Empathetic AI: Assessing Users' Engagement by Looking at their Eyes

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MOTIVATION: No matter how intelligent machines become, they will still need to interact with humans. Humans, while sometimes rational beings, are mostly emotional beings. How do we build AI that understand what their user is feeling and react empathetically?

BACKGROUND: Researchers are studying a variety of techniques to understand a user's motivational/emotional state: ubiquitous sensors, behavioral measurements, physiological sensors, etc. Multi-modal sensing is indeed quite good at predicting emotional state/valence-arousal.

CHALLENGES:
It is burdensome for a user to wear a multitude of sensors.
Cues such as language, tone of voice, facial expression, are highly variable between individuals, and across cultures.

INSIGHT: "Eyes are the windows to a soul"
When a person is paying attention to something, they look at it.
When a person is scared, pupils dilate.
In other words, cues from the eye are repeatable across individuals, and generalizable across cultures.

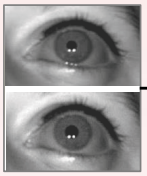
RESEARCH DIRECTIONS:
Assessing attentional and emotional priorities using eye-tracking data
Creating expressive virtual avatars


Human-machine teams

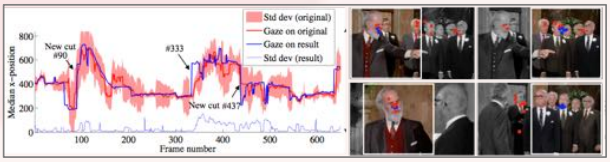

Care-giving tasks

A sensing modality that is generalizable, as well as light-weight and non-invasive.

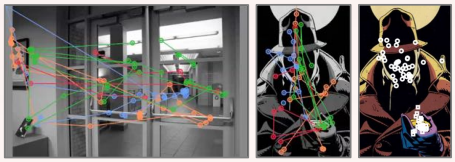
Eye-tracker, webcam, phone camera



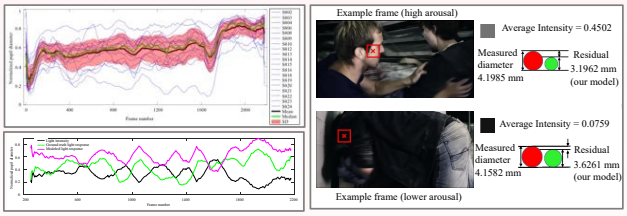
Fixations, Saccades, Scan-paths, Blinks, Pupil diameter



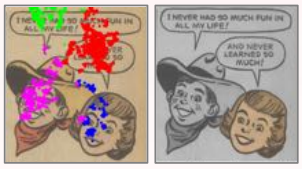
Jain, Sheikh, Shamir, Hodgins. ACM Transactions on Graphics (2015)



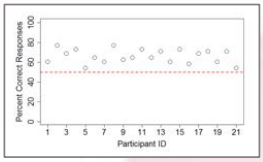
Jain, Sheikh, Hodgins, IEEE Computer Graphics & Applications (2016)

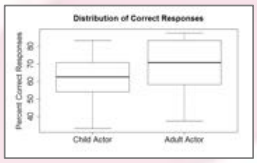


Raiturkar, Kleinsmith, Keil, Banerjee, **Jain**, ACM Symposium on Applied Perception (2016)

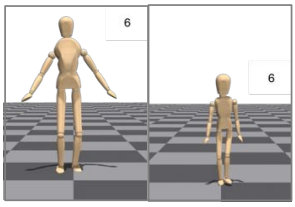


Iyengar, Khetarpal, Koppal, Le Meur, Shea, **Jain**, ACM Transactions on Multimedia (2017)

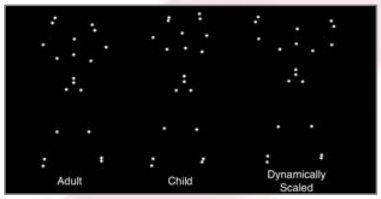


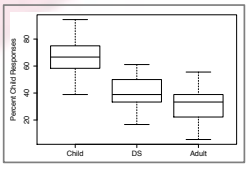


Jain, Anthony, Aloba, Castonguay, Cuba, Shaw, Woodard, ACM Transactions on Applied Perception (2016)



Quantity	Units	Geom. Scaling	Mass Scaling
basic variables			
length	L	L	–
time	T	$L^{1/2}$	–
Motion variables			
displacement	L	L	–
velocity	LT^{-1}	$L^{1/2}$	–
acceleration	LT^{-2}	1	–
angular displacement	–	1	–
angular velocity	T^{-1}	$L^{-1/2}$	–
angular acceleration	T^{-2}	L^{-1}	–





Dong, Paryani, Rana, Aloba, Anthony, **Jain**, ACM Symposium on Motion in Games (2017)

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