

FINGERMARKS AT ACTIVITY LEVEL

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Current situation



What if the source is not disputed?



Activity level propositions

 H_p : S stabbed V with the knife. S did not use the knife to cut food.

H_d : V was not stabbed with the knife. S only used the knife to cut food.

Identify the relevant variables

Fingermark formation process

- \circ Transfer
- \circ Persistence
- \circ Recovery
- \circ Background

Manner of deposition

- \circ Position on hand and fingers during deposition
- \circ Location
- \circ Direction
- \odot Area of friction ridge skin
- \circ Pressure

Bayesian network

Probabilistic model

Nodes represent variables

Arcs represent dependency relationships

Probability assignments



Bayesian network knife example



Case specific experiment

Aim: Using empirical data from a knife experiment to evaluate the Bayesian network for a specific case example.



Method



Scenario: stabbing										
Donor	FM present	Which hand?	Direction	Rotation	Side 1	Side 2	Side 3	Side 4	Backside	Blade
Donor 1	Yes	Right	Underhand	Down	P/F	P/F	F	F/T	None	None
Donor 2	Yes	Right	Overhand	Down	F	Р	P/F	F	None	None
Donor 3	Yes	Right	Overhand	Up	Р	F	F	Р	Т	None
Donor 4	Yes	Right	Overhand	Down	Р	Р	F	F/T	Р	None





Bayesian network



How to measure the relevant variables?



Dutch music festival 'Lowlands'

Aim: Developing a method to analyse the location of fingermarks on twodimensional items.





Results



Heatmap smothering

Feature space



Conclusions study

Fingermark patterns left when smothering with a pillow can be well distinguished from fingermark patterns left when changing a pillowcase, with a classification accuracy of 98%.

The results are not limited to pillowcases; we developed a promising model to study fingermark locations on two-dimensional objects in general. Further research is recommended on the application to casework.

Why activity level evaluation of fingermarks?

What is the relevant question in court?

Who is the one that can provide expert knowledge necessary for this question?

How to assign the probabilities?



Future research

For the evaluation of fingermarks given activity level propositions, it is important to continue research in the following topics:

- Studying the variables that influence activity level interpretations
- Develop methods to objectively measure these variables
- Studies into the dependencies between the variables for a correct representation of the real world
- Expand our knowledge about activities and resulting fingermarks by conducting case specific experiments



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