

Laboratory 3: Multiflash Photography

To: R&D Team
From: James W. Bales
Date: 28 September 2005
Re: Evaluation of Multiflash Photography.
IM3-JWB

Production has tried to use both stroboscopy and synch and delay to analyze certain problems in our factories, but with little success. I need to know what we can do with a multiflash technique, and if we have the ability to do it in-house. The alternative is to pay \$5,000+ for an outside consultant to oversee the work.

As a test of the multiflash process, make your best effort to measure g (acceleration due to gravity) using a multiflash photograph of a falling ball.

Also, the board was pleased with our presentation. They would like us to submit a photo for consideration for the cover of the next annual report – we need something that looks great! Examine your images and tell me what quantitative measurements you can make from them.

Assignment

Use the multiflash technique to take a photograph of a falling ball, and use the image to determine g - the acceleration due to gravity. Then, take a multiflash photograph of something really neat and for the annual report. Try to achieve a photo that might appear in a physics textbook or photography publication (or both). Pick a subject that will allow you to make a quantitative measurement or estimate.

Discuss your proposed subject for the "neat" shot beforehand with the TA/Laboratory Manager who has final say in what experiments are performed. Write up your results in a memo. Your memo should:

1. Discuss the types of problems that multiflash can be used for, and any tips or techniques for improving the images.
2. Describe a calibration procedure for our existing equipment, and tell us the correct values for the flash rates of the unit.
3. Present your results for g , the photo(s) used to determine the results, and a detailed description of the calculation you conducted.
4. Determine the practical accuracy of this method when used in the factory.
5. Provide the production team with a description of your procedure with sufficient detail to allow them to recreate your result.
6. Describe how you took the image for the annual report, including things like the planning of the image, number of flashes, total event duration, etc. Discuss what quantitative measurements (or estimates) you can make from the image. If the image is not quite ready for publication, discuss what you will do to make it better the next time.

Laboratory 3 -- MULTIFLASH PHOTOGRAPHY

Email your proposed experiment to the TA/Laboratory Manager and Dr. Bales 48 hours before you meet for the lab.

1. Use the vacuum photocell to measure the BCPS of the multiframe, and to measure the flash rate for all 6 settings of the flash rate.
2. Take photographs (bracket aperture) of a ball as it falls over a distance of 1 meter. **Plan in advance the area your picture will cover, the magnification that you will use, and the lens you want to use, with an estimate of where you will need to position the camera. Have these ready in your pre-lab write-up.**
3. Create a multiframe image that you would be proud to hang on your wall. The image should
(a) communicate something, preferably quantitative, about the event it documents and
(b) have appeal as a thing of beauty.

This could be something like an experiment or phenomenon out of a physics book or something drawn from your daily experience. It could be a dance, athletic, or martial arts motion. Use your imagination. In your planning think about contrast and other factors that enter into multiframe photography. If a person is going to be in the image, the color of their clothing may be an important factor in the final image quality.

For planning purposes, assume the multiframe strobe has an output of 150 to 250 BCPS, and illuminates a 6-foot diameter circle at a distance of 8 feet from the strobe. Don't forget to specify your lens choice (we have 28 mm, 50 mm, 90 mm, and 200 mm focal length lenses).

Outline your procedure for this part of your experiment.

4. Take measurements from your print of the ball falling. During the lab session, construct a table that includes the position of the ball for each flash of the strobe, and the time of the flash. Compute the average velocity between flashes, and assign that velocity to the midpoint of the time range between flashes. Plot the velocity as a function of time and fit the data to a straight line.

NOTE - You cannot assume that either the initial position or the initial velocity of the ball are zero!

5. In your report discuss how you planned and executed the exercise, including aspects such as planning the composition of the image, selecting number of flashes, estimating the total event duration, etc. Discuss what parameters can measure (or estimate) from the image. If the image is not quite ready for publication, tell us what you would do to make your images better if you were to do this experiment again.