

Multi Exposure and High Speed Photography

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Objective

1. Evaluate the trajectory of a freely falling droplet with multi exposure photography
2. Capture the splashing of droplets on a pool of water

Theory

If you tossed an object either up or down and could somehow eliminate the effects of air on its flight, you would find that the object accelerates downward at a certain constant rate. That rate is called the free-fall acceleration, and its magnitude is represented by g. The acceleration is independent of the object's characteristics, such as mass, density, or shape; it is the same for all objects.

In this experiment series stroboscopic photos of freely falling droplets are taken and shown in picture below

The following equations of motion for constant acceleration also apply to free fall near Earth's surface ;

$$x - x_0 = ut + \frac{1}{2}at^2$$

and

$$v^2 = v_0^2 + 2as$$

that is, they apply to an object in vertical flight, either up or down, when the effects of the air can be neglected.

Apparatus & procedure

1. Picture/Schematic of the setup
2. Steps followed in setting up the apparatus & camera
3. Calibration with scale & evaluation of the droplets size
4. Fix the tip of the needle as the origin and positive y in the downward direction
5. Adjust Brightness & contrast in ImageJ (Image>Adjust> Brightness/contrast) for better visibility of the droplets
6. After calibration, use the multi point tool to locate the position at different time instants

[TODO]Results & discussion



Figure 1: write caption here

Conclusion

In this experiment, multi-exposure photography was used to track the motion of freely falling droplets. The positions of the droplets at different time intervals were measured using ImageJ. The results showed that the droplets accelerated downward at a constant rate, which matches the expected free-fall acceleration due to gravity.

This confirms that the motion of a freely falling object follows the standard equations of motion, and that the effect of air resistance on small droplets over short distances is negligible.