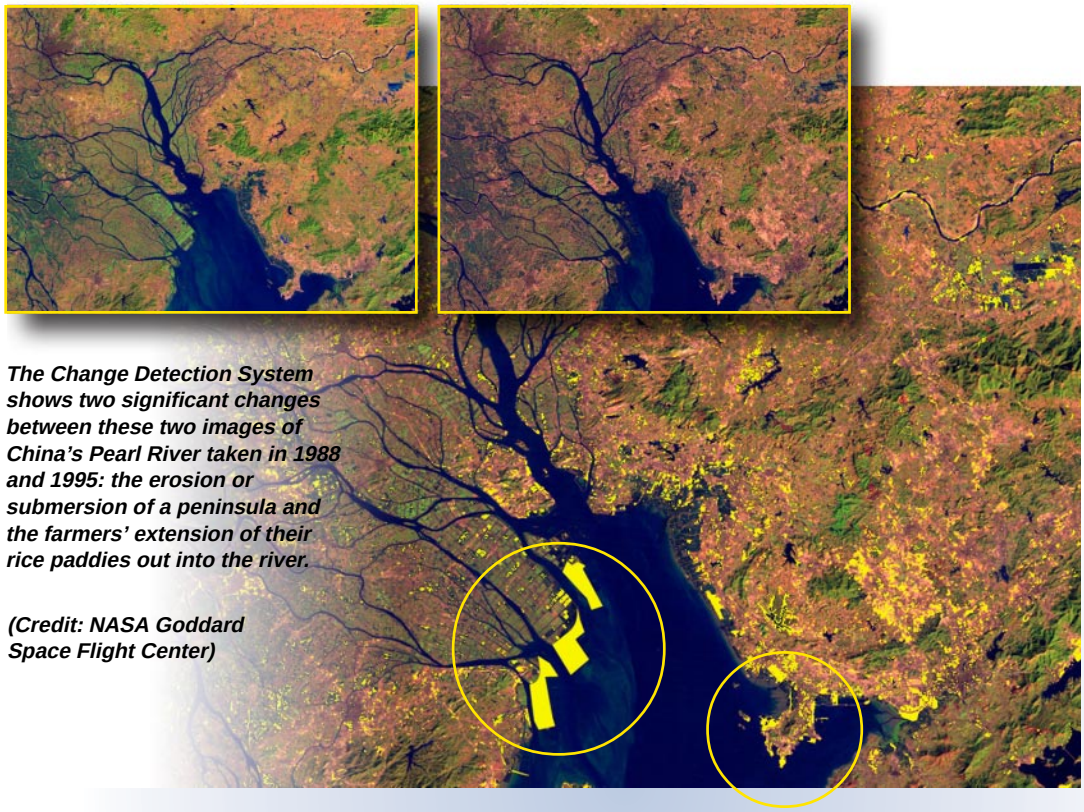
Detecting Change in a New Light



The Change Detection System shows two significant changes between these two images of China's Pearl River taken in 1988 and 1995: the erosion or submersion of a peninsula and the farmers' extension of their rice paddies out into the river.

(Credit: NASA Goddard Space Flight Center)

National Security

Change Detection System

Commercial applications for national security technologies

This award-winning technology enables experts to quickly make accurate decisions by capturing and highlighting changes in digital images that are not immediately discernable to the human eye. Changes that are subtle, such as blood vessel damage during eye surgery, may not show up in a side-by-side comparison of two images. The new Change Detection System (CDS) exposes inconspicuous differences from two photos taken minutes or even weeks apart, detecting changes that might otherwise go overlooked. This system could help medical workers, security personnel, waste management personnel and quality control managers recognize important events.

Differences Emerge

A 2003 winner of R&D magazine's top 100 technologies competition, CDS aligns any two digital images similar in size and perspective. Using identical reference points in each view, CDS maximizes the similarities between them. Then, by flipping back and forth between the two like an animation, previously unnoticeable differences emerge from the background.

CDS can be operated from any standard desktop or portable

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R&D 100 Award Winner for 2003 !

R&D 100 Awards

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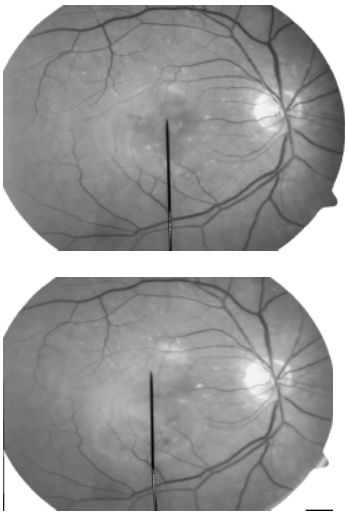

CDS can be useful to ophthalmic surgeons. The change in the position of the pointer in these two images indicates the patient's perceived center of vision before and after surgery.

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computer, plus it works from almost any digitized image format. Initially developed for a variety of national security users, the system could potentially be used whenever small yet important changes occur. Changes in bone or blood vessels can be easily culled from x-ray or MRI images. Ophthalmologists could compare the health of a patient's retina before and after surgery. In manufacturing industries, mass-produced circuit boards could be compared right off the line for quality control. The developers of the system are seeking collaborators in medical diagnostics, industry and security to tailor their system for specific uses. Similarly, limited availability of disposal facilities for radioactive waste and materials may require long term storage containers. The Change Detection System can be used to perform remote inspections of stored inventories to provide early indication of container corrosion.

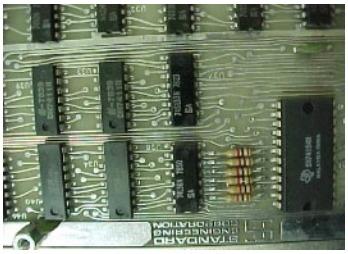
Change is in the Eye of the Beholder

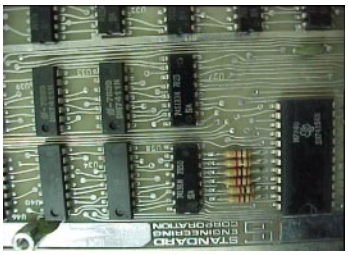
Changes are detected by the tendency of the eye to focus on movement. Instead of a large and complex computer program to align and compare two images, their system aligns the images and lets the far more advanced human eye and brain find the details. In addition, the resolution of what can be detected is limited mainly by the resolution of the electronic images.

No Tripod Necessary

The CDS software is compact and powerful. At about 350 KB, it weighs in at a tenth the size of standard web browsers and word processing programs and works on a standard Windows NT desktop or portable computer. CDS can analyze either scanned photos or images taken directly with a digital camera taken over any time period. While the images need to be similar in perspective and size, no camera tripod is necessary.

CDS can be useful in the quality control of industrial processes. These two different circuit boards, made one right after the other on a production line, show significant differences in chip markings, resistor position and soldering.











The two apparently identical photos at top were actually taken a few minutes apart with a hand-held camera. When aligned and compared with CDS, footprints become visible, revealing that a person has walked in the gravel between shots.

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