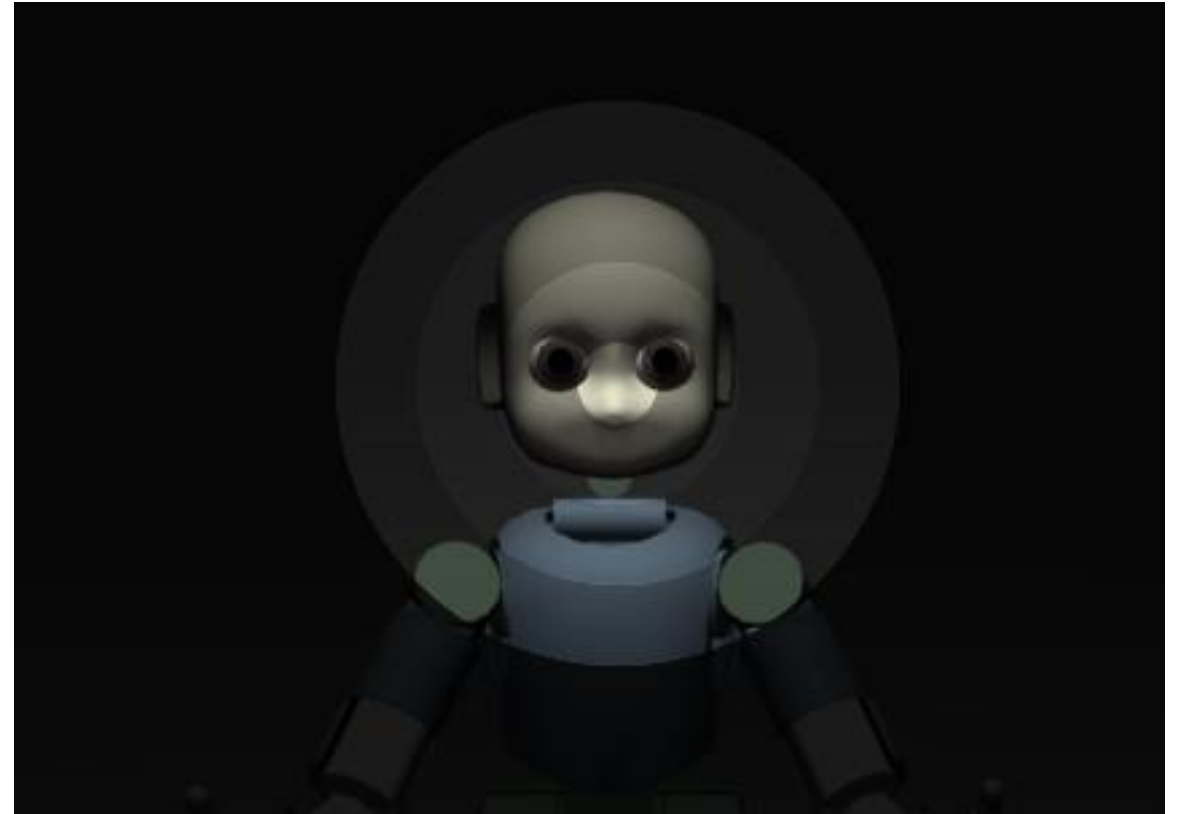


# FocalVid : Facilitating Remote Studies of Video Saliency

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# Author's Bio

***Sahand Shaghaghi*** is a PhD student at University of Waterloo in Waterloo, Canada. He holds an undergraduate (2016) and a master's (2019) degree in Engineering from Ryerson University with specialization in Geomatics Engineering. His areas of interest are topics such as machine vision, computer vision, visual perception, robotics, Human Robot Interaction (HRI), Human Computer Interaction (HCI) and cognitive architectures.

Throughout his graduate studies, he has been involved with various projects related to robotics and computer vision. Recently, he has been involved with two projects relating to mouse-contingent methods and Human Robot Interaction.



# Motivation

- Creation of methodologies which record and analyze users' visual selection preference is of relevance in the field of HCI and HRI.
- Methodologies which facilitate seamless recording of visual saliency for a broader participant base that can be used across a variety of hardware and operating systems are a pivotal component of this process.
- The presented platform is useful in a multitude of experimental scenarios such as: video saliency studies, video game usability studies, and platform usability studies.

# Mouse-contingent Methodologies

- Mouse-contingent methodologies make use of computer mouse and cursor location, which can be reliably recorded, and encourage co-origination of eye and mouse movements in various ways.
- Mouse-contingent methodologies have their roots in psychology studies.
- FocalVid continues the work conducted in methodologies such as “SALICON” and “Bubbleview” which are well known mouse-contingent methodologies.

# Concentric circles

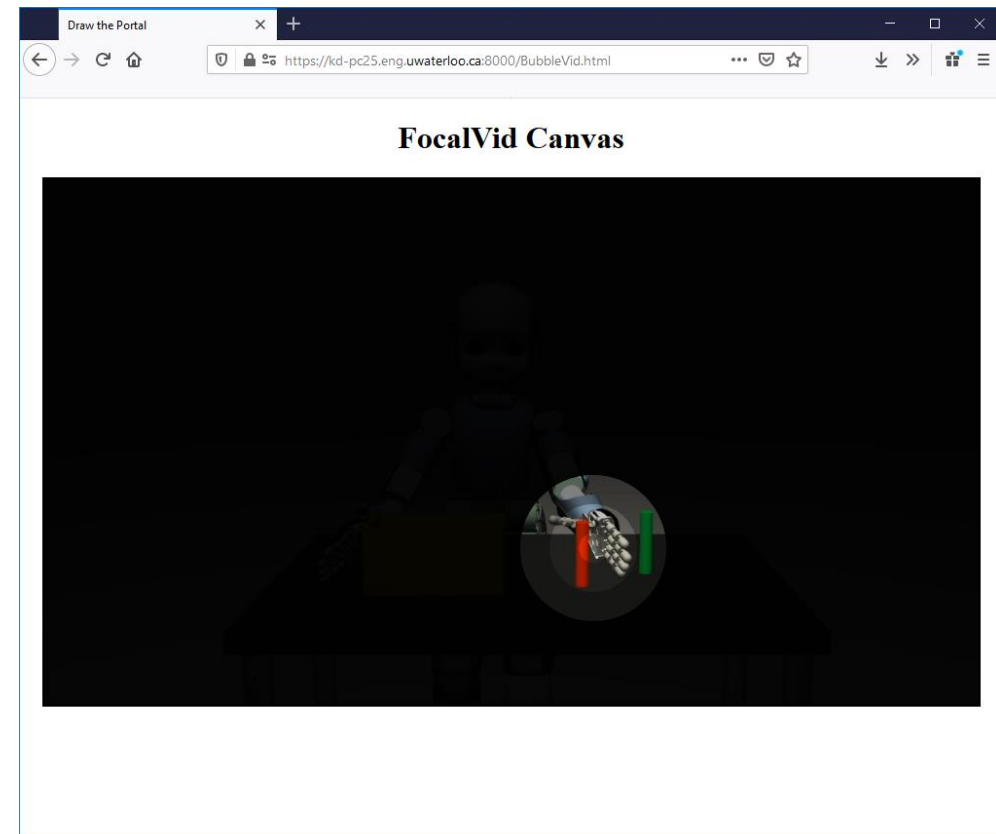
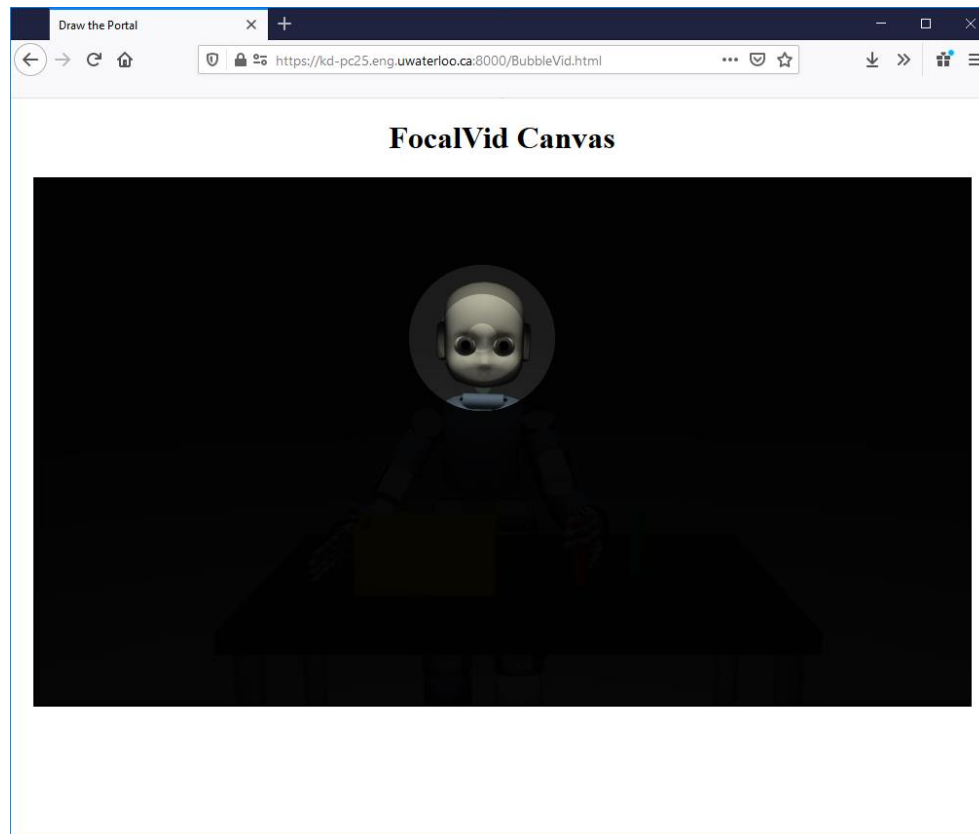
- Our platform displays a video behind a semi-transparent layer.
- This layer is nearly opaque over most of the video frame, but it is more transparent around the mouse-cursor location.
- The transparency is greatest within a small circle around the cursor location, and increasingly opaque in circles of increasing radius.
- This pattern reflects humans' higher visual acuity closer to the fovea, and approximately radially symmetric decreases in acuity approaching the periphery.



Details relating to the concentric circles

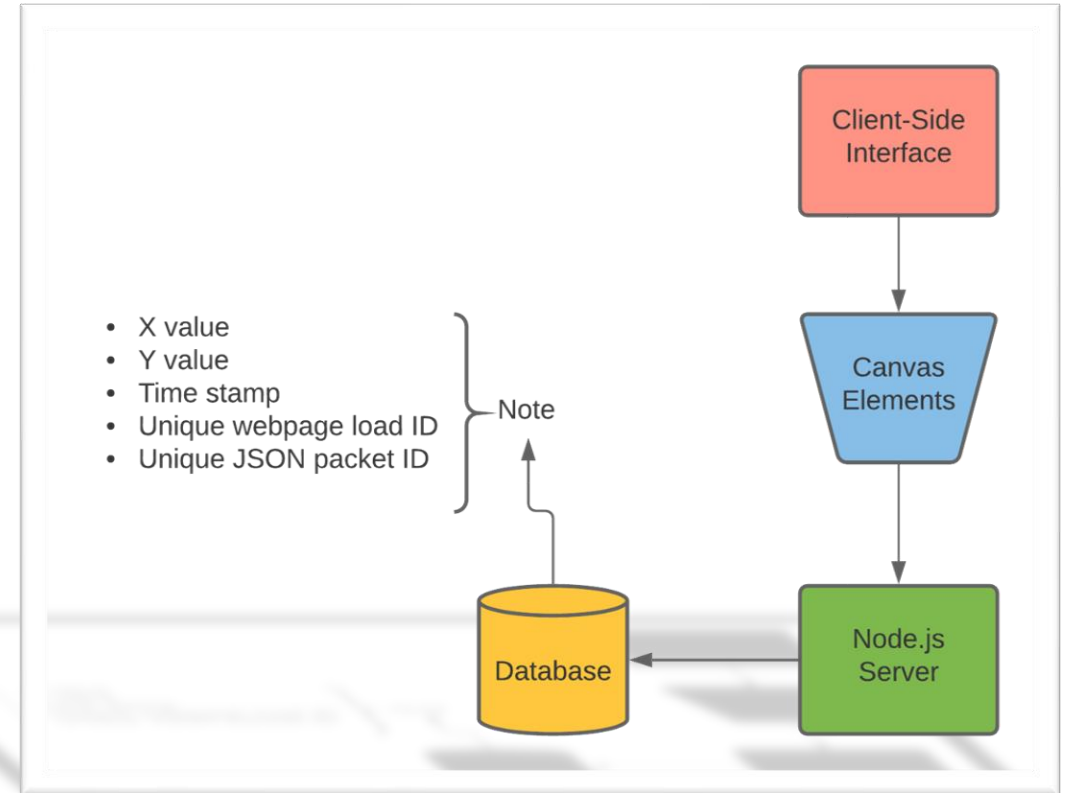
# Platform Performance

- As the cursor is moved, the concentric circles move to bring different areas of canvas into clarity.



# FocalVid System Design

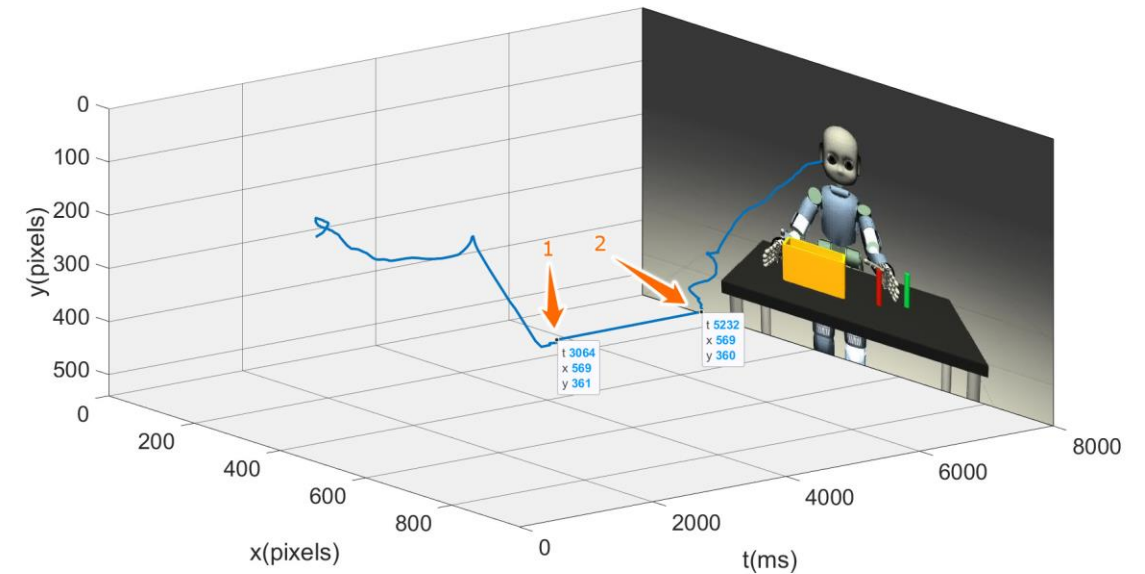
- Client-side hosts the canvas and conducts the bulk of visual data processing.
- Canvas elements is the core component of this platform, since it makes the functioning of concentric circles possible.
- “Node.js” is used as the webserver which handles delivery of the cursor data from client-side to the database.
- The database used is a non-relational database called “NeBD”.



FocalVid System Diagram

# Example: Dwell Time

- Data log visualization of recorded mouse-contingent cursor locations using FocalVid.
- The axes of the 3D graph represent x, y pixel coordinates in the video canvas and t, the time in milliseconds since the start of the video.
- An example of *dwell of the cursor and hence the clearest visual region on the robot's left hand* could be seen in this instance (between points 1 & 2).

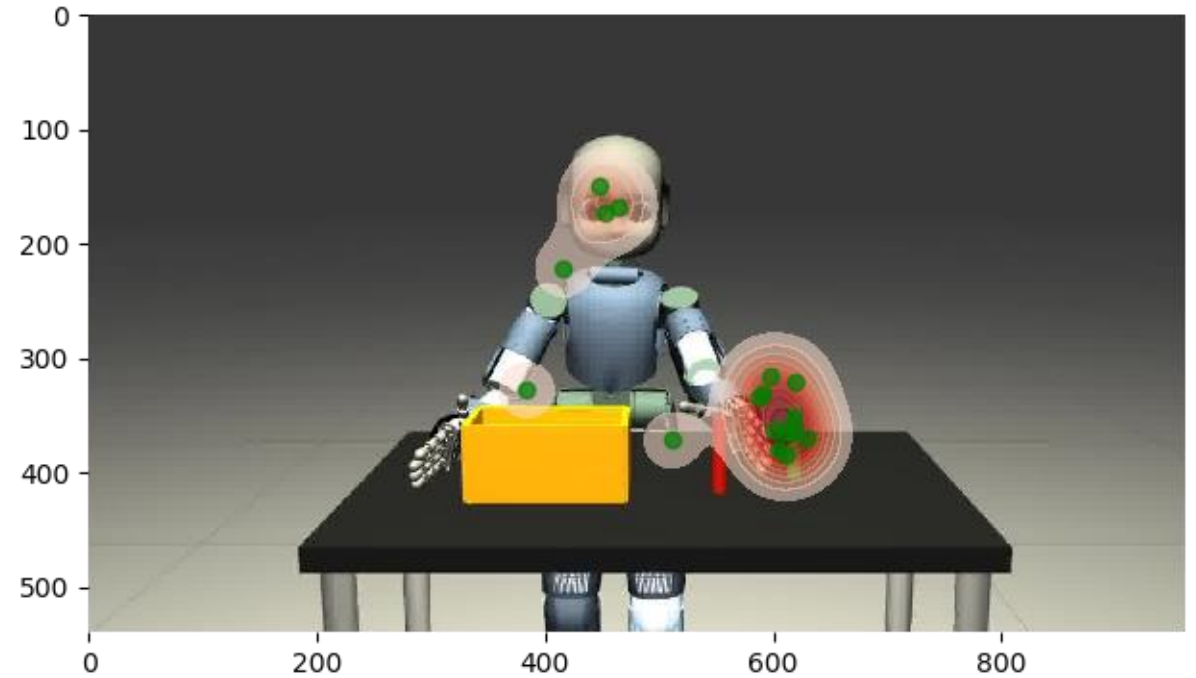


Cursor dwell on robot's left hand.



# Example: Heatmaps

- Heatmap of the mouse-contingent points recorded through the first two experiments using the authors.
- Cursor data adjacent to a single frame is processed.
- *Two major clusters* could be seen, one belonging to the face area of interest (AOI) and the other belonging to the left hand AOI.
- Notice that the hand AOI does not fully align with the hand location, possibly due to presence of other highly salient features in the vicinity of hand, etc.



Heatmap relating to mouse contingent recorded points.

# Conclusion

- FocalVid could be used to record and analyze participants' mouse-contingent visual selection data which can be used in laboratory studies, but importantly, is likely to be highly advantageous for online studies with remote participants.
- The presented system is functional as it stands to record and conduct the needed analysis of the data.

# Future Work

- Immediate future works relating to this project could be classified into:
  - Time stamping improvements,
  - In-depth system verification and
  - Data analysis additions.
- Work is underway to improve upon the time-stamping method such that in addition to the present time-stamp, frame count for viewed video frames is also recorded to the database so that lags could be identified and adjusted for in the data processing step.



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