Automated Face Recognition

using 3D shape extracted from 2D images

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Mestrado em Informática

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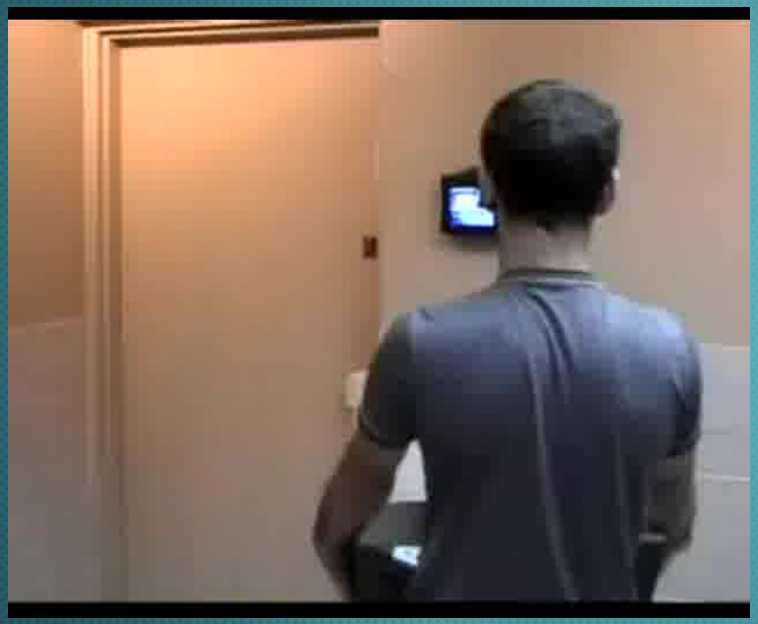
Why attempt computer-based face recognition?

Humans' ability to do it is already remarkable...

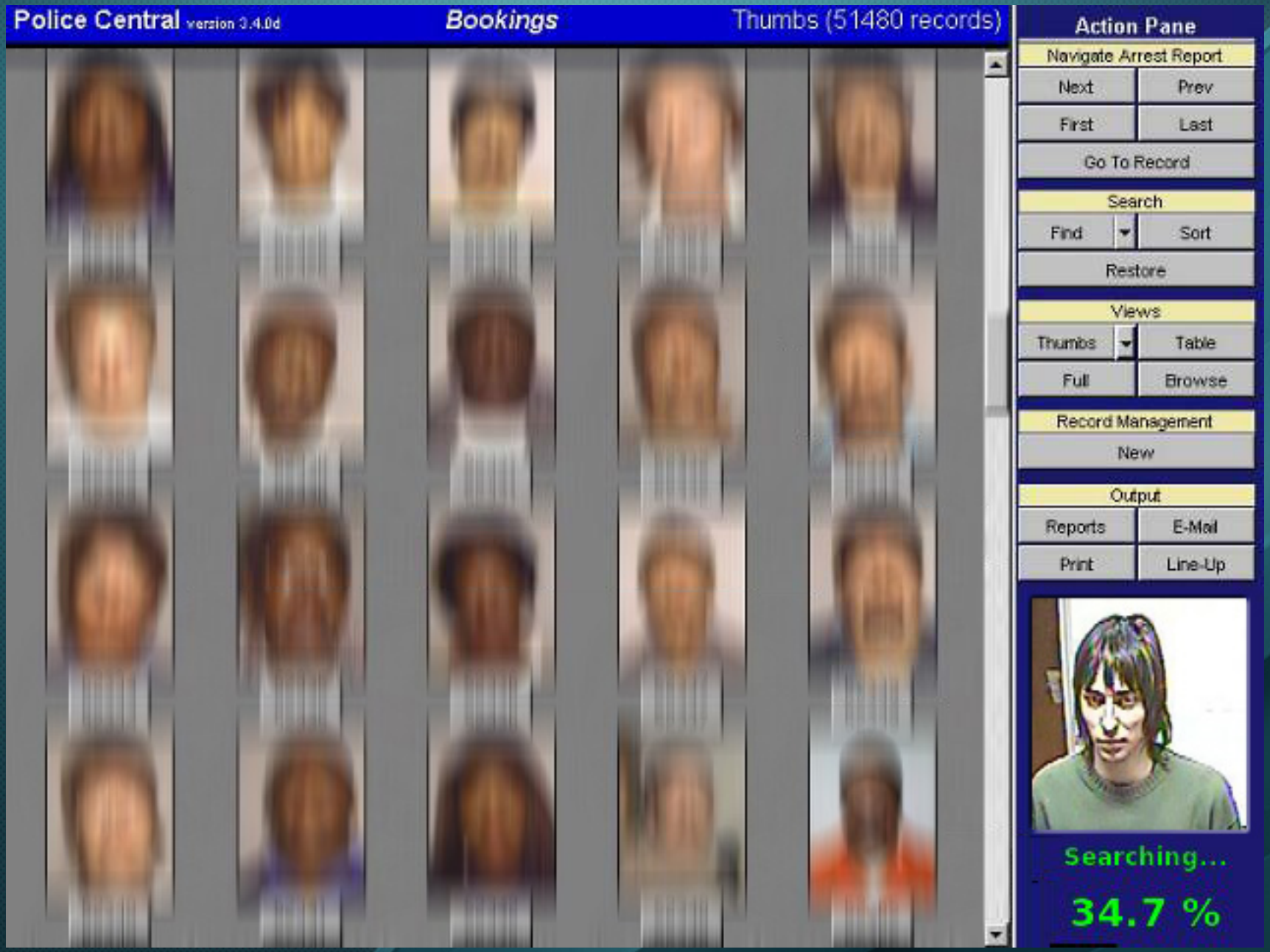
...but we don't want to depend on humans for certain tasks.

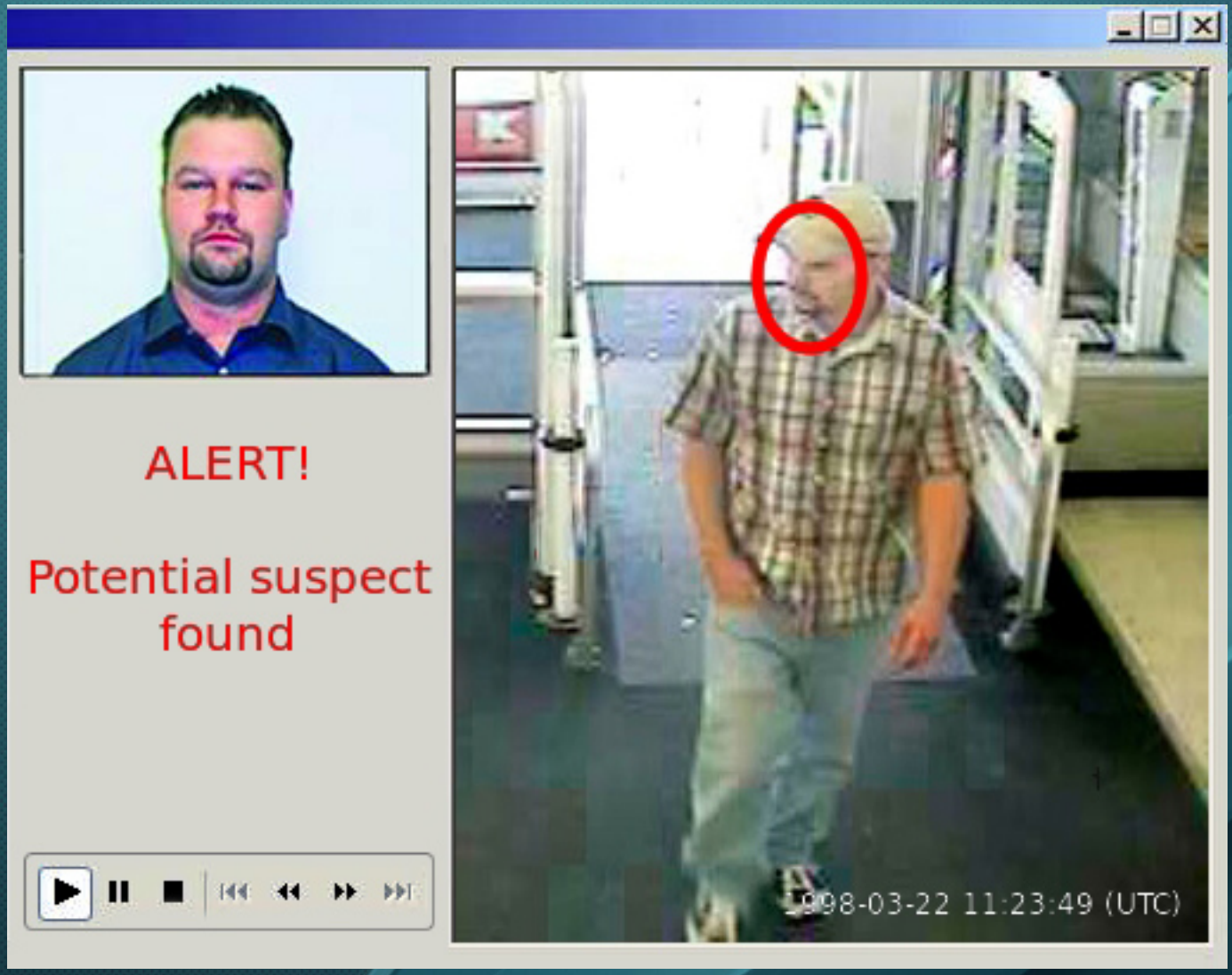
(even if we're not CSI)



Find: Jason

The Bridge of Death


Police Central version 3.4.0d
Bookings
Thumbs (51480 records)
Action Pane
Navigate Arrest Report
Next
Prev
First
Last
Go To Record
Search
Find
Sort
Restore
Views
Thumbs
Table
Full
Browse
Record Management
New
Output
Reports
E-Mail
Print
Line-Up
Searching...
34.7 %


ALERT!
Potential suspect found
1998-03-22 11:23:49 (UTC)

Wait… wasn't this done already?

Wait… wasn't this done already?

NO!

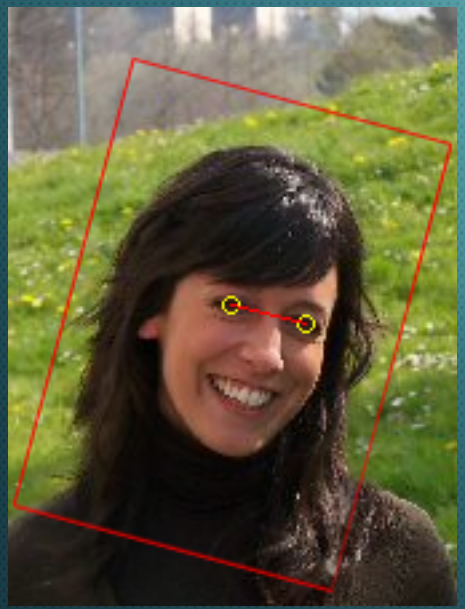
So what has been done so far?

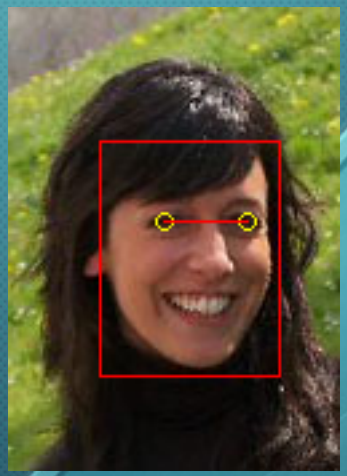
What has been done so far?

1. **Geometric comparison**

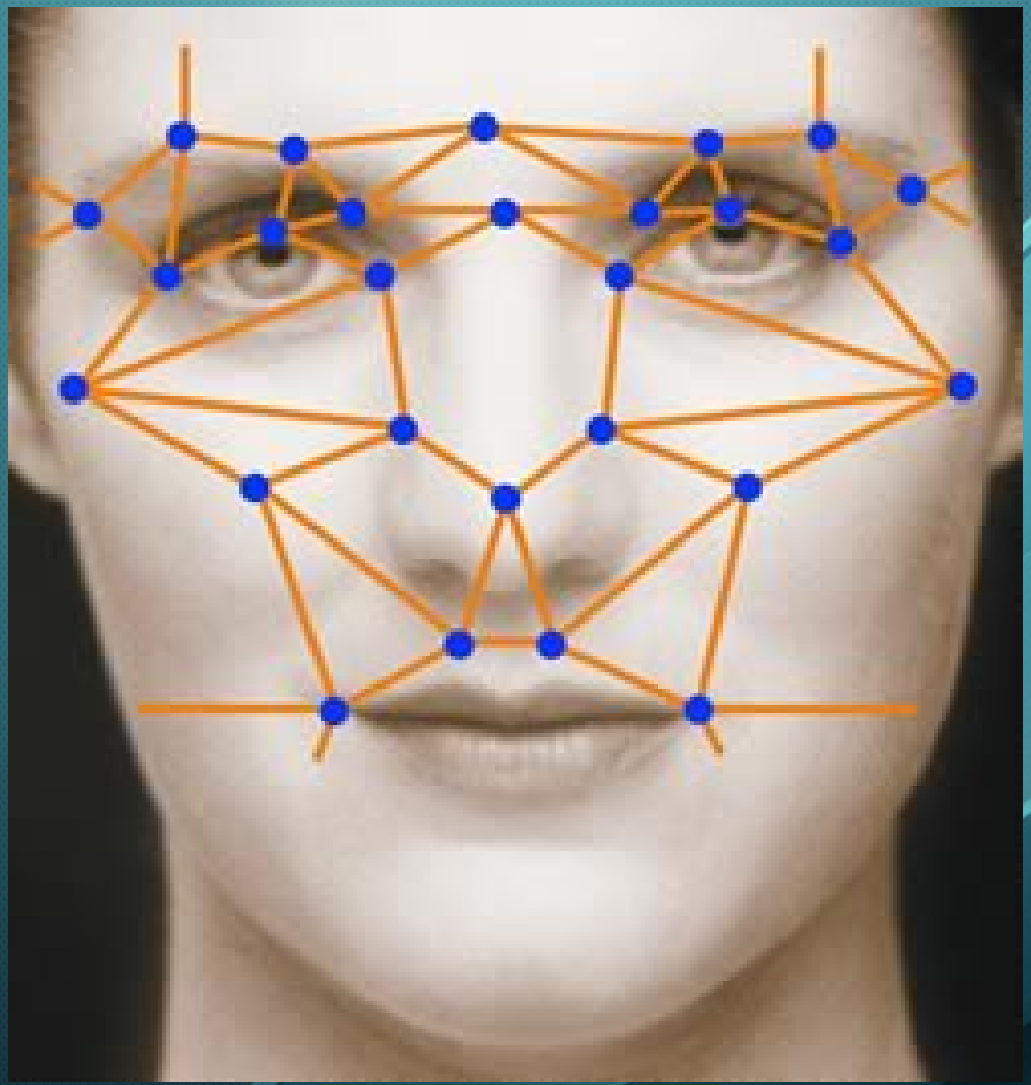
Geometric approaches

Geometric approaches





Geometric approaches



Geometric approaches

but...

The points tracked weren't stable:

- facial expressions
- weight gain/loss
- occlusions (hair, beard, glasses...)

result: sub-optimal recognition performance

What has been done so far?

2. Image-based comparison

Image-based approaches

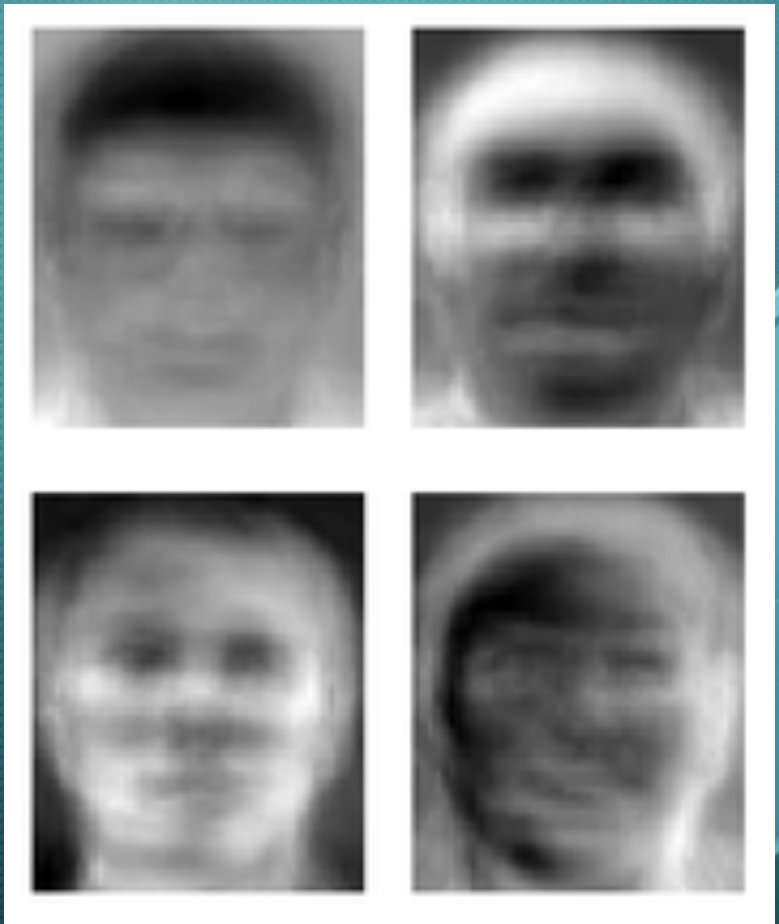


Image-based approaches

main **advantage**:

better handling of occlusions and small variations

main **disadvantage**:

less robust to pose, illumination and expression (PIE) variance

Image-based approaches

many techniques have been developed
for **pose** and **illumination** cancellation

...not so much for **expression** cancellation

Image-based approaches

Typical shape / expression normalization:

What has been done so far?

3. 3D facial recognition

3D approaches

but...

...capturing detailed 3D shape requires **complex** and **expensive** specialized sensors

What does this thesis offer?

What does this thesis offer?

geometric + image-based + 3D

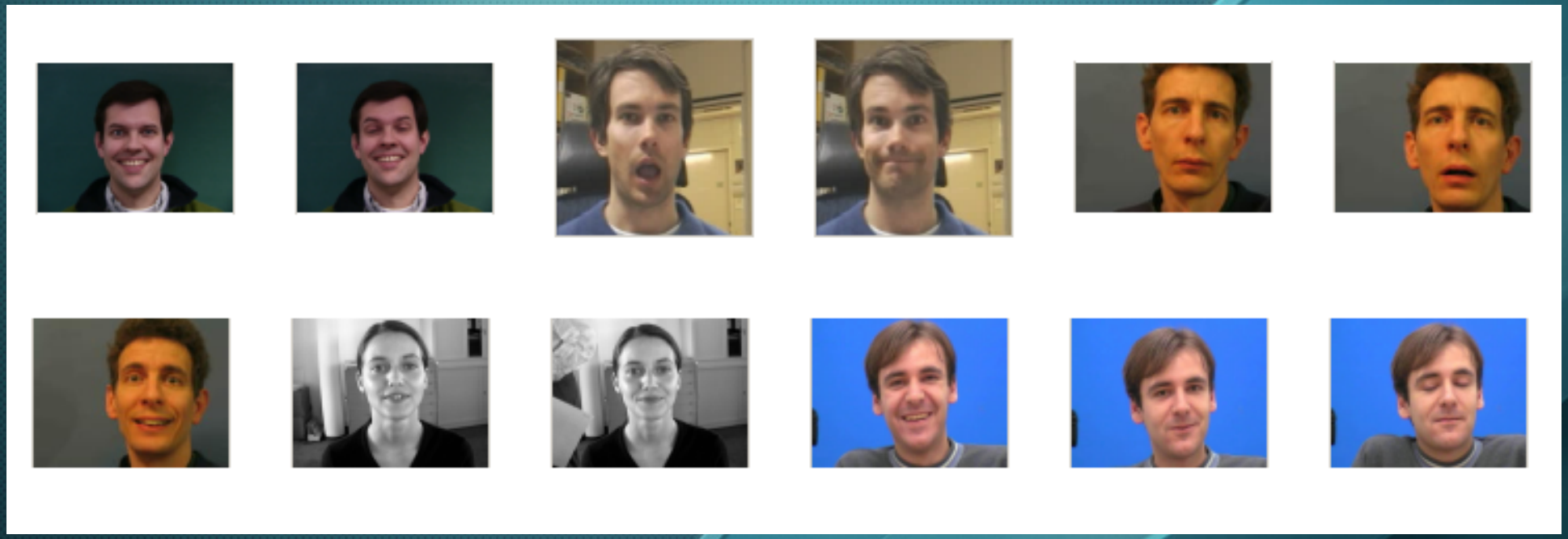
=

Expression cancellation

...that is: selective removal
of non-rigid facial deformations

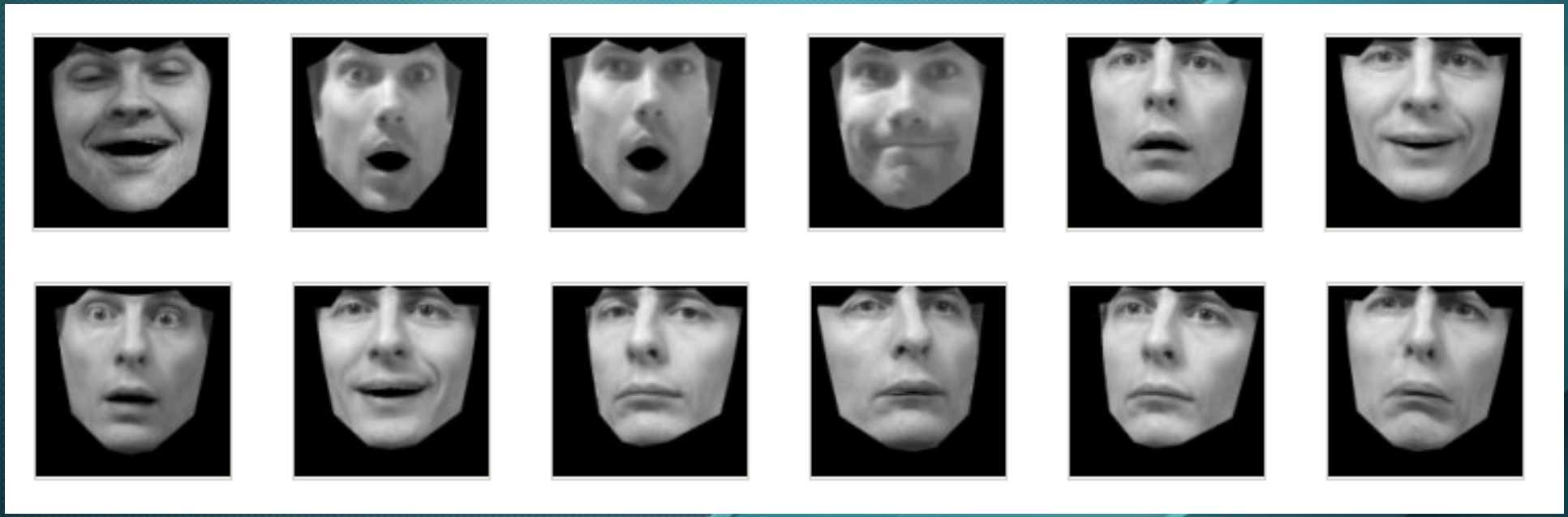
How does it work?

Results



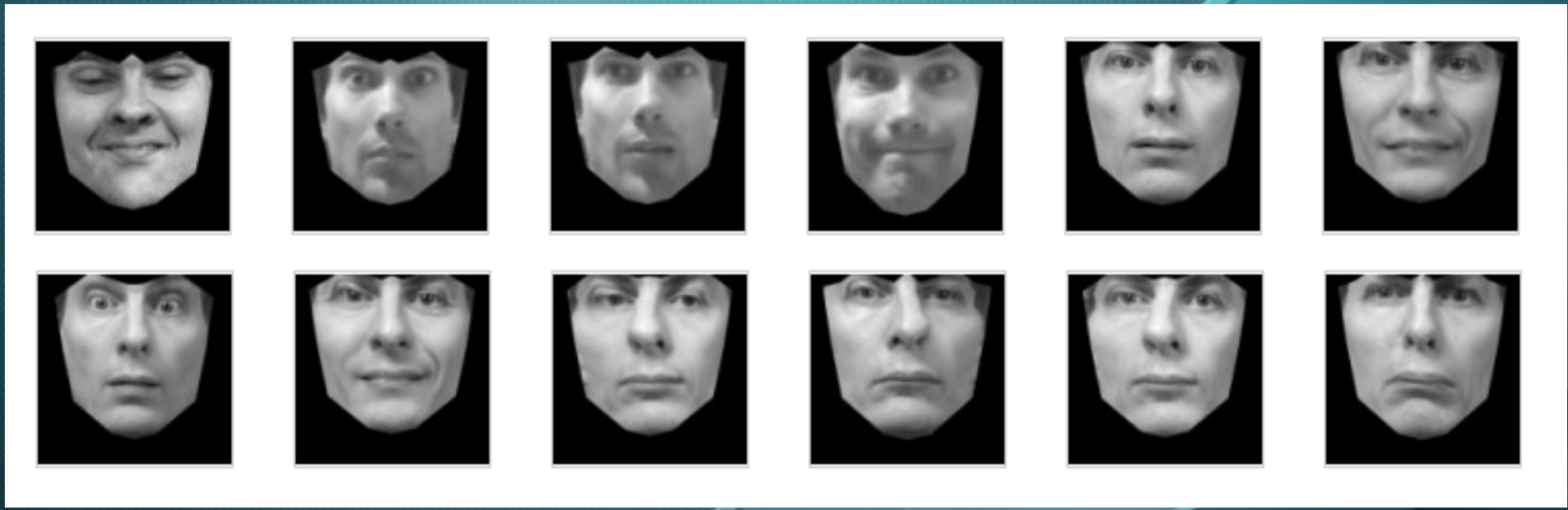
Original images (sample)

Results



Without 3D pose and expression cancellation:
74% recognition

Results



With 3D pose and expression cancellation:
100% recognition

Thank you!