

Throwable Panoramic Ball Camera

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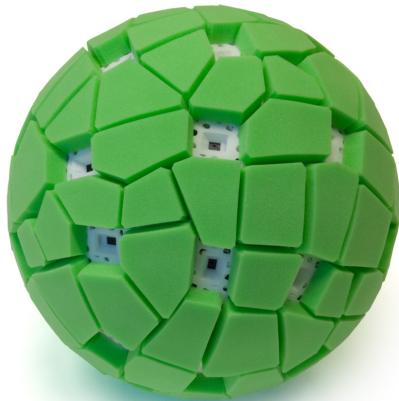


Figure 1: Left: The Throwable Panoramic Ball Camera. Right: Viewer screenshot. Scenes can have many moving objects (see banana).

1 Overview

Acquiring panoramic images using stitching takes a lot of time and moving objects may cause ghosting. It is also difficult to obtain a full spherical panorama, because the downward picture cannot be captured while the camera is mounted on the tripod.

In this work, we present a throwable panoramic camera that solves these problems. The camera is thrown into the air and captures an image at the highest point of flight - when it is hardly moving. The camera takes full spherical panoramas, requires no preparation and images are taken instantaneously. It can capture scenes with many moving objects without producing ghosting artifacts and creates unique images.

Our camera uses 36 fixed-focus 2 megapixel mobile phone camera modules. The camera modules are mounted in a robust, 3D-printed, ball-shaped enclosure that is padded with foam and handles just like a ball. Our camera contains an accelerometer which we use to measure launch acceleration. Integration lets us predict rise time to the highest point, where we trigger the exposure. After catching the ball camera, pictures are downloaded using USB and automatically shown in our spherical panoramic viewer. This lets users interactively explore a full representation of the captured environment.

We used the camera to capture full spherical panoramas at scenic spots, in a crowded city square and in the middle of a group of people taking turns in throwing the camera. Above all we found that it is a very enjoyable, playful way to take pictures.

2 Previous Work

In recent years a phenomenon called "camera tossing" emerged - throwing consumer cameras into the air using the self-timer. Kuwa et al. [2010] proposed a throwable camera system that stitches images of a single high speed camera to create a kind of ribbon image. "trips" by Faoro is a design concept that proposes a throwable panoramic camera. The concept is designed to only capture a cylindrical panorama and a method of triggering has not been described.

Other design concepts include "flee" by Bogazpinar and "SatuGO" by Larsen and Jacobsen which propose non-panoramic throwable cameras with a single camera module. These concepts describe rugged simple cameras with a normal field of view to be used for camera tossing. They are meant to capture multiple images at a fixed interval or a single image with a manual timer, respectively.

Our camera system captures a full spherical panorama and automatically determines the correct time for triggering. We integrate the measured acceleration during launch to obtain the launch velocity. From this the rise time to the top can be easily calculated. The results are sharp images as the camera triggers at the highest point of the flight - when it is moving very slowly.

Hand-held and stationary full spherical panoramic cameras exist (e.g. Tanahashi et al. [2000], Immersive Media Corp. Dodeca 2360 System. [2006]), but at least the mount or the arm will always be visible in the picture. In addition to producing a full spherical image and taking no time to setup, our throwable panoramic camera creates unique images.

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References

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