AN-015 Simple Motion Detection Interrupt

A simple motion detection host interrupt pin is available starting with version 1.3.1 firmware release. The HOST_INT pin provides a simple means of motion detection without having to read and interpret the reported speed or magnitude information from the OSP241/OPS242.

This application note describes the motion detection HOST_INT pin function and how it may be used for simple triggering of a user interface when objects are detected. It will also describe a means of filtering the reported data to try to capture objects of interest (ex. a person walking) and not clutter from other objects detected.

HOST_INT Interface

Starting with v1.3.1 firmware release, the OPS241 and OPS242 have a new, simple interface to alert for motion detection. The new firmware uses filter settings to trigger the HOST_INT pin on the sensor and pull it low when an object is detected in the field of view.

The assigned pin on the OPS242 is the HOST_INT located at pin 3 on header J8. The pin uses 3.3V signaling and is active Low. Upon detection of an object, the pin voltage will pulldown to near 0V. On the OPS241 (serial number ≥ 1000), the signal comes out to pin 6 on header J5 and is labeled INT0. This signal is level shifted up to 5V so that it can be used for direct connection to an Arduino. Early OPS241 (serial number <1000), the signal comes out to test point 24 and uses only 3.3V signaling.

Hysteresis is built into the detection scheme of the HOST_INT pin. This is used to make sure the pin does not trip from spurious data and solid detection of an object has been made. The hysteresis requires that at least two speed and/or magnitude reports meeting the filter settings are seen before the HOST_INT is triggered. The HOST_INT will stay triggered (Low) until two consecutive reports not meeting the filter settings are seen (Figure 1). In this manner, the shortest time the HOST_INT pin will trigger is two report lengths of time. With the default settings, reports are sent approximately every 156 ms so the minimum Low time will be around 312 ms. Changing the buffer size and sampling rate will make this value either shorter or longer. The basic timing for different buffer size and sampling rates is shown in Table 2.

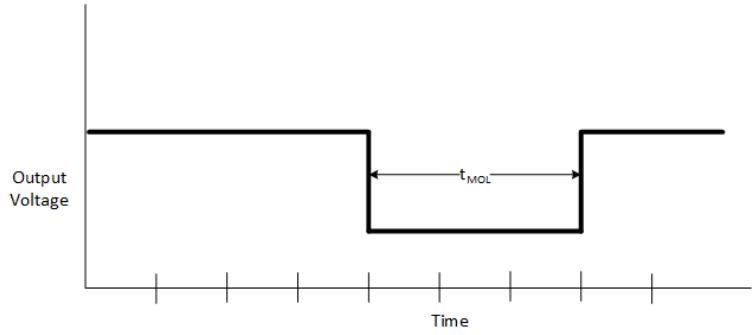

Figure 1. HOST_INT Active Low Time

Table 1 below gives an example of several speed reports and the output voltage on the HOST_INT line. The example uses a speed filter of 0.5 (set R > 0.5). Once two consecutive speed reports greater than 0.5 are seen, the output will be triggered. In this example, three consecutive reports meet the filter requirements. Upon seeing two consecutive reports below the speed filter, the HOST_INT will return high.

Table 1. Example Report Data (speed filter R > 0.5)

Report Number	Reported Speed	Output Voltage	Notes
1	0.18	High	
2	0.09	High	
3	1.40	High	
4	1.20	High	Motion confirmed present
5	1.10	Low	
6	0.09	Low	
7	0.09	Low	Motion confirmed gone
8	0.18	High	

Table 2. Base Report Rate Time

Sample Rate	Buffer Size	Total Processing Time (ms)	Report Rate (Hz)
5,000	256	218	4.6
	512	232	4.3
	1024	259	3.9
10,000	256	114	8.8
	512	126	7.9
	1024	156	6.4
20,000	256	64	15.6
	512	77	13.0
	1024	104	9.6
50,000	256	33	30.3
	512	46	21.7
	1024	73	13.7
100,000	256	23	43.5
	512	35	28.6
	1024	64	15.6

Speed and Magnitude Filtering

In addition to the simple HOST_INT trigger, filtering has been improved to provide for min and max values on both speed and magnitude. This can be used to filter out unwanted clutter from a field of view. For example, if only cars are desired to be seen for a sensor mounted on a street light and not a person walking

past it, the speed and/or magnitude can be set to only detect cars. Or the opposite can be used to filter cars out to only detect people.

With v1.3.1, the API has been updated for both speed and magnitude filtering on min and max values. See Application Note AN-10 API Interface for details about the full API. Figure 2 gives a graphical view of the speed and magnitude filter. Setting either R (speed) or Q (magnitude) provides the filter settings that control when HOST_INT is triggered. The default settings do not have any speed filtering and magnitude setting is Q = 100.

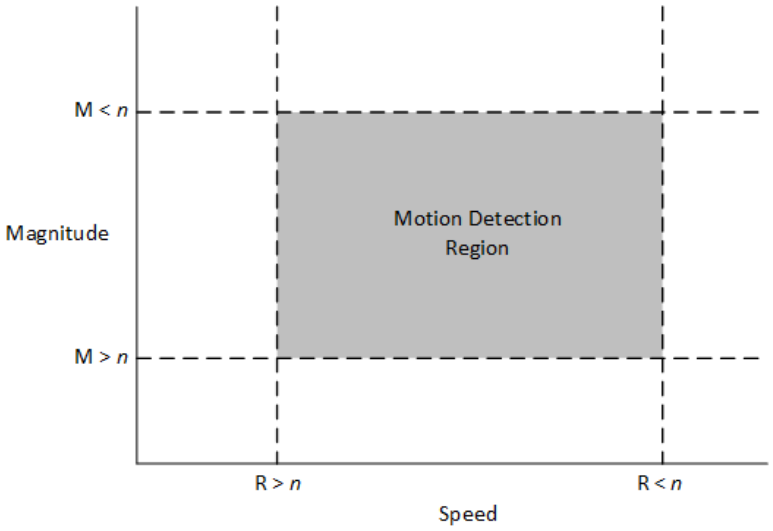

Figure 2. Speed and Magnitude Filtering

As an example, when trying to detect a person walking, you may not want to see cars that are passing by in the background. In this case, both speed and magnitude can be utilized to filter for detecting the person. For speed, a person rarely moves faster than 1.5 m/s when walking. Cars on the other hand rarely move slower than 5 mph (2.2 m/s). Likewise, the magnitude of a person walking towards an OPS241/OPS242 has been measured between 10-20 (~8 m distance) and 200-700 (1m distance). The magnitude of a car at 8m runs between 50-110 and at 1m between 400-900. Based on this information, setting speed filtering at R > 0.5 m/s and R < 2 m/s can help eliminate cars. Magnitude filtering is a little more challenging because the sensor can pick up the larger, more reflective metal at farther distances. But setting Q < 50 could provide a good filter for any cars detected. Alternatively, keeping the default Q > 10 (default setting) is good to filter out simple clutter signals which can be easily seen.

Revision History

Version	Date	Description
A	November 14, 2018	Initial release.