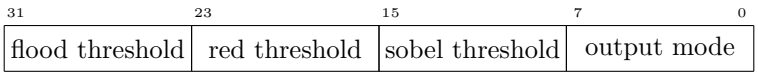
TurretMaster5000 Docs

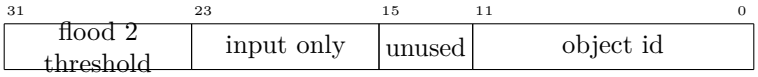
Register list

Table 1: Table of AXI registers. 'w' indicates read and write register, 'r' indicates read only register.

address	r/w	description
5'h00	r	obj_m11
5'h01	r	obj_m12
5'h02	r	obj_m21
5'h03	r	rx_read_pointer
5'h04	r	tx_write_pointer
5'h05	r	tx_read_pointer
5'h06	r	rx_fifo_track
5'h07	r	tx_fifo_track
5'h08	r	mm2s_tready
5'h09	r	mm2s_tvalid
5'h0A	r	s2mm_tvalid
5'h0B	r	s2mm_tready
5'h0C	w	ctrl_reg1
5'h0D	w	frame_resetn
5'h0E	r	laser_xy
5'h0F	w	ctrl_reg2
5'h10	r	num_labels
5'h11	r	obj_area
5'h12	r	obj_x
5'h13	r	obj_y
5'h14	r	obj_m20
5'h15	r	obj_m02
5'h16	r	obj_m30
5'h17	r	obj_m03



(a) Control register 1.



(b) Control register 2.

Figure 1: Control register layout.

Mode enums

i	mode
0	pass
1	gray
2	sobel
3	thresh
7	flood1
8	flood2
4	cc
5	color
6	laser

Moment calculations

Translational invariants

$$u_{ij} = \sum_x \sum_y (x - \bar{x})^i (y - \bar{y})^j p_{ij}$$

Scale invariants

$$n_{ij} = \frac{u_{ij}}{u_{00}^{1+\frac{i+j}{2}}}$$

Rotational invariants

$$\begin{aligned}
I_0 &= n_{20} + n_{02} \\
I_1 &= (n_{20} - n_{02})^2 + 4n_{11}^2 \\
I_2 &= (n_{30} - 3n_{12})^2 + (3n_{21} - n_{03})^2 \\
I_3 &= (n_{30} + n_{12})^2 + (n_{32} + n_{03})^2 \\
I_4 &= (n_{30} - 3n_{12})(n_{30} + n_{12}) \left((n_{30} + n_{12})^2 - 3(n_{21} + n_{03})^2\right) \\
&\quad + (3n_{21} - n_{03})(n_{21} + n_{03}) \left(3(n_{30} + n_{12})^2 - (n_{21} + n_{03})^2\right) \\
I_5 &= (n_{20} - n_{02}) \left((n_{30} + n_{12})^2 - (n_{21} + n_{03})^2\right) \\
&\quad + 4n_{11}(n_{30} + n_{12})(n_{21} + n_{03}) \\
I_6 &= (3n_{21} - n_{03})(n_{30} + n_{12}) \left((n_{30} + n_{12})^2 - 3(n_{21} + n_{03})^2\right) \\
&\quad - (n_{30} - 3n_{12})(n_{21} + n_{03}) \left(3(n_{30} + n_{12})^2 - (n_{21} + n_{03})^2\right)
\end{aligned}$$

Comparison

$$x = \sum_{i=0}^{5} \frac{(I_i - I'_i)^2}{I_i I'_i}$$