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Conclusions

ATR for backscatter people screening

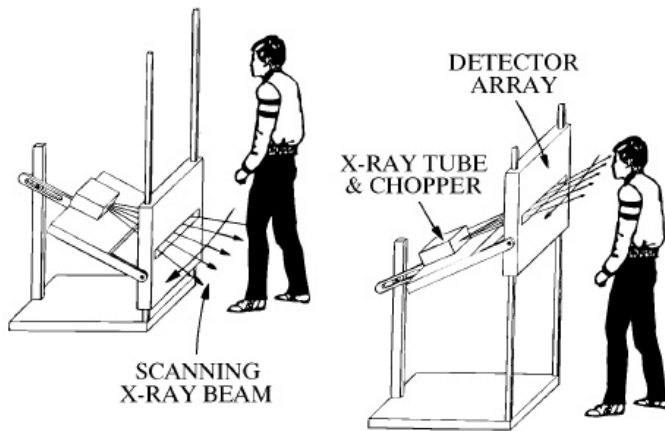
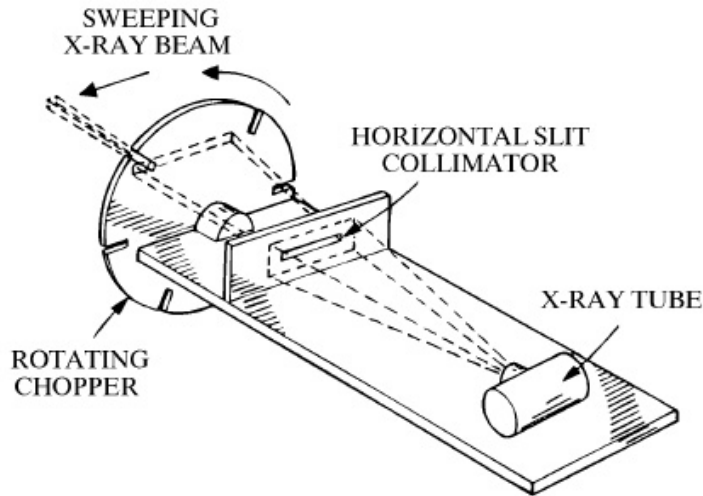
ATR is a challenging problem with backscatter images due to low object contrast, pose variations, false alarm mechanisms and data collection limitations

We have created a framework that permits the problem to be broken up and contributed to by many individual algorithms

Presently three teams have created 30+ individual algorithms within this framework, and we would be open for more collaboration partners



Imaging hardware

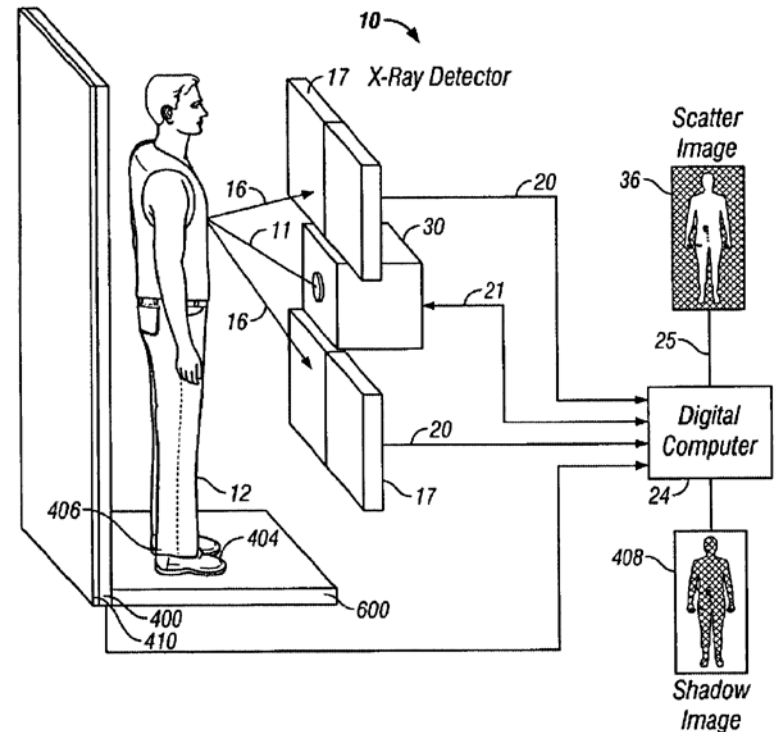


Raster x-ray pencil beam

Vertical sweep and cam

Wide area detectors

Back scatter and 'forward scatter' image



Imaging – the challenge



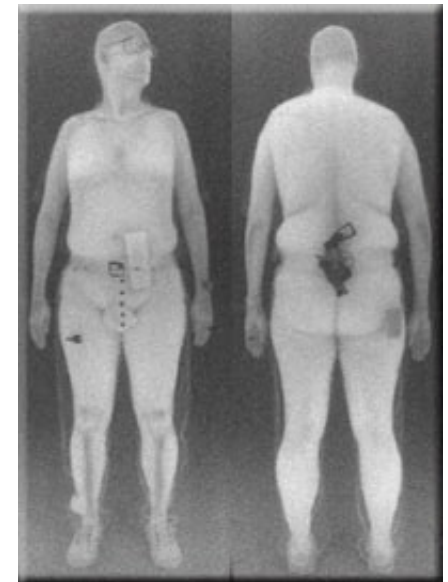
Contrast and appearance of objects in backscatter imaging

Background is black – no backscatter

Subject is white – significant backscatter off body

Proximity, tissue/fat/bone provide contrast

Objects of interest appear black, grey or white



ATR image processing steps



Calibration



Image acquisition



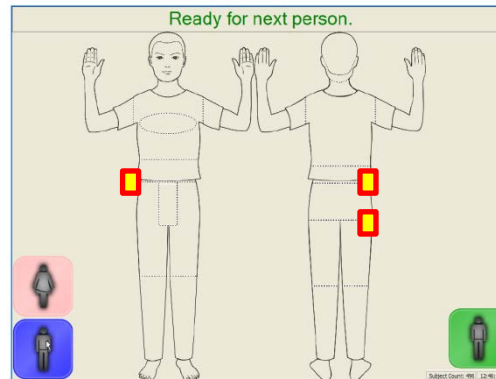
Image correction



Body segmentation and body zone identification



Algorithm processing



Avatar display

Images data submitted to multiple, parallel algorithms

Algorithm result consolidation, various weighting options to optimally 'spend' false alarm rate

Final result display, morphing and simplification of results.

Pose sensitivity

Subject Pose

Pose is a compromise

- Physical demands on population

- Security requirements

- System capabilities

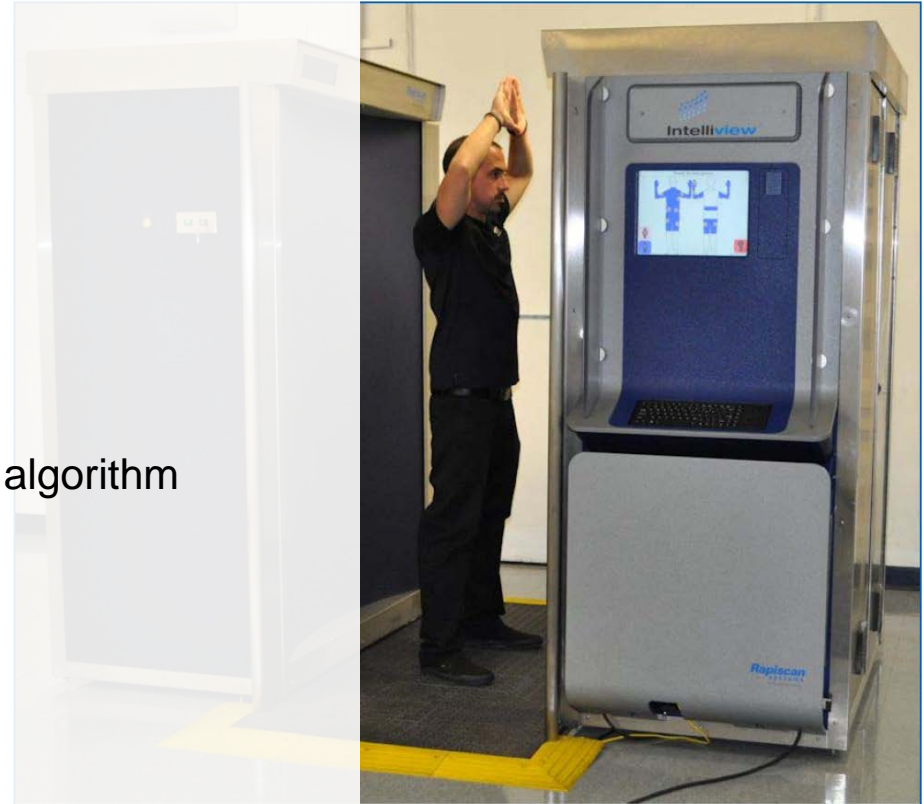
Variations in pose need to be handled by the algorithm

- Degree of freedom in arms, legs

- Identification of body regions

- Separation of body regions

Area for further improvement



Algorithm summary

Algorithm 30+ Branches exploiting different methods

Body Outline – bumps or voids indicative of objects

Symmetry – asymmetry indicative of objects

Active Background – off-body dark objects

White on White – low Z objects against low Z body background

Gray on white – medium Z materials against low Z body background

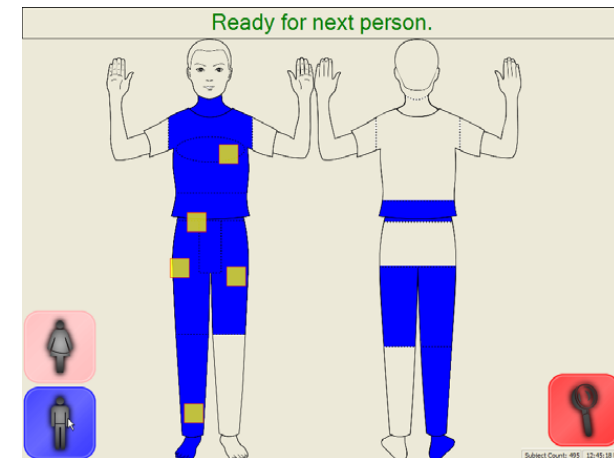
Dark on white – high Z materials against low Z body background

Legs – special handling of shin and knee bones

Torso - special handling of chest area

Arm – positional variation, hands

Head – special handling of false alarm mechanisms



Conclusions

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