

Bicycle Theft Detection using CCTV

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UK FACTS....

- A bicycle is reported stolen every 5 minutes in England and Wales.
- 480,000 bicycles stolen annually in the UK (06/07).
- 21,236 bicycles stolen in London (06/07).
- 4 out of 5 stolen bicycles are not reported.

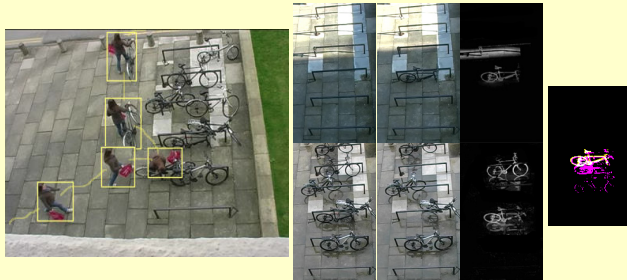
Using CCTV

Councils have installed CCTV cameras on top of bicycle racks.



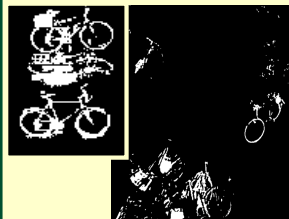
People and Bicycles Detection

People are tracked as they enter the racks. Bicycles are detected by studying the change within the racks.



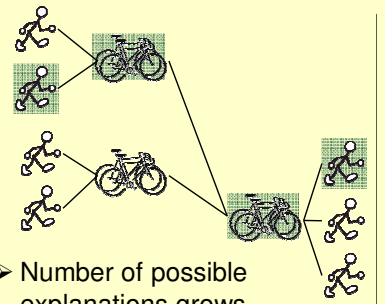
Visual Ambiguity

- Several people approach the racks at the same time.
- Bicycle clusters are not separated.



Best Explanation

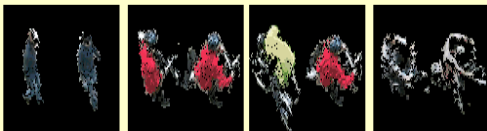
- Constrained global explanation.



- Number of possible explanations grows (exponentially).
- Novel approach to search the space of explanations (using Markov Chain Monte Carlo). [1]

Theft Detection

Clothing colour is used for comparison. Other soft biometrics like height and body mass could also be used.



Dataset and Results

- 3 days from Leeds (106 drops & picks)
- 2 days from Cambridge* (127 drops & picks)

Connection Accuracy	Greedy	Our Method
Leeds	73.8	86.4
Cambridge	66.1	71.0

Simulated Theft Day [2,3]	Predicted	
Actual	Thief	Non-Thief
Thief	10	3
Non-Thief	17	183

* Courtesy of National Express East Anglia

Publications:

- [1] Recognising Linked Events: Searching the Space of Feasible Explanations. Computer Vision and Pattern Recognition (CVPR), 2009
- [2] Associating People Dropping off and Picking up Objects. British Machine Vision Conference (BMVC), 2007
- [3] Bicycle Theft Detection. International Crime Science Conference. (CS2), 2007

