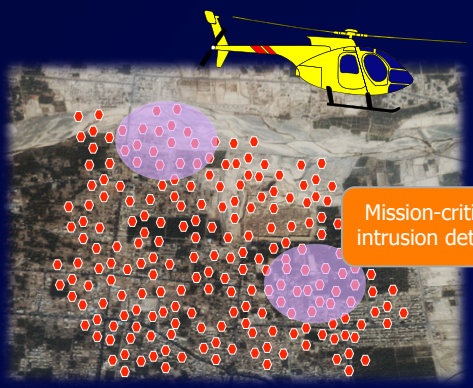
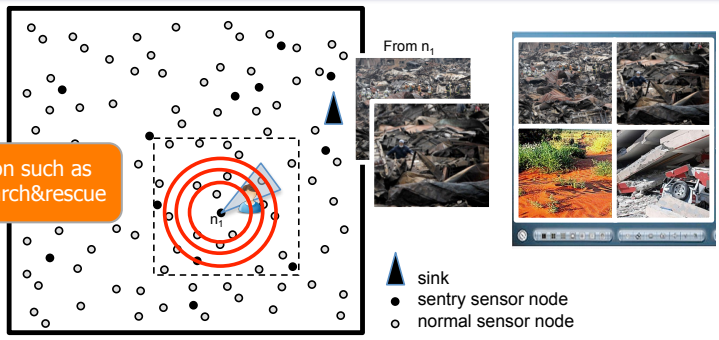
CRITICALITY-BASED SCHEDULING OF WIRELESS IMAGE SENSORS

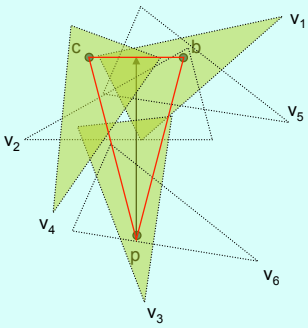


Mission-critical application such as intrusion detection or search&rescue



$Co(V) = \{$
$\{V\},$
$\{V_1, V_3, V_4\},$
$\{V_2, V_3, V_4\},$
$\{V_3, V_4, V_5\},$
$\{V_1, V_4, V_6\},$
$\{V_2, V_4, V_6\},$
$\{V_4, V_5, V_6\}$
$\}$

$|Co(V)| = 7$



- # of cover-sets defines redundancy level
- Nodes with large # of cover-sets can take images at a faster rate
- Link capture rate to criticality level, [0,1], and the # of cover-sets
- High-criticality apps use convexe curves to have higher capture rate, even for nodes with small # of cover-sets.
- Concave curves would yield lower capture rate for low-criticality apps.
- Criticality level can be dynamically modified on intrusion detection

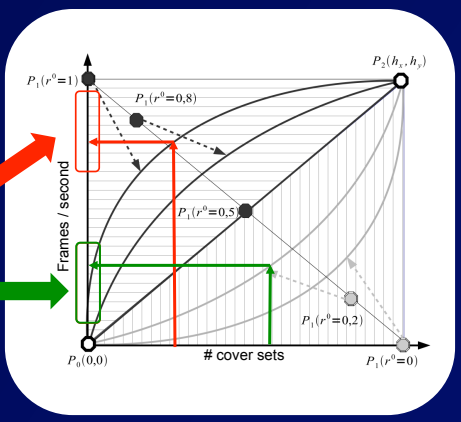
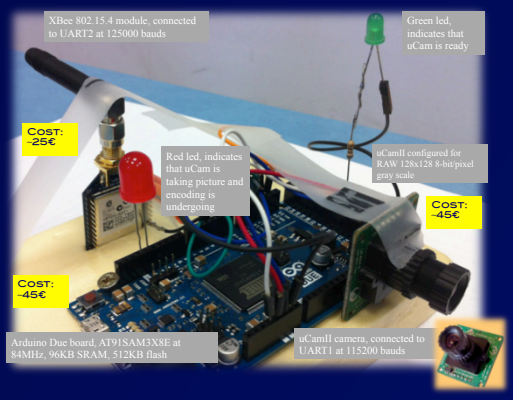


Image sensor built with off-the-shelves components: Arduino Due & uCamII

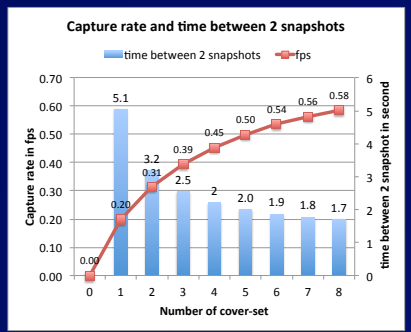


Performance measures for an 128x128 image

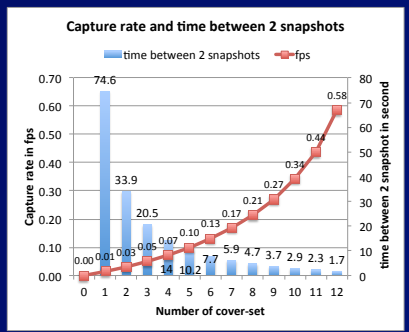
		N	R	A	B = D - A`	C = B / N	D
Quality Factor Q	size in bytes (MSS=90)	Number of packets	time to read data from ucam	global encode + pkt time (measured)	global transmit time (computed)	transmit time/pkt (computed)	global encode + pkt + transmit time (measured)
100	9768	158	1.512	1.027	1.064	0.0067	2.091
90	5125	70	1.512	0.782	0.539	0.0077	1.321
80	3729	48	1.512	0.704	0.384	0.0080	1.088
70	2957	37	1.512	0.686	0.304	0.0082	0.99
60	2552	32	1.512	0.662	0.263	0.0082	0.925
50	2265	28	1.512	0.646	0.233	0.0083	0.879
40	2024	25	1.512	0.657	0.207	0.0083	0.864
30	1735	21	1.512	0.649	0.177	0.0084	0.826
20	1366	17	1.512	0.638	0.14	0.0082	0.778
10	911	11	1.512	0.628	0.093	0.0085	0.721
5	576	7	1.512	0.624	0.058	0.0083	0.682

Adapt the criticality model to the image sensor hardware performances

- The image sensor needs 1512ms to read data from uCam & perform intrusion detection. Plus an additional 200ms for initiating the snapshot. In total 1712ms is the minimum time between 2 snapshots
- The maximum image capture rate is then about 0.58 image/s
- We can vary the maximum # of cover sets to change the increment amount



Criticality level of 0.8, max # of cover sets is set to 8



Criticality level of 0.2, max # of cover sets is set to 12

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