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Project Description

Mechanics of Cameras and Time Laps Video

Abstracts

The experiment looked at the mechanism of cameras and the process of making a time lapse video. Specifically, this experiment focused on the filming of decomposing food and any sort of bacterial growth over time. A variety of food was assembled, such as bread, cheese, fruits, vegetables, and processed meat, and it was left in a chemical vent hood with a Nikon D90 camera taking photos every 40 minutes. The results showed that there were not enough bacterial growth in an environment such as the chemical vent hood, and the pictures captured resulted in a time lapse video of 48 seconds.

Background

The origin of camera reverts back to the Ancient Greeks and the Chinese. They used devices called camera obscura which projected images on to screens. This idea was not fully developed until the 1800s, when practical models of camera started being introduced.[1] Since then, the mechanism of cameras have advanced from simple box camera with one shutter speed and fixed lenses. Well known camera brands such as Kodak and Nikon has developed cameras with complex setting and even digital cameras.

The experiment was conducted because of an interest in capturing the decomposition of food and any growth of bacteria. This interest led to researches on how mechanisms of cameras correspond to that of human eyes.

There are many similarities when comparing the human eyes to a camera (Figure 1). They both process light reflected from an object and capture images. The outer most part of the eye is the cornea, which is compared to the camera's lens cover. The cornea is more complex than a camera's lens cover, because it functions as more than a cover. The shape of a human eye is curved, which results in the cornea being shapes in to a convex shape, which converges the light inside the eye. The lens further inside the eye also help converge the light rays. Other features that are similar are the pupil, which is similar to the aperture inside the camera. These mechanisms both expand and shrink in order to adjust the lighting. Another feature that is similar in both the human eye and the camera is where the image is processed. In the human eye, the light focuses on a part of the eye called retina which sends signals down the nerve to process the image. In the camera, this area is called the film or the imaging area.[2]

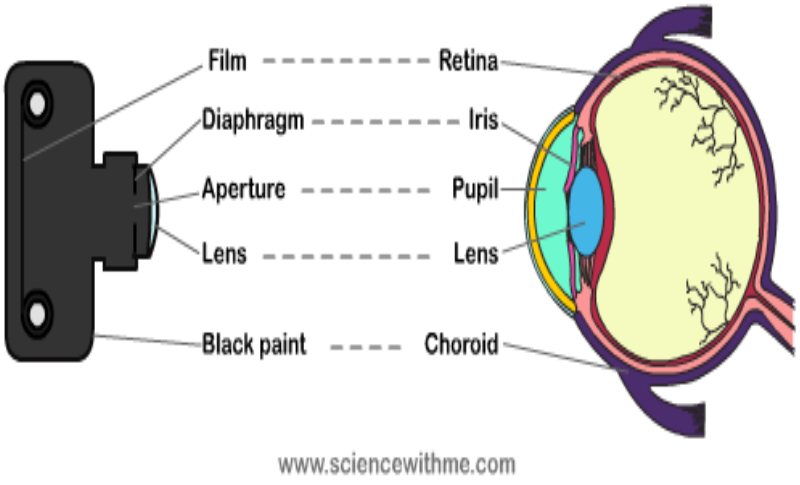

Figure 1. The comparison of the mechanisms between the human eye and the camera. The dashed line connects the two features that are similar in function.

Although the layout of the eye and the camera are relatively similar, there are subtle differences between the two. The way the eyes work, it adjusts light and focus through the response from the brain. Then the brain takes these images and balances the lighting and color to make sense of the image. This process is called a subjective measuring of light. The camera, on the other hand, uses absolute measurement of light. The adjustments need to process the images are done outside of the image processing area. In the process of focusing on an object, the lens in the camera moves closer or further to the target object. In the case of a human eye, the muscles surrounding the lens change the shape of the lens. Another difference is that the light sensors in the camera are uniformly sensitive to light, while the human retina is not. This difference allows for greater sensitivity to dark environments.

Materials and Methods

The materials used were Nikon D90 camera, a tripod, apture timer camera remote shutter, external battery source for the D90 camera, variety of foods (banana, orange, apple, lettuce, bread, cheddar cheese, ham, sausage pieces, and grape tomatoes), and plastic plates and bowls. The location of the experiment was a chemical hood vent, in order to minimize odor. The tripod, D90 Nikon camera with a 35mm lens, the shutter timer, and the battery for the camera was set up inside the vent hood. Variety of food was chosen, and was then placed on plastic plates and bowls near the camera so that it would be in focus. The automatic shutter for the camera was set to a delay of 30 seconds, long of 1 second, interval of 40 minutes, and n of infinity. After 13 days

of documenting, the total number of picture was 457. These pictures were then put into a video playing each picture at 10 frames per second. This setting resulted to a video playing the whole process in 48 seconds. The application Adobe Premiere Pro CC was used to make the time lapse video. The series of photos were inserted as sequence layout and the clip was then slowed down to 40% the original speed to show more detail in the video and to slow down the whole process of the decomposition presented on the screen.

Results and Discussion

The setting of the camera explained in the methods section resulted to a video playing the whole process in 48 seconds. In the video, it is evident that the only food to decompose was the apple, and the banana showed browning. Other food items seem to stay the same, but did show signs of dehydration on the surface.

This experiment was originally focused on creating a time lapse video of the decomposition of food and to swab for bacterial samples to be presented on a glass plate. With the use of a microscope, the intent was to look at bacteria under magnification. There were no swabbing of bacteria unlike planned, due to the lack of bacterial growth on the food items. The source of this error could have been from the lack of variety in the food samples. From previous research on other time lapse videos of food decomposition, there were many samples of fruits and vegetables that could have offered a wider range of decomposition. Another error could have arisen from the fact that this experiment was conducted in a chemical hood vent. The constant air ventilation in the chemical hood vent could have sucked all the moisture out of the food samples, which was evident from the dehydrated surfaces of the food samples. Since moisture is necessary for microbial growth, this could be why there was no bacterial growth on the food samples. Even if

small amounts of bacteria were able to grow, it is likely they were sucked in to the air vent. If the experiment is to be conducted again, it should be done in an area with an environment that would be beneficial for the bacteria to grow. The area should have moisture, decently warm temperature, and little to no disturbance. Another change could be constant misting of the food with water. Since the chemical hood vent was shared with the chemistry graduate students, there was a disturbance during the photo taking, which lead to a change in the frame and a sudden change in the focused food items.

References

1. (2016). "History of Cameras - Timeline - Film, Digital, SLR, Compact, Instant, Disposable." *History of Cameras - Timeline - Film, Digital, SLR, Compact, Instant, Disposable*.
2. (2014). Richards, Beth. "Differences Between Human Eye and Camera." *LIVESTRONG.COM*. LIVESTRONG.COM.
3. Kamps, Haje Jan. (2011). "The Differences between Your Eyes and Your Camera." *RSS*.

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