

How much can behaviour analysis help?

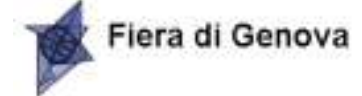
David Hogg, University of Leeds

Genova, 28th September 2011



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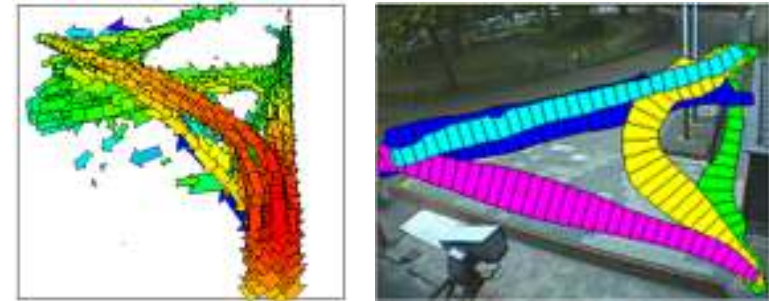
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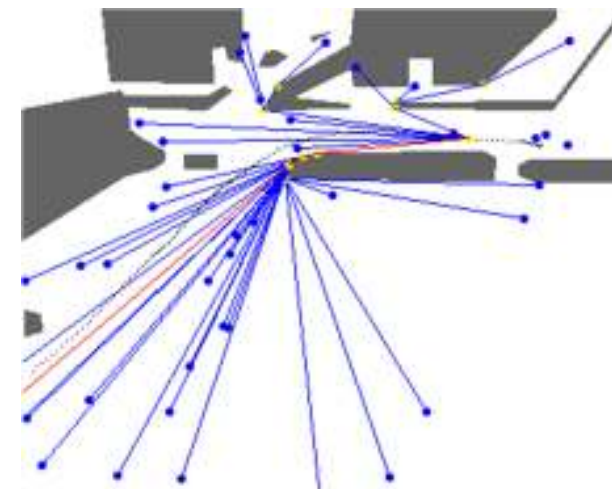
- **Kinematic models**

- Johnson and Hogg (IVC, 1996)
- Makris and Ellis (SMC, 2005)
- sensitive to changes in scene-layout
- likely to omit rare events



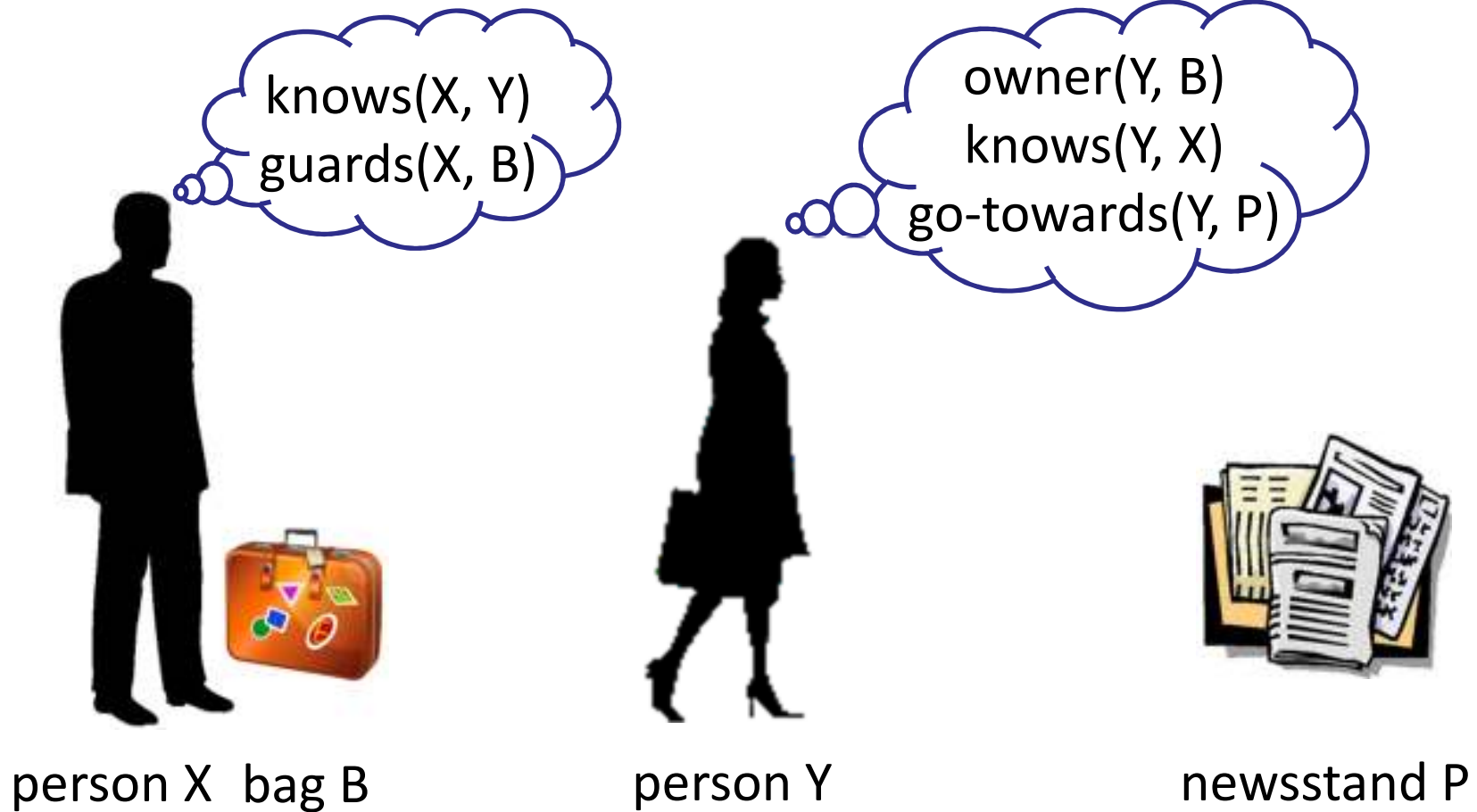
- **Agent (intentional) models**

- human motion results from executing goal-directed plans
- Intille and Bobick (CVIU, 1999)
- Dee and Hogg (BMVC, 2004)



Abandoned bags

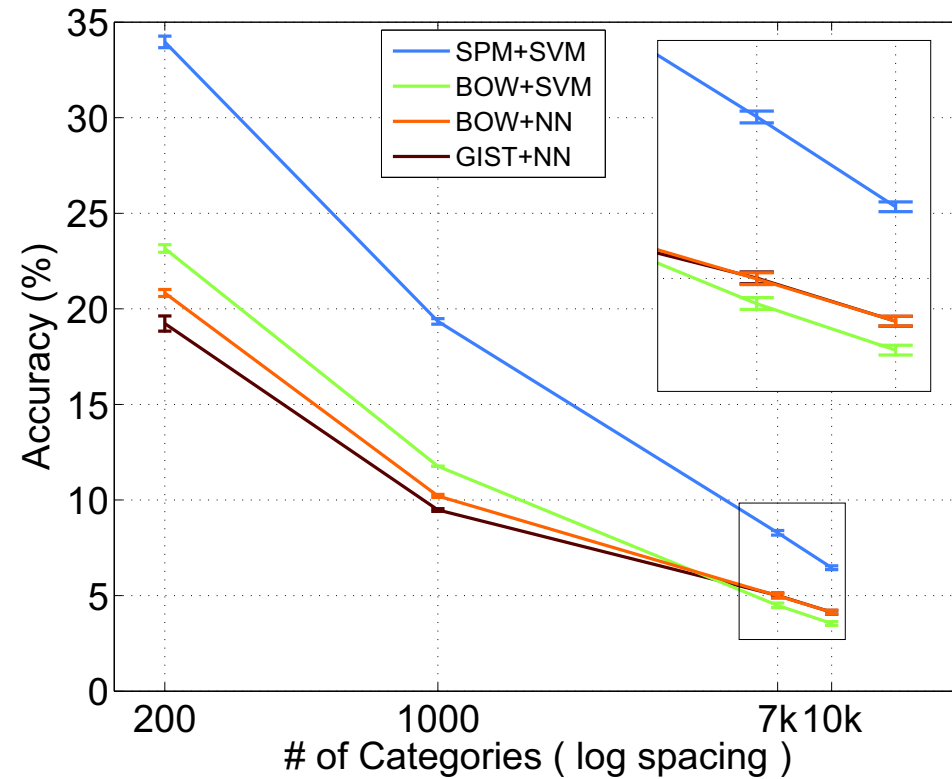




Object detection

10,000 categories
 9 million images
 50-50 train/test split
 Forced choice, 1-from-K

From Deng, et al., ECCV 2010



Action detection

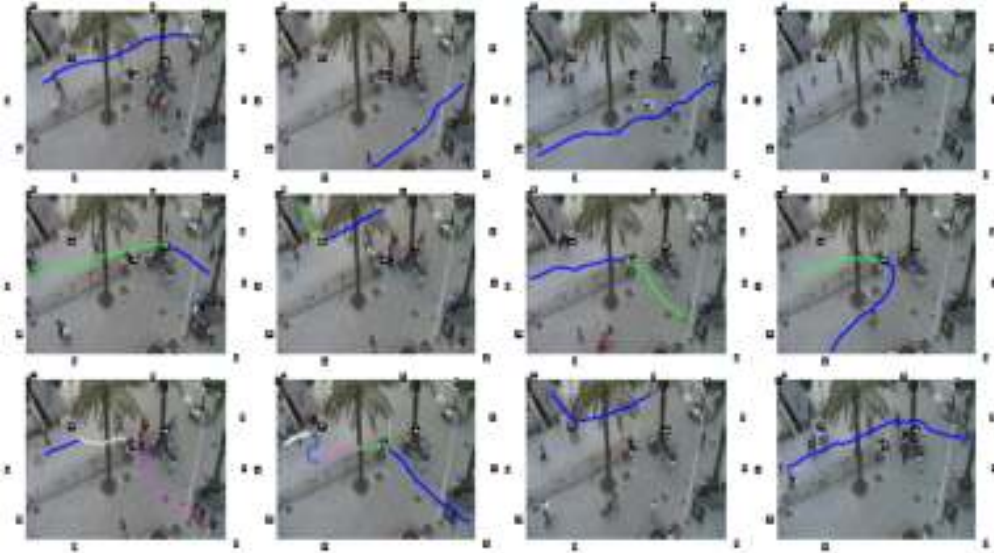
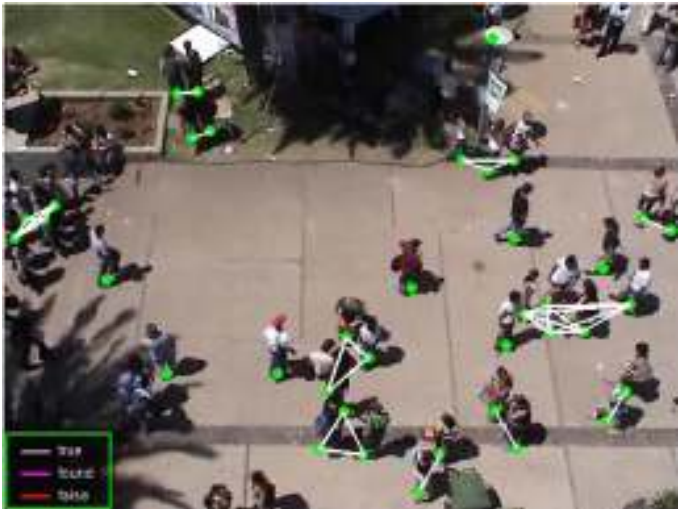


From Laptev et al., CVPR 2008



Laptev and Perez, ICCV 2007

Social groups and destinations



ELSAG Sequence	Baseline	Ownership	Ownership + Social Groups	Ground-truth
18	✓	✓	✓	0
22	✗ (0)	✓	✓	W+A
23	✓	✗ (W+A)	✗ (W+A)	0
24	✗ (0)	✓	✓	W
25	✓	✗ (W)	✓	0
26	✗ (0)	✓	✓	W+A
27	✗ (0)	✓	✓	W
28	✗ (0)	✓	✓	W+A
29	✗ (0)	✓	✓	W
30	✗ (0)	✓	✓	W+A
36	✓	✗ (W+A)	✓	0
37	✓	✗ (W)	✓	0

Threat assessment – contextual factors



Factor	Exhibition centre	International airport
Time of day	yes	no
Season	no	no
Number of people nearby	yes	yes
Proximity to important infrastructure or hazardous materials	yes	yes
Size of bag	no	no
Major disruption	no	yes
Negative publicity	no	no
Causing offence	yes	no
Causing dangerous crowd behaviour	yes	no
Time of high alert	yes	yes
Potential target at venue (e.g. VIP)	yes	yes
Specific threats/intelligence	yes	yes
Innocent explanation (e.g. taxi stand)	yes	no
Suspect apparent diminished capacity	no	yes
Apparent non-threatening (e.g. mother with child)	yes	yes
Potentially suspicious behaviour (e.g. running)	yes	yes
Potential for serious offence by security check	no	no

- **SUBITO is an advisory system – helping with operator overload**
 - Sorts individuals against a precise threat (*abandoned baggage*)
 - Avoids pitfalls of manual and fully automated analysis
- **However, there is potential for prejudice in definition of group relationships and intentions**
 - for example, variation in SFM parameter values for different ethnic groups
- **Need for on-going ethical evaluation beyond SUBITO to counter ‘function creep’**