Config.h settings

Settings found in config.h are used for customizing quadcopter flight settings and a number of software settings.

Flight control settings

This settings comprise of rate control, high and low, expo, if needed to be performed by quad itself (for stock tx) and switch config, mainly for level mode switching.

Rate

The rate is changed by the following lines in config.h file. The unit is degrees / second. The number is the rotation rate at max stick deflection, for example 360 would perform a full turn in 1 second.

```
// rate in deg/sec
// for acro mode
#define MAX_RATE 360.0
#define MAX_RATEYAW 360.0
```

Low rates are controlled by a multiplier, which is applied to the rates above. The low rates are usually used for the stock tx, as the rate hi/low channel is also set by default to work with it.

```
#define LOW_RATES_MULTI 0.5f
```

Switches (auxiliary channels)

Switches/buttons are used to control functions such as level/acro mode change, dual rates and flips.

This functions can be assigned to any channel, if using a devo or a module. The number of channels depends on radio protocol specifications.

For the stock tx, only some buttons can be used.The H8 tx supports only the rate button (called expert here) and using the trims as switches. The flip button can only be used for flips.

```
// level / acro mode switch

// CH_FLIP - flip
// CH_EXPERT - expert
// CH_HEADFREE - headfree
// CH_RTH - headingreturn
// CH_AUX1 - AUX1 ( gestures <<v and>>v)
// CH_PIT_TRIM - Pitch trims ***1**
// CH_RLL_TRIM - Roll trims ***1**
// CH_THR_TRIM - Throttle trims ***1**
// CH_YAW_TRIM - Yaw trims ***1**
```

```
// CH_INV - Inverted mode
// CH_VID
// CH_PIC
// CH_ON - on always
// CH_OFF - off always

// devo can use DEVO_CHAN_5 - DEVO_CHAN_10

#define RATES CH_EXPERT
#define LEVELMODE CH_AUX1
#define STARTFLIP CH_OFF
#define LEDS_ON CH_FLIP

// **1***  available only when #define USE_STOCK_TX is set
```

Special channels: Not all channels are sent from the transmitter, some channels are based in the software, currently only gesture controlled channels CH_AUX1.

Available channels depend on the *radio protocol* selected, the ones described are for Bayang protocol (recomended)

Stock tx

The trim buttons do not do anything in the stock tx. To use the trims for controlling a function, set the function channel to the trim (such as CH_PIT_TRIM - pitch trims) and enable "#define USE_STOCK_TX"

*Do not enable "**#define USE_STOCK_TX**" if you want to use a devo or tx module and the trims are set as a function!*

Devo tx

Silverware supports setting a channel number as found in DeviationTX:DEVO_CHAN_5 - DEVO_CHAN_10 for use with deviaton tx or with nrf_multipro module.

```
#define LEDS_ON DEVO_CHAN_9 // sets leds to channel 9
```

For the multimodule, use MULTI_CHAN_5 for channel 5, for example.

Other settings

Auto throttle feature:

The auto throttle will keep a constant upwards thrust as the quad leans in one direction. Used in level mode, usually.

Example: Suppose the quadcopter is at a 45 degrees angle. Because of the angle, only half the thrust will contribute to maintaining height. The other half will provide lateral acceleration. With "auto throttle" on, the software will increase throttle to compensate. As a result, the quad will maintain altitude better while maneuvering.

```
#define AUTO_THROTTLE
```

Lower throttle feature

With this option enabled, the quadcopter will lower the throttle in order to maintain better control near full throttle. Without it (default) the quadcopter will usually lean slightly in one direction at full throttle, as there may not be enough control ability. (the motors can't increase over maximum).

Usually, other firmwares have this option on, but in silverware, it is optional, because it results in a loss of thrust at full throttle, which small brushed quads most certainly can do without.

An opposite option, increase thrust, is of use when throttle is near zero, and will improve control in such situations.

The “type 3” mix is more useful with brushless builds, it's instant acting, but it also has the largest throttle loss.

```
#define MIX_LOWER_THROTTLE
//#define MIX_INCREASE_THROTTLE

//#define MIX_LOWER_THROTTLE_3
//#define MIX_INCREASE_THROTTLE_3
```

Throttle transient compensation feature

The TTCF feature improves throttle response of the quadcopter. The curve has been measured for 6mm motors, and it may not work the same with other motors. The factor can be adjusted also by adding the line to config.h. With this feature on, the quadcopter will react faster to throttle changes.

This feature only works on the throttle stick, it does not affect controls in any other way. However, the increase motor use may reduce flight time.

```
#define THROTTLE_TRANSIENT_COMPENSATION

// this line may be added
#define THROTTLE_TRANSIENT_COMPENSATION_FACTOR 7.0
```

Gyro lpf filter (software)

The software lpf filter is a custom gyro filter, additional to the hardware filter which is present in the gyro device. The hardware filter is set around 43Hz by default, but for additional vibration removal, a software filter can be added.

Changing the filters affects the tuning of the pids, it's a good idea to consider the filter before tuning.

The last 2 filters have custom frequency, and they also account for variable sample rate, or different from default. They are recommended with gcc as the loop time is exceeded there. All other filters are calculated for a loop time of 1Khz (1000 uS).

```
// set only one below
//#define SOFT_LPF_1ST_023HZ
```

```
//#define SOFT_LPF_1ST_043HZ
//#define SOFT_LPF_1ST_100HZ
//#define SOFT_LPF_2ND_043HZ
#define SOFT_LPF_2ND_088HZ
//#define SOFT_LPF_4TH_088HZ
//#define SOFT_LPF_4TH_160HZ
//#define SOFT_LPF_4TH_250HZ
//#define SOFT_LPF_1ST_HZ 100
//#define SOFT_LPF_2ST_HZ 100
//#define SOFT_LPF_NONE
```

Gyro lpf filter (hardware)

The hardware gyro lpf filter is part of the gyro integrated circuit. It's setting changes the frequency of the internal filter. The internal filter also has a latency which may affect pid P and D terms. A lower latency may be better, however vibration will limit the usefulness of higher gyro frequencies. The “0” setting should be avoided.

```
// gyro filter 0 = 250hz delay 0.97mS
// gyro filter 1 = 184hz delay 2.9mS
// gyro filter 2 = 92hz delay 3.9mS
// gyro filter 3 = 41hz delay 5.9mS (Default)

#define GYRO_LOW_PASS_FILTER 3
```

Motor filter feature

There are 2 motor filtering options, a hanning 3 tap filter which reduces very high frequencies only, and a 1st order low pass filter that uses a coefficient as a setting. The motor filter has effects on pid tuning similar to those of the gyro low pass filters.

```
// enable motor filter - select one
// motorfilter1: hanning 3 sample fir filter
// motorfilter2: 1st lpf, 0.2 - 0.6 , 0.6 = less filtering
//#define MOTOR_FILTER
#define MOTOR_FILTER2_ALPHA 0.3
```

Motor curve

In silverware, the motors are linearized so that the resulting thrust is linear. the curves are obtained by measuring the motors and propellor combination. Although it's not necessary to know the curve, using a curve allows the pids to be consistent across the throttle range.

Motor linearity changes somewhat with pwm frequency, and for this reason each curve also has a frequency at which it was measured.

```
// pwm frequency for motor control
#define PWMFREQ 24000

// motor curve to use
```

```
// the pwm frequency has to be set independently
//#define MOTOR_CURVE_NONE
//#define MOTOR_CURVE_85MM_32KHZ
//#define BOLDCLASH_716MM_8K
#define BOLDCLASH_716MM_24K
```