Bicycle Theft Detection

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Facts

- 500,000 Bicycles stolen annually in the UK
- 21,236 bicycles stolen in London (2006/7).
- 5% of the stolen bicycles returned to their owners. (2005)
- Highest rate of bicycle thefts in: the Netherlands, Sweden, Japan, Canada, New Zealand, England, Finland and South Africa
Facts

From the news…

- **22/5/2007**: Cheltenham - £100,000 worth of bicycles have been stolen over the past 9 months.
- **22/6/2007**: Oxford (1800 bicycle thefts during the last year) city sets up CCTV cameras over bicycle racks.
From the news...

- 23/5/2007 – Catching Daniel Westrop…
  “have been stealing commuters' cycles, often two a day, for the past three years”!!
The Task
Relevant work

1. Metro Stations

Relevant work

2. Airport Gates

Relevant work

3. Abandoned Baggage

Bicycle Theft Detection

1. Tracking People
2. Detecting Bicycles
3. Deciding on drop-off and pick-up actions.
4. Comparing colour information
5. Raising warnings
Bicycle Theft Detection

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Experiments and Results

1. 1 hour recording
   - 45 events – 22 pairs

2. 50 min recording
   - 22 events – 9 pairs

3. 9.5 hrs recording
   - 40 events – 18 pairs

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Correct Example
Theft Warning Example
Strengths & Weaknesses

Strengths:
- Decrease in required monitoring time.

Recorded time: 11 hours and 30 minutes
Warning time: 13 minutes
Strengths & Weaknesses

Strengths:

- Decrease in required monitoring time.
- Raises warning, no action taken.
Strengths & Weaknesses

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Weaknesses
- Person changing clothing.
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Weaknesses
- Person changing clothing.
- Does not detect suspicious behaviour.
- System’s failure cases…
System’s Failure Cases

1. The thief wears the same clothing as the owner.
System’s Failure Cases

2. The thief drops another bicycle and picks a better one at the same time.
3. The tracker loses track of people as they pause
4. Theft cases of parts of the bicycle
False Warning Example
Conclusion

- 77% theft detection rate.
- 8.5% false negative rate.
- 1.9% of required monitoring time.
Thank you..

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