



# An Algorithm for Your Blindspot

From MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL)



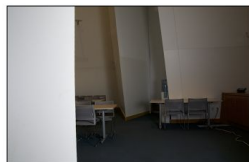
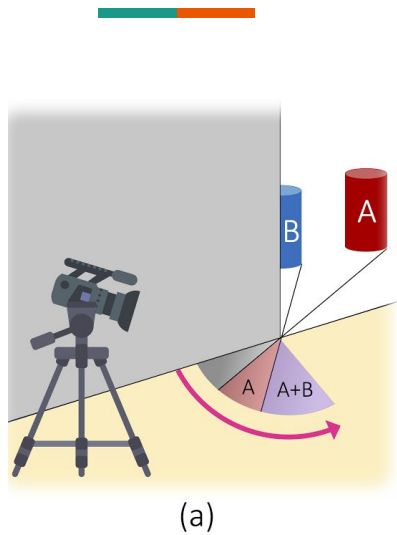
## What is it and How it Works:

- Uses an AI algorithm and standard RGB cameras
  - “Turned corners into cameras” using the penumbra
    - Penumbra - region of a shadow cast by a hidden object
- Uses light reflections to detect people and things hidden around corners and measures their speed and trajectory
- Use the changes in the penumbra at the base of the edge recorded from the Corner Cameras, to construct a 1-D images of how the hidden scene beyond the corner evolves with time
  - I.e. tracks the hidden object or subject’s movements

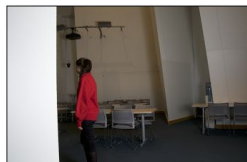


# Corner Cameras

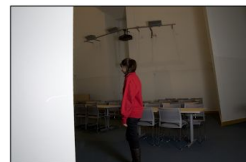
- An edge camera system that consists of four components:
  - the visible and hidden scene
  - the obstructed edge
  - the ground (to reflect light from both scenes)
- observation plane: the (ground) plane perpendicular to the occluding edge



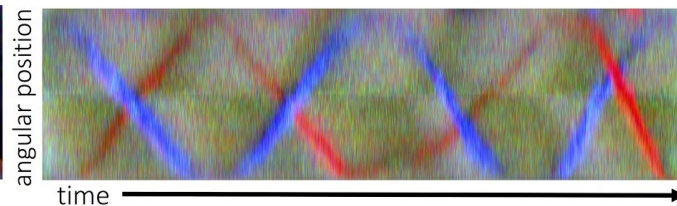
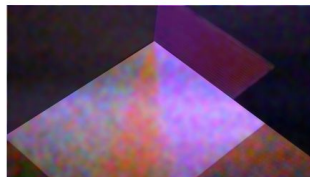
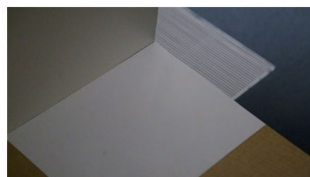
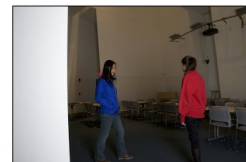
(c) Original Frame



(d) Color Magnified



(e) Reconstructed 1D Video of Hidden Scene

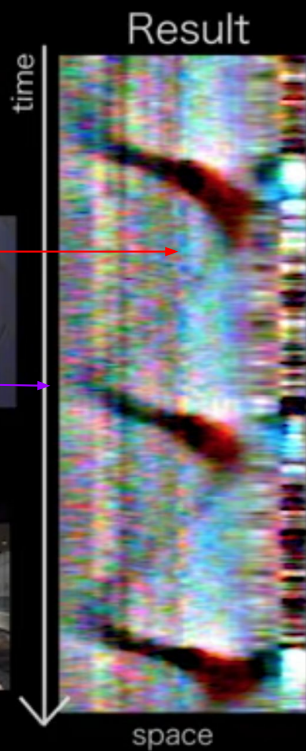


## CHILD WALKING

Corner Video



Hidden Scene

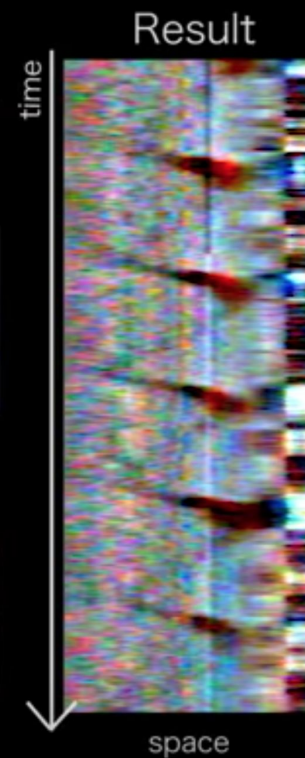


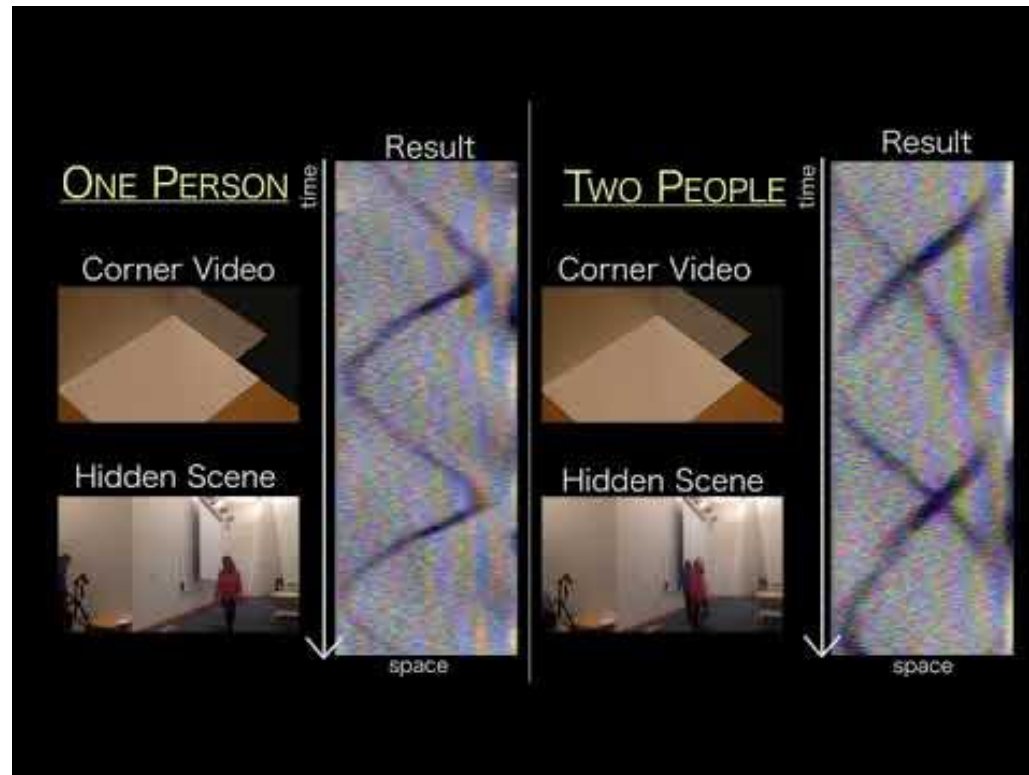
## CHILD SKIPPING

Corner Video



Hidden Scene







## Some Flaws

- Does not work in complete darkness
- Frequent light changes makes it difficult to accurately measure the penumbra
- Some possible errors:
  - Misidentifying corners of occluding edges can affect estimating 2-D position of person or object
  - When using this on the two side edges of a door frame, errors in estimating projected angles of object or person on either side (left or right) can cause errors in determining where the object or person actually is behind the obstruction



**Code:** <https://github.com/vye16/corner-camera>

Used MatLab and C++ to create the algorithm for the Corner Cameras.





# Goals and Uses

- Make it accessible on the smartphone, so you can use your smartphone to detect who or what is in your blindspot
- For self-driving cars
  - Ability to detect oncoming cars or pedestrians
- Search-and-rescue emergency responses
- Can be adapted to other kinds of vehicles such as wheelchairs



# Sources

- Bouman, Katherine L., et al. “Turning Corners into Cameras: Principles and Methods.” pp. 1–9., doi:[http://people.csail.mit.edu/klbouman/pw/papers\\_and\\_presentations/cornercam\\_iccv2017.pdf](http://people.csail.mit.edu/klbouman/pw/papers_and_presentations/cornercam_iccv2017.pdf).
- <http://people.csail.mit.edu/klbouman/cornercameras.html>
- CSAIL, Adam Conner-Simons |. “An Algorithm for Your Blind Spot.” *MIT News*, 9 Oct. 2017, [news.mit.edu/2017/artificial-intelligence-for-your-blind-spot-mit-csail-cornercameras-1009](https://news.mit.edu/2017/artificial-intelligence-for-your-blind-spot-mit-csail-cornercameras-1009).