

Gigapan: Digitizing the Earth Locally

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We believe that the way we perceive the world is directly linked to what we've experienced. As we encounter more, our world view grows. Earth browsers such as Google Earth allow us to fly across the earth, exploring from the macro to the micro scale. Experiencing the earth in this way is immersive and compelling, but as an explorer zooms in to approach the Forbidden City or an African village, he or she hits the "glass floor": exploration is limited to images taken from the sky. The Digital Earth revolution compels us to break through this glass floor, switching from an aerial point of view to a human one. This requires a new approach to capturing Earth imagery.

In this talk, we will motivate and present a very-low-cost robotic device that transforms the compact digital camera into a very high-resolution panoramic image capture device. The device, termed Gigapan, enables a typical camera to yield explorable panoramas with greater than one billion pixels of resolution. Such high resolution panoramas not only present the world from the photographers point of view, they also allow the viewer to zoom around and explore the world from a human perspective.

The Gigapan robot is based on the simple idea that we can robotically capture hundreds or thousands of images from inexpensive digital cameras to construct explorable panoramas with billions of pixels. As storage continues to become cheaper and digital cameras increase in resolution and zoom, these panoramas will become increasingly detailed. Our talk will present both the performance envelope of the Gigapan system and will include a real-time demonstration of the system in action. We will relate recent user experiences with the Gigapan and discuss a diversity of potential applications. Finally, we plan to both present and invite commentary regarding the planned trajectory for this device, such as the ability to create large-scale time lapse panoramas.

The Gigapan robot will be available prior to the conference presentation date in two forms. Firstly, at least one company will be producing the device, fully built, for consumers. Secondly, we will present a public-domain recipe that guides mechanically apt individuals in constructing their own Gigapan frame for their digital camera. Together with this hardware, the Gigapan system includes both firmware and control circuitry as well as open-source stitching software that takes into account the kinematic characteristics of the robotic device itself.

The glass floor can't be broken with satellites or aircraft. We need to shift to a human perspective. The amount of data to capture is staggering, but collectively fewer than one hundred people using Gigapan-like devices can produce a larger volume of image data per day than all existing commercial satellites. But perhaps most importantly, human photographers will capture personal views of the world in a way that automated aerial

and satellite photography cannot match. We hope that devices like Gigapan will help put the creation of high-resolution explorable imagery into the hands of the general public, mapping the world from the human perspective and enabling new methods for education, storytelling, and communication through the sharing of immersive visual experience.

Note to reviewers: the Global Connection Project has submitted two abstracts for presentations. Although both abstracts relate to our imagery work, this proposed presentation focuses on the Gigapan hardware and its potential for a new degree of digitization while the other presentation relates to a new website for maintaining, sharing and annotating panoramic imagery in novel ways. The presentations, though complementary, are completely independent.