the grabber arm and return its status.*

- unsigned short int colour_ldr () const

  *Get the analogue reading from the LDR used to detect colour.*

- unsigned short int bad_bobbin_ldr () const

  *Get the analogue reading from the LDR used to detect the bad bobbin.*

- void indication_LEDs (const bool led_0, const bool led_1, const bool led_2)

  *Set the bobbin colour indication LEDs.*

- void colour_leds (const bool red, const bool green)

  *Turn on and off the LEDs used to light up the bobbin for colour detection.*

- void bad_bobbin_led (const bool status)

  *Turn on and off the LED used to light up the top of the bobbin, for bad bobbin detection.*

- void grabber_jaw (const bool status)

  *Turn the grabber jaw actuator on or off.*

- void grabber_lift (const bool status)

  *Turn the grabber lift mechanism actuator on or off.*

### 6.2.1 Detailed Description

Provide a hardware agnostic interface to the required hardware functionality.

Definition at line 53 of file hal.h.

## 6.2.2 Constructor & Destructor Documentation

### 6.2.2.1 IDP::HardwareAbstractionLayer::HardwareAbstractionLayer ( const int *robot = 0* )

Initialise the HAL class.

Establishes the link to the robot.

Definition at line 31 of file hal.cc.

## 6.2.3 Member Function Documentation

### 6.2.3.1 unsigned short int IDP::HardwareAbstractionLayer::bad_bobbin_ldr ( ) const

Get the analogue reading from the LDR used to detect the bad bobbin.

**Returns**

The analogue reading value

Definition at line 303 of file hal.cc.

### 6.2.3.2 void IDP::HardwareAbstractionLayer::bad_bobbin_led ( const bool *status* )

Turn on and off the LED used to light up the top of the bobbin, for bad bobbin detection.

**Parameters**

***status*** Whether the LED should be on or off (true=on)

Definition at line 343 of file hal.cc.

### 6.2.3.3 void IDP::HardwareAbstractionLayer::clear_status_register ( ) const

Read the status register, discarding its value.

Definition at line 251 of file hal.cc.

### 6.2.3.4 unsigned short int IDP::HardwareAbstractionLayer::colour_ldr ( ) const

Get the analogue reading from the LDR used to detect colour.

**Returns**

The analogue reading value

Definition at line 293 of file hal.cc.

### 6.2.3.5 void IDP::HardwareAbstractionLayer::colour_leds ( const bool *red,* const bool *green* )

Turn on and off the LEDs used to light up the bobbin for colour detection.

**Parameters**

***red*** Whether the red LED should be on or off (true=on)

***green*** Whether the green LED should be on or off (true=on)

Definition at line 330 of file hal.cc.

#### 6.2.3.6 void IDP::HardwareAbstractionLayer::grabber_jaw ( const bool *status* )

Turn the grabber jaw actuator on or off.

**Parameters**

***status*** Jaw actuator status (true=on)

Definition at line 353 of file hal.cc.

#### 6.2.3.7 void IDP::HardwareAbstractionLayer::grabber_lift ( const bool *status* )

Turn the grabber lift mechanism actuator on or off.

**Parameters**

***status*** Lift actuator status (true=on)

Definition at line 363 of file hal.cc.

#### 6.2.3.8 bool IDP::HardwareAbstractionLayer::grabber_switch ( ) const

Read the switch mounted on the grabber arm and return its status.

**Returns**

The current value of the switch, true if pressed

Definition at line 283 of file hal.cc.

#### 6.2.3.9 void IDP::HardwareAbstractionLayer::indication_LEDs ( const bool *led_0*, const bool *led_1*, const bool *led_2* )

Set the bobbin colour indication LEDs.

**Parameters**

***led_0*** Whether LED0 should be on or off (true=on)

***led_1*** Whether LED1 should be on or off (true=on)

***led_2*** Whether LED2 should be on or off (true=on)

Definition at line 315 of file hal.cc.

#### 6.2.3.10 const LineSensors IDP::HardwareAbstractionLayer::line_following_sensors ( ) const

Read the I/O port connected to the line following sensors, then return a struct with their current state.

**Returns**

A LineSensors struct containing the current state of the sensors

Definition at line 214 of file hal.cc.

#### 6.2.3.11 void IDP::HardwareAbstractionLayer::motor_left_backward ( const unsigned short int *speed* )

Drive the left motor backward at the given speed.

**Parameters**

***speed*** The speed at which to drive the motor

Definition at line 132 of file hal.cc.

#### 6.2.3.12 void IDP::HardwareAbstractionLayer::motor_left_forward ( const unsigned short int *speed* )

Drive the left motor forward at the given speed.

**Parameters**

***speed*** The speed at which to drive the motor

Definition at line 98 of file hal.cc.

#### 6.2.3.13 void IDP::HardwareAbstractionLayer::motor_right_backward ( const unsigned short int *speed* )

Drive the right motor backward at the given speed.

**Parameters**

***speed*** The speed at which to drive the motor

Definition at line 149 of file hal.cc.

#### 6.2.3.14 void IDP::HardwareAbstractionLayer::motor_right_forward ( const unsigned short int *speed* )

Drive the right motor forward at the given speed.

**Parameters**

***speed*** The speed at which to drive the motor

Definition at line 115 of file hal.cc.

#### 6.2.3.15 void IDP::HardwareAbstractionLayer::motors_backward ( const unsigned short int *speed* )

Drive both motors backwards at a given speed.

**Parameters**

***speed*** The speed to drive at, 0 to 127

Definition at line 81 of file hal.cc.

#### 6.2.3.16 void IDP::HardwareAbstractionLayer::motors_forward ( const unsigned short int *speed* )

Drive both motors forwards at a given speed.

**Parameters**

***speed*** The speed to drive at, 0 to 127

Definition at line 64 of file hal.cc.

#### 6.2.3.17 void IDP::HardwareAbstractionLayer::motors_stop ( )

Stop all motors.

Definition at line 199 of file hal.cc.

#### 6.2.3.18 void IDP::HardwareAbstractionLayer::motors_turn_left ( const unsigned short int *speed* )

Drive the motors to steer the robot to the left.

**Parameters**

***speed*** The speed to drive at, 0 to 127

Definition at line 166 of file hal.cc.

#### 6.2.3.19 void IDP::HardwareAbstractionLayer::motors_turn_right ( const unsigned short int *speed* )

Drive the motors to steer the robot to the right.

**Parameters**

***speed*** The speed to drive at, 0 to 127

Definition at line 183 of file hal.cc.

#### 6.2.3.20 bool IDP::HardwareAbstractionLayer::reset_switch ( ) const

Read the reset switch and return its status.

**Returns**

The current value of the switch, true if pressed

Definition at line 273 of file hal.cc.

#### 6.2.3.21 char IDP::HardwareAbstractionLayer::status_register ( ) const

Read the status register and return it.

**Returns**

The STATUS register

Definition at line 262 of file hal.cc.

The documentation for this class was generated from the following files:

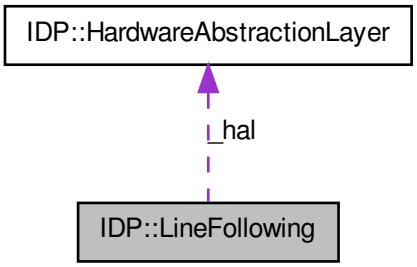
- src/libidp/hal.h
- src/libidp/hal.cc

## 6.3 IDP::LineFollowing Class Reference

Maintain the robot position correctly with respect to the white line markers, during driving and manouvering.

`#include <line_following.h>`

Collaboration diagram for IDP::LineFollowing:



## Public Member Functions

- LineFollowing (HardwareAbstractionLayer *hal)
  *Construct the Line Follower.*
- LineFollowingStatus follow_line (void)
  *Read line sensors and correct motor movement to keep us going straight.*
- LineFollowingStatus turn_left (void)
  *Turn the robot left until the sensors encounter another line.*
- LineFollowingStatus turn_right (void)
  *Turn the robot right until the sensors detect another line.*
- LineFollowingStatus turn_around_cw (void)
  *Turn the robot around clockwise until the sensors detect another line.*
- LineFollowingStatus turn_around_ccw (void)
  *Turn the robot around counterclockwise until the sensors detect another line.*
- LineFollowingStatus junction_status (void)
  *Return whether we can see a junction or not, without changing motor settings.*
- void set_speed (unsigned short int speed)
  *Set the speed that motors will be driven at.*

### 6.3.1 Detailed Description

Maintain the robot position correctly with respect to the white line markers, during driving and manouvering.

Definition at line 95 of file line_following.h.

### 6.3.2 Constructor & Destructor Documentation

#### 6.3.2.1 IDP::LineFollowing::LineFollowing ( HardwareAbstractionLayer * *hal* )

Construct the Line Follower.

Definition at line 57 of file line_following.cc.

### 6.3.3 Member Function Documentation

#### 6.3.3.1 LineFollowingStatus IDP::LineFollowing::follow_line ( void )

Read line sensors and correct motor movement to keep us going straight.

**Returns**

A LineFollowingStatus to indicate that either we are going fine, we are lost, or one or more possible turns were found.

Definition at line 71 of file line_following.cc.

#### 6.3.3.2 LineFollowingStatus IDP::LineFollowing::junction_status ( void )

Return whether we can see a junction or not, without changing motor settings.

**Returns**

A LineFollowingStatus indicating junctions or NO_TURNS_FOUND if no junctions found.

Definition at line 304 of file line_following.cc.

#### 6.3.3.3 void IDP::LineFollowing::set_speed ( unsigned short int *speed* )

Set the speed that motors will be driven at.

**Parameters**

***speed*** How fast to drive the motors, 0 to MOTOR_MAX_SPEED.

Definition at line 339 of file line_following.cc.

#### 6.3.3.4 LineFollowingStatus IDP::LineFollowing::turn_around_ccw ( void )

Turn the robot around counterclockwise until the sensors detect another line.

**Returns**

A LineFollowingStatus code

Definition at line 292 of file line_following.cc.

#### 6.3.3.5 LineFollowingStatus IDP::LineFollowing::turn_around_cw ( void )

Turn the robot around clockwise until the sensors detect another line.

**Returns**

A LineFollowingStatus code

Definition at line 281 of file line_following.cc.

#### 6.3.3.6 LineFollowingStatus IDP::LineFollowing::turn_left ( void )

Turn the robot left until the sensors encounter another line.

**Returns**

A LineFollowingStatus code

Definition at line 261 of file line_following.cc.

#### 6.3.3.7 LineFollowingStatus IDP::LineFollowing::turn_right ( void )

Turn the robot right until the sensors detect another line.

**Returns**

A LineFollowingStatus code

Definition at line 271 of file line_following.cc.

The documentation for this class was generated from the following files:

- src/libidp/line_following.h
- src/libidp/line_following.cc

## 6.4 IDP::LineSensors Struct Reference

Contains the LINE or NO_LINE status of each of the four IR sensors used for line following.

`#include <hal.h>`

### Public Attributes

- LineSensorStatus outer_left
- LineSensorStatus line_left
- LineSensorStatus line_right
- LineSensorStatus outer_right

### 6.4.1 Detailed Description

Contains the LINE or NO_LINE status of each of the four IR sensors used for line following.

Definition at line 41 of file hal.h.

### 6.4.2 Member Data Documentation

#### 6.4.2.1 LineSensorStatus IDP::LineSensors::line_left

Definition at line 44 of file hal.h.

#### 6.4.2.2 LineSensorStatus IDP::LineSensors::line_right

Definition at line 45 of file hal.h.

#### 6.4.2.3 LineSensorStatus IDP::LineSensors::outer_left

Definition at line 43 of file hal.h.

#### 6.4.2.4 LineSensorStatus IDP::LineSensors::outer_right

Definition at line 46 of file hal.h.

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

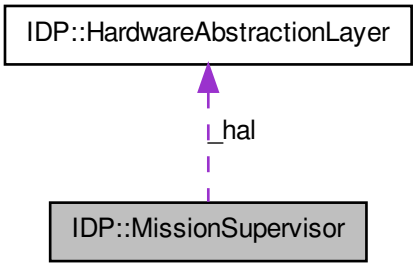
- src/libidp/hal.h

## 6.5 IDP::MissionSupervisor Class Reference

Control the overall robot behaviour and objective fulfillment.

`#include <mission_supervisor.h>`

Collaboration diagram for IDP::MissionSupervisor:




### Public Member Functions

- MissionSupervisor (int robot)
  *Construct the MissionSupervisor.*
- ~MissionSupervisor ()
  *Destruct the MissionSupervisor, deleting the HAL.*
- void run_task ()
  *Commence running the main task.*
- void drive_forward ()
  *Set both motors driving forwards.*
- void drive_backward ()
  *Set both motors driving backwards.*
- void stop ()
  *Stop all motors.*

- void test_line_sensor ()
  *Attempt to read the line sensor status.*
- void test_line_following ()
  *Test line following on a straight line.*
- void test_navigation ()
  *Test navigation code.*
- const HardwareAbstractionLayer * hal () const
  *Const accessor for the HAL.*

### 6.5.1 Detailed Description

Control the overall robot behaviour and objective fulfillment.

Definition at line 24 of file mission_supervisor.h.

### 6.5.2 Constructor & Destructor Documentation

#### 6.5.2.1 IDP::MissionSupervisor::MissionSupervisor ( int *robot* = `0` )

Construct the MissionSupervisor.

Initialises a link to the specified robot number, or 0 if running embedded.

**Parameters**

***robot*** Which robot to link to, or 0 if embedded

Definition at line 30 of file mission_supervisor.cc.

#### 6.5.2.2 IDP::MissionSupervisor::~MissionSupervisor ( )

Destruct the MissionSupervisor, deleting the HAL.

Definition at line 42 of file mission_supervisor.cc.

### 6.5.3 Member Function Documentation

#### 6.5.3.1 void IDP::MissionSupervisor::drive_backward ( )

Set both motors driving backwards.

Definition at line 70 of file mission_supervisor.cc.

#### 6.5.3.2 void IDP::MissionSupervisor::drive_forward ( )

Set both motors driving forwards.

Definition at line 59 of file mission_supervisor.cc.

#### 6.5.3.3 const HardwareAbstractionLayer * IDP::MissionSupervisor::hal ( ) const

Const accessor for the HAL.

Definition at line 256 of file mission_supervisor.cc.

#### 6.5.3.4 void IDP::MissionSupervisor::run_task ( )

Commence running the main task.

Definition at line 51 of file mission_supervisor.cc.

#### 6.5.3.5 void IDP::MissionSupervisor::stop ( )

Stop all motors.

Definition at line 80 of file mission_supervisor.cc.

#### 6.5.3.6 void IDP::MissionSupervisor::test_line_following ( )

Test line following on a straight line.

Definition at line 125 of file mission_supervisor.cc.

#### 6.5.3.7 void IDP::MissionSupervisor::test_line_sensor ( )

Attempt to read the line sensor status.

Definition at line 90 of file mission_supervisor.cc.

#### 6.5.3.8 void IDP::MissionSupervisor::test_navigation ( )

Test navigation code.

Definition at line 234 of file mission_supervisor.cc.

The documentation for this class was generated from the following files:

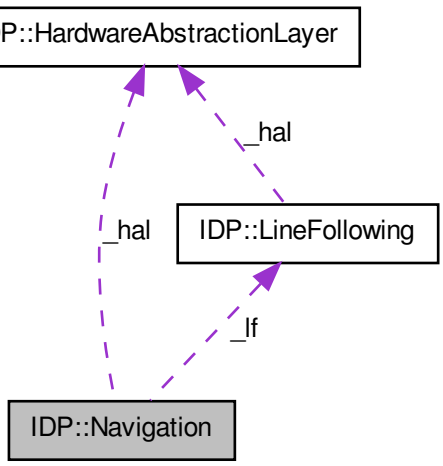
- src/libidp/mission_supervisor.h
- src/libidp/mission_supervisor.cc

## 6.6 IDP::Navigation Class Reference

Find a route from one place to another on the board, and maintain an estimate of the current position.

`#include <navigation.h>`

Collaboration diagram for IDP::Navigation:




## Public Member Functions

- Navigation (HardwareAbstractionLayer *hal, const NavigationNode from, const NavigationNode to)

  *Initialise the class, storing the const pointer to the HAL.*

- ~Navigation ()

  *Destruct Navigation, deleting the LineFollowing object.*

- NavigationStatus go (const NavigationLocation location)

  *Go to a NavigationLocation.*

- NavigationStatus go_node (const NavigationNode target)

  *Go to a particular NavigationNode.*

### 6.6.1 Detailed Description

Find a route from one place to another on the board, and maintain an estimate of the current position.

Definition at line 68 of file navigation.h.

## 6.6.2 Constructor & Destructor Documentation

### 6.6.2.1 IDP::Navigation::Navigation ( HardwareAbstractionLayer * *hal*, const NavigationNode *from* = `NODE7`, const NavigationNode *to* = `NODE8` )

Initialise the class, storing the const pointer to the HAL.

The optional parameters from and to can be used to define the starting position, but default to the 'start box'.

**Parameters**

***hal*** A const pointer to an instance of the HAL

***from*** The node behind the robot at the start

***to*** The node in front of the robot at the start

Definition at line 126 of file navigation.cc.

### 6.6.2.2 IDP::Navigation::~Navigation ( )

Destruct Navigation, deleting the LineFollowing object.

Definition at line 143 of file navigation.cc.

## 6.6.3 Member Function Documentation

### 6.6.3.1 NavigationStatus IDP::Navigation::go ( const NavigationLocation *location* )

Go to a NavigationLocation.

**Returns**

A NavigationStatus code

Definition at line 155 of file navigation.cc.

### 6.6.3.2 NavigationStatus IDP::Navigation::go_node ( const NavigationNode *target* )

Go to a particular NavigationNode.

**Returns**

A NavigationStatus code

Definition at line 166 of file navigation.cc.

The documentation for this class was generated from the following files:

- src/libidp/navigation.h
- src/libidp/navigation.cc

## 6.7 IDP::SelfTests Class Reference

Execute a variety of functionality self tests.

`#include <self_tests.h>`

### Public Member Functions

- SelfTests (int robot)

  *Constuct a SelfTest instance Completely seperate to mission supervisor and initialises own link to robot, with its own HAL instance.*

- void drive_forward (void)

  *Drive the robot forwards for a moment.*

- void drive_backward (void)

  *Drive the robot backwards for a moment.*

- void stop (void)

  *Stop all of the robot's motors.*

- void turn_left (void)

  *Drive motors in opposite directions to turn the robot left on the spot.*

- void turn_right (void)

  *Drive motors in opposite directions to turn the robot right on the spot.*

- void steer_left (void)

  *Drive forwards for a moment whilst reducing the speed of the left motor relative to the right to steer left.*

- void steer_right (void)

  *Drive forwards for a moment whilst reducing the speed of the right motor relative to the left to steer right.*

- void line_sensors (void)

  *Display the status (LINE or NO_LINE) of each of the four IR line following sensors.*

- void microswitches (void)

  *Display the state of each of the two microswitches.*

- void LDRs (void)

  *Display the current ADC read from the light dependent resistor.*

- void actuators (void)

  *Fire each of the actuators in turn.*

- void line_following (void)

  *Follow a line until further notice, without caring where we end up.*

- void clamp_control (void)

  *Use the actuators to pick up an object before placing it back down again.*

- void bobbin_analyse (void)

  *Analyse the colour of the bobbin that is currently being held in the clamp.*

- void navigate (void)

  *Select a source and destination and then navigate to the destination assuming we are starting at the source.*

- void position (void)

  *Drive slowly looking for an object in range for pickup, then position self ready to clamp said object.*

- void status_LEDs (void)

  *Turn on each of the status LEDs (used for indicating bobbin colour) in turn.*

- void colour_sensor_LEDs (void)

  *Turn on each of the coloured LEDs used for colour detection in turn.*

- void badness_LED (void)

  *Turn on the LED used for detecting bad bobbins.*

### 6.7.1 Detailed Description

Execute a variety of functionality self tests.

Definition at line 21 of file self_tests.h.

### 6.7.2 Constructor & Destructor Documentation

#### 6.7.2.1 IDP::SelfTests::SelfTests ( int *robot* = `0` )

Constuct a SelfTest instance Completely seperate to mission supervisor and initialises own link to robot, with its own HAL instance.

**Parameters**

***robot*** Which robot to link to, or 0 if embedded

Definition at line 28 of file self_tests.cc.

### 6.7.3 Member Function Documentation

#### 6.7.3.1 void IDP::SelfTests::actuators ( void )

Fire each of the actuators in turn.

Definition at line 122 of file self_tests.cc.

#### 6.7.3.2 void IDP::SelfTests::badness_LED ( void )

Turn on the LED used for detecting bad bobbins.

Definition at line 192 of file self_tests.cc.

#### 6.7.3.3 void IDP::SelfTests::bobbin_analyse ( void )

Analyse the colour of the bobbin that is currently being held in the clamp.

Definition at line 148 of file self_tests.cc.

#### 6.7.3.4 void IDP::SelfTests::clamp_control ( void )

Use the actuators to pick up an object before placing it back down again.

Definition at line 139 of file self_tests.cc.

#### 6.7.3.5 void IDP::SelfTests::colour_sensor_LEDs ( void )

Turn on each of the coloured LEDs used for colour detection in turn.

Definition at line 184 of file self_tests.cc.

#### 6.7.3.6 void IDP::SelfTests::drive_backward ( void )

Drive the robot backwards for a moment.

Definition at line 45 of file self_tests.cc.

#### 6.7.3.7 void IDP::SelfTests::drive_forward ( void )

Drive the robot forwards for a moment.

Definition at line 37 of file self_tests.cc.

#### 6.7.3.8 void IDP::SelfTests::LDRs ( void )

Display the current ADC read from the light dependent resistor.

Definition at line 114 of file self_tests.cc.

#### 6.7.3.9 void IDP::SelfTests::line_following ( void )

Follow a line until further notice, without caring where we end up.

Definition at line 130 of file self_tests.cc.

#### 6.7.3.10 void IDP::SelfTests::line_sensors ( void )

Display the status (LINE or NO_LINE) of each of the four IR line following sensors.

Definition at line 98 of file self_tests.cc.

#### 6.7.3.11 void IDP::SelfTests::microswitches ( void )

Display the state of each of the two microswitches.

Definition at line 106 of file self_tests.cc.

#### 6.7.3.12 void IDP::SelfTests::navigate ( void )

Select a source and destination and then navigate to the destination assuming we are starting at the source.

Definition at line 157 of file self_tests.cc.

#### 6.7.3.13 void IDP::SelfTests::position ( void )

Drive slowly looking for an object in range for pickup, then position self ready to clamp said object.

Definition at line 166 of file self_tests.cc.

#### 6.7.3.14 void IDP::SelfTests::status_LEDs ( void )

Turn on each of the status LEDs (used for indicating bobbin colour) in turn.

Definition at line 175 of file self_tests.cc.

#### 6.7.3.15 void IDP::SelfTests::steer_left ( void )

Drive forwards for a moment whilst reducing the speed of the left motor relative to the right to steer left.

Definition at line 80 of file self_tests.cc.

#### 6.7.3.16 void IDP::SelfTests::steer_right ( void )

Drive forwards for a moment whilst reducing the speed of the right motor relative to the left to steer right.

Definition at line 89 of file self_tests.cc.

#### 6.7.3.17 void IDP::SelfTests::stop ( void )

Stop all of the robot's motors.

Definition at line 53 of file self_tests.cc.

#### 6.7.3.18 void IDP::SelfTests::turn_left ( void )

Drive motors in opposite directions to turn the robot left on the spot.

Definition at line 62 of file self_tests.cc.

#### 6.7.3.19 void IDP::SelfTests::turn_right ( void )

Drive motors in opposite directions to turn the robot right on the spot.

Definition at line 71 of file self_tests.cc.

The documentation for this class was generated from the following files:

- src/libidp/self_tests.h
- src/libidp/self_tests.cc

## 6.8 IDP::StatusWatchdog Class Reference

Polls the STATUS register of the microcontroller any handles any errors that may arise.

`#include <status_watchdog.h>`

### Public Member Functions

- int check () const

  *Read the STATUS register of the microcontroller and return the value.*

### 6.8.1 Detailed Description

Polls the STATUS register of the microcontroller any handles any errors that may arise.

Definition at line 20 of file status_watchdog.h.

### 6.8.2 Member Function Documentation

#### 6.8.2.1 int IDP::StatusWatchdog::check ( ) const

Read the STATUS register of the microcontroller and return the value.

**Returns**

The error encountered, if any

Definition at line 23 of file status_watchdog.cc.

The documentation for this class was generated from the following files:

- src/libidp/status_watchdog.h
- src/libidp/status_watchdog.cc

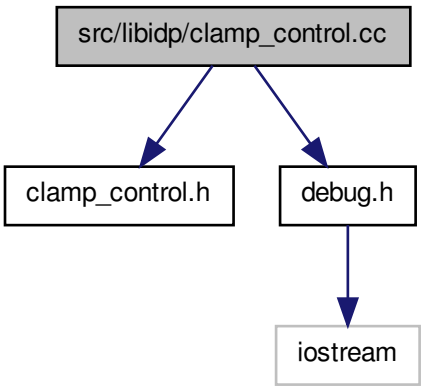
# Chapter 7

# File Documentation

## 7.1 src/libidp/clamp_control.cc File Reference

```
#include "clamp_control.h"
#include "debug.h"
```

Include dependency graph for clamp_control.cc:




### Namespaces

- namespace IDP

### Defines

- #define MODULE_NAME "Clamp"

- #define TRACE_ENABLED false
- #define DEBUG_ENABLED true
- #define INFO_ENABLED true
- #define ERROR_ENABLED true

### 7.1.1 Define Documentation

#### 7.1.1.1 #define DEBUG_ENABLED true

Definition at line 12 of file clamp_control.cc.

#### 7.1.1.2 #define ERROR_ENABLED true

Definition at line 14 of file clamp_control.cc.

#### 7.1.1.3 #define INFO_ENABLED true

Definition at line 13 of file clamp_control.cc.

#### 7.1.1.4 #define MODULE_NAME "Clamp"

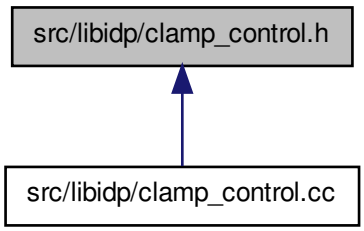
Definition at line 10 of file clamp_control.cc.

#### 7.1.1.5 #define TRACE_ENABLED false

Definition at line 11 of file clamp_control.cc.

## 7.2 src/libidp/clamp_control.h File Reference

This graph shows which files directly or indirectly include this file:



### Classes

- class IDP::ClampControl

  *Manage the actuation of the clamp, as well as the detection and analysis of bobbins for their colour and badness.*

### Namespaces

- namespace IDP

### Enumerations

- enum IDP::BobbinColour { IDP::BOBBIN_RED, IDP::BOBBIN_GREEN, IDP::BOBBIN_WHITE }

  *Bobbin colours.*

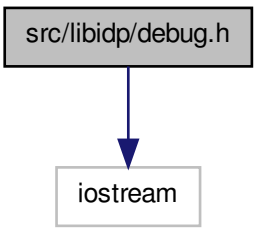
- enum IDP::BobbinBadness { IDP::BOBBIN_GOOD, IDP::BOBBIN_BAD }

  *Bobbin good or bad.*

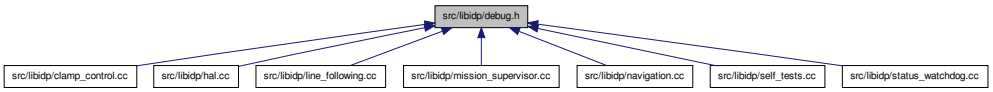
## 7.3 src/libidp/debug.h File Reference

```
#include <iostream>
```

Include dependency graph for debug.h:



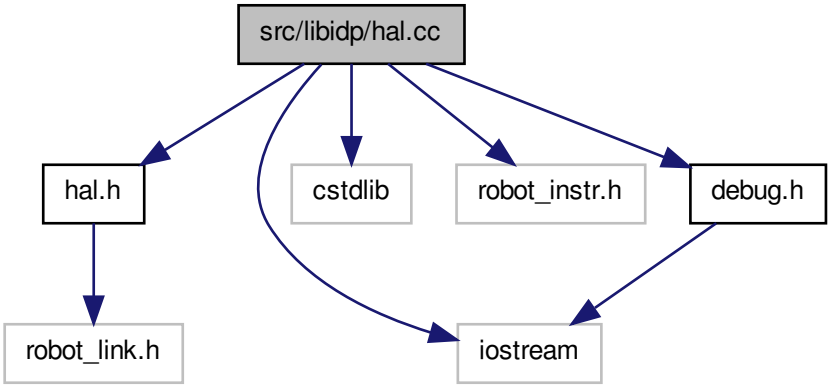

This graph shows which files directly or indirectly include this file:



## 7.4 src/libidp/hal.cc File Reference

```
#include "hal.h"
#include <iostream>
#include <cstdlib>
#include <robot_instr.h>
#include "debug.h"
```

Include dependency graph for hal.cc:




### Namespaces

- namespace IDP

### Defines

- #define MODULE_NAME "HAL"
- #define TRACE_ENABLED false
- #define DEBUG_ENABLED false
- #define INFO_ENABLED true
- #define ERROR_ENABLED true
- #define UNUSED(x) (void)(x)

### 7.4.1 Define Documentation

#### 7.4.1.1 #define DEBUG_ENABLED false

Definition at line 17 of file hal.cc.

#### 7.4.1.2 #define ERROR_ENABLED true

Definition at line 19 of file hal.cc.

#### 7.4.1.3 #define INFO_ENABLED true

Definition at line 18 of file hal.cc.

#### 7.4.1.4 #define MODULE_NAME "HAL"

Definition at line 15 of file hal.cc.

#### 7.4.1.5 #define TRACE_ENABLED false

Definition at line 16 of file hal.cc.

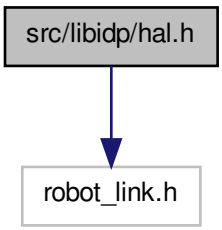
#### 7.4.1.6 #define UNUSED( *x* ) (void)(x)

Definition at line 23 of file hal.cc.

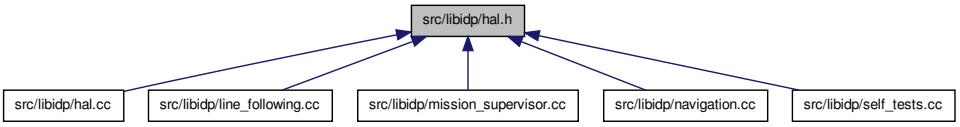
## 7.5 src/libidp/hal.h File Reference

```
#include <robot_link.h>
```

Include dependency graph for hal.h:



This graph shows which files directly or indirectly include this file:




## Classes

- struct IDP::LineSensors

  *Contains the LINE or NO_LINE status of each of the four IR sensors used for line following.*

- class IDP::HardwareAbstractionLayer

  *Provide a hardware agnostic interface to the required hardware functionality.*

## Namespaces

- namespace IDP

## Enumerations

- enum IDP::LineSensorStatus { IDP::LINE, IDP::NO_LINE }

  *Line sensor status, LINE or NO_LINE.*

## Variables

- const int IDP::MOTOR_MAX_SPEED = 127

  *Highest allowable motor speed in either direction.*

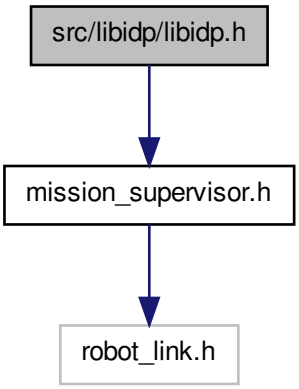
- const int IDP::MOTOR_RAMP_TIME = 16

  *How fast to ramp the motors towards the desired speed.*

# 7.6 src/libidp/libidp.h File Reference

```
#include "mission_supervisor.h"
```

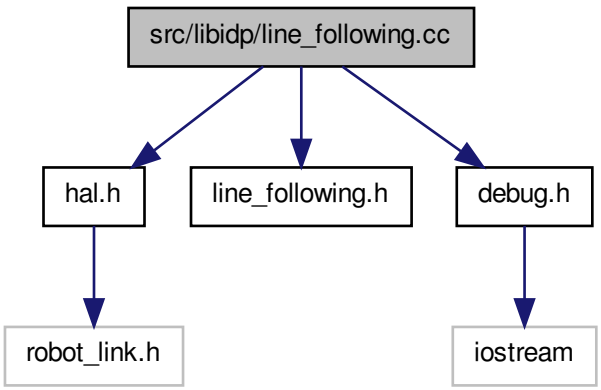
Include dependency graph for libidp.h:




## 7.7 src/libidp/line_following.cc File Reference

```
#include "hal.h"
#include "line_following.h"
#include "debug.h"
```

Include dependency graph for line_following.cc:



## Namespaces

- namespace IDP

## Defines

- #define MODULE_NAME "LineFollowing"
- #define TRACE_ENABLED false
- #define DEBUG_ENABLED true
- #define INFO_ENABLED true
- #define ERROR_ENABLED true

## Functions

- unsigned short int IDP::cap_correction (const unsigned short int correction)

  *Cap a line following correction value to MAX_CORRECTION.*

### 7.7.1 Define Documentation

#### 7.7.1.1 #define DEBUG_ENABLED true

Definition at line 13 of file line_following.cc.

#### 7.7.1.2 #define ERROR_ENABLED true

Definition at line 15 of file line_following.cc.

#### 7.7.1.3 #define INFO_ENABLED true

Definition at line 14 of file line_following.cc.

#### 7.7.1.4 #define MODULE_NAME "LineFollowing"

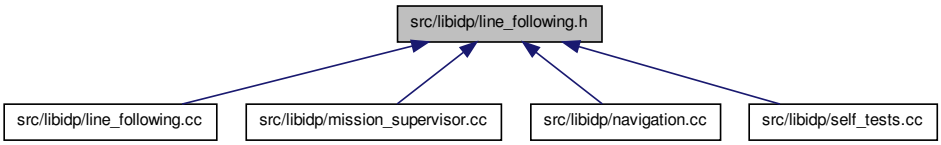
Definition at line 11 of file line_following.cc.

#### 7.7.1.5 #define TRACE_ENABLED false

Definition at line 12 of file line_following.cc.

# 7.8 src/libidp/line_following.h File Reference

This graph shows which files directly or indirectly include this file:




## Classes

- class IDP::LineFollowing

  *Maintain the robot position correctly with respect to the white line markers, during driving and manouvering.*

## Namespaces

- namespace IDP

## Enumerations

- enum IDP::LineFollowingStatus {

  IDP::ACTION_IN_PROGRESS, IDP::ACTION_COMPLETED, IDP::LEFT_TURN_FOUND, IDP::RIGHT_TURN_FOUND,

  IDP::BOTH_TURNS_FOUND, IDP::LOST, IDP::NO_TURNS_FOUND }

  *Line following return status codes.*

- enum IDP::LineFollowingTurnDirection {

  IDP::TURN_LEFT, IDP::TURN_RIGHT, IDP::TURN_AROUND_CW, IDP::TURN_AROUND_-CCW,

  IDP::MAX_TURN_DIRECTION }

  *Possible turn directions.*

- enum IDP::LineFollowingLineStatus { IDP::ON_LINE, IDP::LOST_LINE, IDP::OTHER, IDP::MAX_LINE_STATUS }

  *Possible line statuses, used internally.*

## Functions

- unsigned short int IDP::cap_correction (const unsigned short int correction)

  *Cap a line following correction value to MAX_CORRECTION.*

### Variables

- const double IDP::INTEGRAL_GAIN = 4.0

  *Constant for integral control in line following.*

- const short unsigned int IDP::MAX_CORRECTION = 127

  *Maximum differential correction value before it gets capped.*

- const unsigned int IDP::LOST_TIMEOUT = 50

  *The number of loop iterations before we count as lost.*

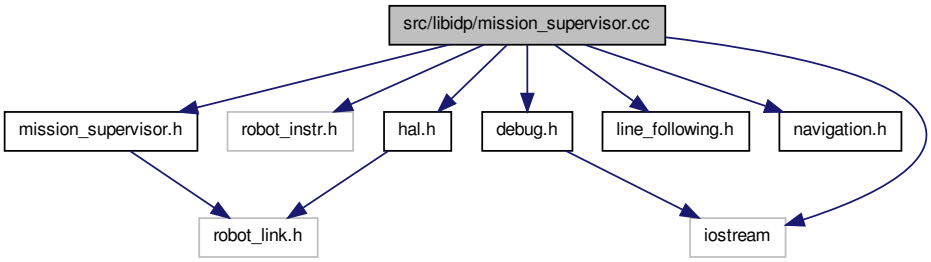
- const unsigned int IDP::EDGE_ERROR = 2

  *How much an outer sensor seeing the edge of a line should add to the appropriate error.*

## 7.9 src/libidp/mission_supervisor.cc File Reference

```
#include <iostream>
#include <robot_instr.h>
#include "mission_supervisor.h"
#include "hal.h"
#include "line_following.h"
#include "navigation.h"
#include "debug.h"
```

Include dependency graph for mission_supervisor.cc:




### Namespaces

- namespace IDP

### Defines

- #define MODULE_NAME "MisSup"

- #define TRACE_ENABLED false
- #define DEBUG_ENABLED true
- #define INFO_ENABLED true
- #define ERROR_ENABLED true

### 7.9.1 Define Documentation

#### 7.9.1.1 #define DEBUG_ENABLED true

Definition at line 18 of file mission_supervisor.cc.

#### 7.9.1.2 #define ERROR_ENABLED true

Definition at line 20 of file mission_supervisor.cc.

#### 7.9.1.3 #define INFO_ENABLED true

Definition at line 19 of file mission_supervisor.cc.

#### 7.9.1.4 #define MODULE_NAME "MisSup"

Definition at line 16 of file mission_supervisor.cc.

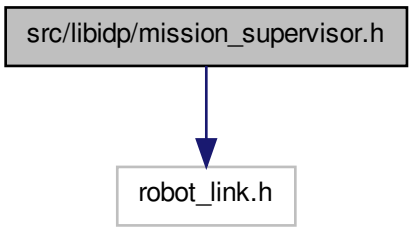
#### 7.9.1.5 #define TRACE_ENABLED false

Definition at line 17 of file mission_supervisor.cc.

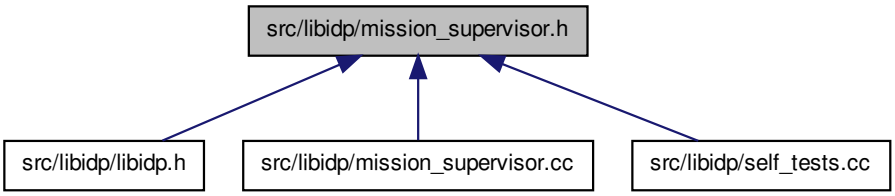
## 7.10 src/libidp/mission_supervisor.h File Reference

```
#include <robot_link.h>
```

Include dependency graph for mission_supervisor.h:



This graph shows which files directly or indirectly include this file:




## Classes

- class IDP::MissionSupervisor

  *Control the overall robot behaviour and objective fulfillment.*

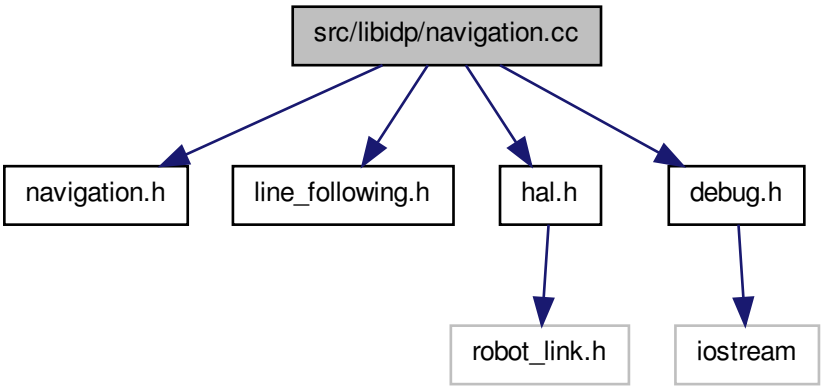
## Namespaces

- namespace IDP

# 7.11 src/libidp/navigation.cc File Reference

```
#include "navigation.h"
#include "line_following.h"
#include "hal.h"
#include "debug.h"
```

Include dependency graph for navigation.cc:




## Namespaces

- namespace IDP

## Defines

- #define MODULE_NAME "Navigation"
- #define TRACE_ENABLED false
- #define DEBUG_ENABLED true
- #define INFO_ENABLED true
- #define ERROR_ENABLED true
- #define UNUSED(x) (void)(x)

## Variables

- const NavigationTurn IDP::NAVIGATION_NODE_TURNS [MAX_DIRECTION][MAX_NODE]

  *The turns at each node.*

- const NavigationTurn IDP::NAVIGATION_TURN_MAP [MAX_DIRECTION][MAX_NODE]

  *Turns that should be taken at each node in each direction.*

- const NavigationNode IDP::NAVIGATION_LOCATION_LOOKUP [MAX_LOCATION][2]

  *The lookup table of NavigationLocations to a pair of NavigationNodes indicating the start and end node (with implied direction).*

- const NavigationNode IDP::NAVIGATION_ROUTE_MAP [MAX_DIRECTION][MAX_NODE]

  *The route to take, node by node.*

### 7.11.1 Define Documentation

#### 7.11.1.1 #define DEBUG_ENABLED true

Definition at line 14 of file navigation.cc.

#### 7.11.1.2 #define ERROR_ENABLED true

Definition at line 16 of file navigation.cc.

#### 7.11.1.3 #define INFO_ENABLED true

Definition at line 15 of file navigation.cc.

#### 7.11.1.4 #define MODULE_NAME "Navigation"

Definition at line 12 of file navigation.cc.

#### 7.11.1.5 #define TRACE_ENABLED false

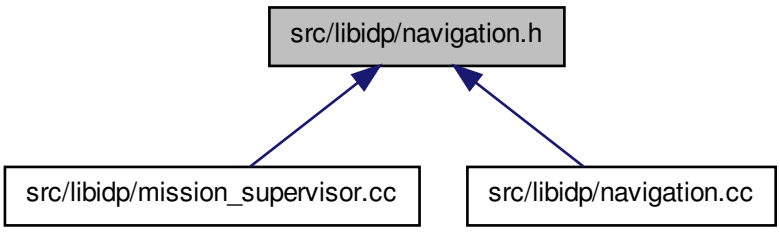
Definition at line 13 of file navigation.cc.

#### 7.11.1.6 #define UNUSED( *x* ) (void)(x)

Definition at line 20 of file navigation.cc.

## 7.12 src/libidp/navigation.h File Reference

This graph shows which files directly or indirectly include this file:



## Classes

- class IDP::Navigation

  *Find a route from one place to another on the board, and maintain an estimate of the current position.*

## Namespaces

- namespace IDP

## Enumerations

- enum IDP::NavigationStatus { IDP::NAVIGATION_ENROUTE, IDP::NAVIGATION_ARRIVED, IDP::NAVIGATION_LOST, IDP::MAX_STATUS }

  *Current navigation status.*

- enum IDP::NavigationLocation { IDP::NAVIGATION_BOXES, IDP::NAVIGATION_RACK, IDP::NAVIGATION_DELIVERY, IDP::MAX_LOCATION }

  *Possible locations for navigation to be asked to go to.*

- enum IDP::NavigationDirection { IDP::NAVIGATION_CLOCKWISE, IDP::NAVIGATION_-ANTICLOCKWISE, IDP::MAX_DIRECTION }

  *Directions around the circuit.*

- enum IDP::NavigationNode {

  IDP::NODE1, IDP::NODE2, IDP::NODE3, IDP::NODE4,

  IDP::NODE5, IDP::NODE6, IDP::NODE7, IDP::NODE8,

  IDP::NODE9, IDP::NODE10, IDP::NODE11, IDP::MAX_NODE }

  *Navigation nodes, numbered clockwise from the bottom right corner of the table.*

- enum IDP::NavigationTurn {

  IDP::STRAIGHT, IDP::LEFT, IDP::RIGHT, IDP::BOTH,

  IDP::LEFT_AND_STRAIGHT, IDP::RIGHT_AND_STRAIGHT, IDP::BOTH_AND_-STRAIGHT, IDP::END_OF_LINE,

  IDP::MAX_TURNS }

  *Possible turns at a node.*

- enum IDP::NavigationCachedJunction {

  IDP::NO_CACHE, IDP::LEFT_TURN, IDP::RIGHT_TURN, IDP::BOTH_TURNS,

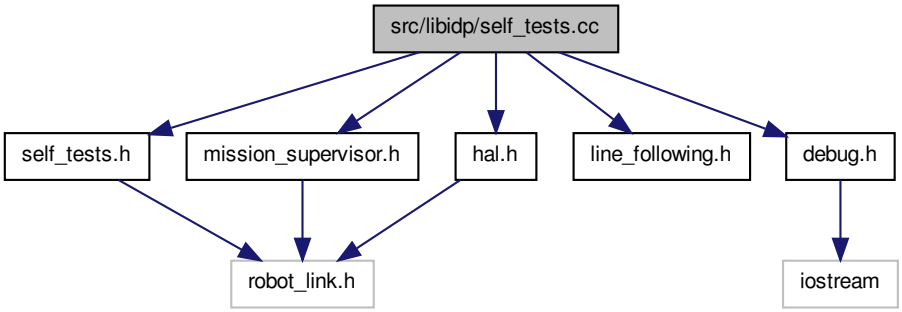
  IDP::NO_TURNS }

  *Cached junction information for use while driving over a junction or executing a turn.*

## 7.13 src/libidp/self_tests.cc File Reference

```
#include "self_tests.h"
#include "mission_supervisor.h"
#include "hal.h"
#include "line_following.h"
#include "debug.h"
```

Include dependency graph for self_tests.cc:




### Namespaces

- namespace IDP

### Defines

- #define MODULE_NAME "SelfTests"
- #define TRACE_ENABLED false
- #define DEBUG_ENABLED true
- #define INFO_ENABLED true
- #define ERROR_ENABLED true

### 7.13.1 Define Documentation

#### 7.13.1.1 #define DEBUG_ENABLED true

Definition at line 16 of file self_tests.cc.

#### 7.13.1.2 #define ERROR_ENABLED true

Definition at line 18 of file self_tests.cc.

#### 7.13.1.3 #define INFO_ENABLED true

Definition at line 17 of file self_tests.cc.

#### 7.13.1.4 #define MODULE_NAME "SelfTests"

Definition at line 14 of file self_tests.cc.

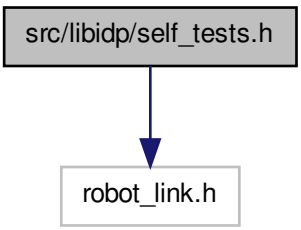
#### 7.13.1.5 #define TRACE_ENABLED false

Definition at line 15 of file self_tests.cc.

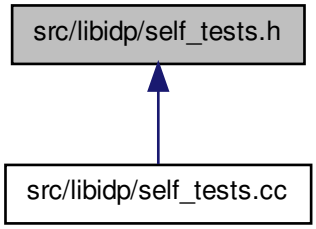
## 7.14 src/libidp/self_tests.h File Reference

```
#include <robot_link.h>
```

Include dependency graph for self_tests.h:




This graph shows which files directly or indirectly include this file:



### Classes

- class IDP::SelfTests

  *Execute a variety of functionality self tests.*

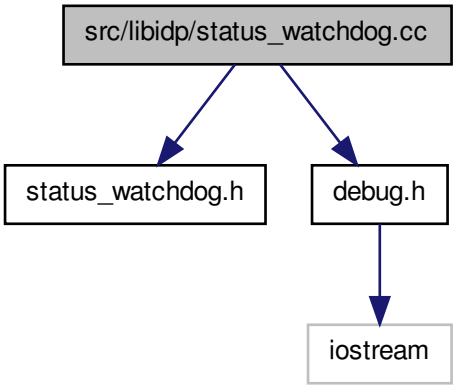
### Namespaces

- namespace IDP

## 7.15 src/libidp/status_watchdog.cc File Reference

```
#include "status_watchdog.h"
#include "debug.h"
```

Include dependency graph for status_watchdog.cc:




### Namespaces

- namespace IDP

### Defines

- #define MODULE_NAME "StatusWatch"
- #define TRACE_ENABLED false
- #define DEBUG_ENABLED true
- #define INFO_ENABLED true
- #define ERROR_ENABLED true

### 7.15.1 Define Documentation

#### 7.15.1.1 #define DEBUG_ENABLED true

Definition at line 13 of file status_watchdog.cc.

#### 7.15.1.2 #define ERROR_ENABLED true

Definition at line 15 of file status_watchdog.cc.

#### 7.15.1.3 #define INFO_ENABLED true

Definition at line 14 of file status_watchdog.cc.

#### 7.15.1.4 #define MODULE_NAME "StatusWatch"

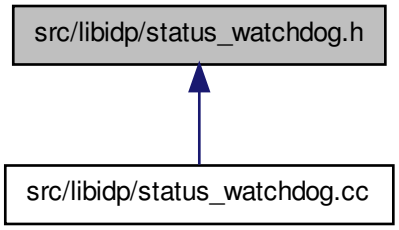
Definition at line 11 of file status_watchdog.cc.

#### 7.15.1.5 #define TRACE_ENABLED false

Definition at line 12 of file status_watchdog.cc.

## 7.16 src/libidp/status_watchdog.h File Reference

This graph shows which files directly or indirectly include this file:




### Classes

- class IDP::StatusWatchdog

  *Polls the STATUS register of the microcontroller any handles any errors that may arise.*

## Namespaces

- namespace IDP

# Index