

PREDICTING ABNORMALITIES IN COMPLEX HUMAN- OBJECT INTERACTION BY USING OBJECT AFFORDANCE CONTEXT

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Affordance in computer vision

- ❑ In contrast with the views of the orthodox schools of constructive psychology, the concept of affordances (1979), has allowed us to look at the intrinsic and functional attributes of objects.
- ❑ Affordance is neither subjective nor objective.
- ❑ The mutual relations have been exploited in computer vision for diverse applications.
- ❑ Concept of 'Causal indexicals' by Cambell (1993) / perceived affordance

Abnormalities

- ❑ The definition of abnormal actions refers to the course of actions that do not follow the expected pattern.
- ❑ Contexts are important
- ❑ Various contexts have been used such as:
 - Spatial
 - Temporal
 - Sequential
 - Prior knowledge
 - Trajectory

HOI based abnormalities(I)



HOI related abnormalities(II)

- ❑ A person is drinking from an aerosol sprayer
- ❑ A child is playing with the knife
- ❑ A gas hob is in ON state with out anything on top
- ❑ A plastic plate inside an woven
- ❑ A disable person is lifting a heavy object etc.

Attributes

Object related attributes

Object's affordance class, material, aspect ratio, object's state, danger index, shape, ambient object's affordance, object's group etc.

Actor related attributes

Age, gender, disability, aspect ratio, alone/group etc.

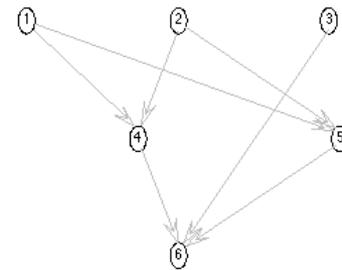
Proposed Framework(I)

- Probabilistic graphical models (PGM) are powerful means of reasoning in the domain of uncertainty.
- The Human poses and its attributes and the object and its attributes may be considered as different nodes of the PGM.
- With substantial amount of training videos, the structural relationships between these nodes may be learned.
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- Inference can be done for most probable actions or for most probable joint assignments of these nodes

Proposed Framework(II)

A Bayesian Network has been created with nodes corresponding to :

1(O)=Object Class (A coke Bottle, A medicine Bottle, An aerosol bottle),
2(A)=Age group of the actor (Child and adult), 3(P)=Human pose (Drinking pose and spraying pose),
4(D)=Danger Index of the object (Low and High),5(AF)=Affordance of the object (Drinking and spraying) and
6(AS)=The Action state (Normal/Abnormal)



Results(I)

- We have considered two scenarios where we condition on the object as an aerosol spray, the age group as child. The resulting Abnormality came to

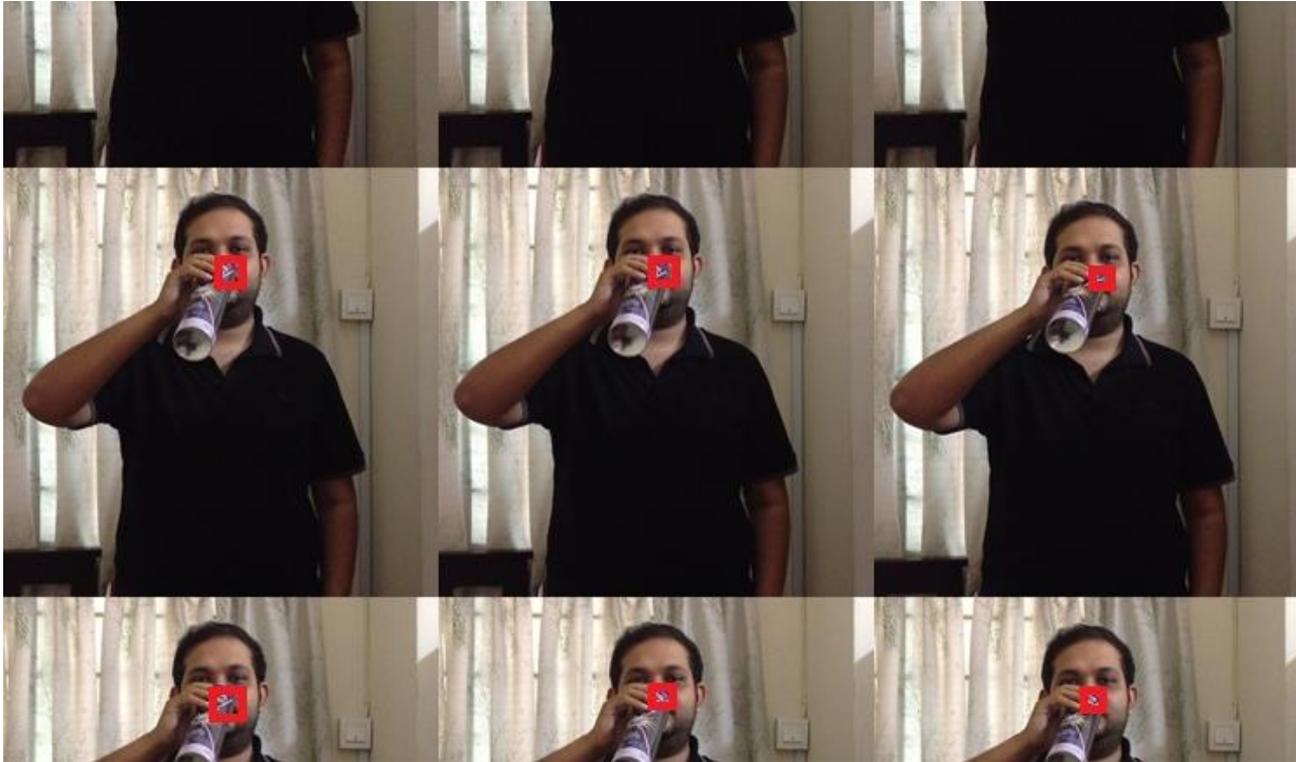
0.1550 ~ 15.50% (Normal)

0.8450~84.50% (Abnormal)

- The same experiment with the conditioned age group is adult reveals a result
0.68~68% (Normal)0.32~32%(Abnormal)
- Another experiment was done where an adult has been drinking from the aerosol spray and it also provided with a desired outcome.

□ MLE for learning and junction tree algorithm for inference is used.

Results(II)



Contributions

- ❑ This research contributes a novel context for Human-Object interaction based abnormalities.
- ❑ Include and explores new attributes related to Human and object for more salient affordance prediction.
- ❑ Providing a framework for ambient affordance prediction.

Thank You