

'Webcameras and the Telepresent Landscape'

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Editor's Introduction

One of the most notable recent developments bringing ICTs and cities into close articulation is the webcam phenomenon. As a perfect illustration of the ways in which ICTs and cities are today mutually constitutive, it is now possible, via the Internet, to access webcams, as distant prostheses, to 'see' an expanding universe of urban (and non-urban) sites across the world on a computer screen. With similar ease one can watch the room next door or witness a sunset on the far side of the world.

But how does this explosion of telepresent, and instantly accessible, urban prosthetic eyes relate to constructions of technology, visibility, the urban spectacle, and cultures of looking, in previous eras? In this specially commissioned piece Thomas Campanella, an urbanist interested in the new media who works at the University of North Carolina, analyses these connections. Exploring the history and diffusion of webcams, Campanella traces their complex genealogical linkages to traditional post, telephone, telegraph, camera and television technologies. He also asserts that webcams are direct descendants of electromechanical attempts to project cityscapes onto screens for remote, real time, viewing, such as the *camera obscura* and *camera lucida*.

To Campanella, webcams herald a dramatic explosion in the availability and performance of remote prosthetic eyes for the viewing of distant places in (near) real time. They exemplify the ways in which cyberspaces are seamlessly fused into transglobal digital media systems, with many millions of terminals, which themselves act as cyborg-like prostheses of human senses and organs. And they intensify the logics of speed, distanciation, and the movement from asynchronous communications (which involve a delay between sending and receiving) to synchronous, or real time, ones (which have very little delay). What webcams do not do, however, is bring anything like the rich co-presence enjoyed when people are physically present in real places.

It was often claimed during the reign of Queen Victoria that the sun never set upon the British empire. While the age of global imperialism is long over, we have in recent years constructed an empire far greater than any in history. This vast and somewhat elusive realm is the cyberspatial empire of networked computers that stirred to life with the PRATT (developed by the Advanced Research Project Agency of the US Department of Defense) in the 1960s, and has since evolved into the Internet and world wide web. Today we are busily transposing into this new cultural space

seemingly every detail of the human experience; cyberspace is, as David Gelernter, in his book *Mirror Worlds* (1991) memorably put it, a vast 'mirror world' reflecting reality itself.

In the early days of the digital revolution it was often heard that cyberspace threatened the robustness and vitality of the so-called 'real' world, that the two were opposing entities fated to an oil-and-water battle for supremacy. There were even predictions that the city itself, that paragon of physicality, was doomed. To these anti-urbanists, the modem's trill proclaimed a

coming age of telecommuting from wired rural idylls. This vision, favored by Marshall McLuhan, Alvin Toffler, George Gilder and other futurists, was only the latest iteration of an age-old American scepticism about cities, something we inherited from the quixotic polymath depicted on our nickels.

But even in the early days of the web, there was evidence suggesting that people were using their networked computers to affirm and even celebrate the values of place that were supposedly heading the way of the dodo. For one, we started using computer-based communication to recreate the kinds of interaction once afforded by dense urban neighborhoods or small towns – the kinds of communal life celebrated by Jane Jacobs and Garrison Keillor. People who first met online found themselves arranging to meet in ‘meat space.’ And then a handful of hackers started patching old video cameras into their computers, apparently for no other reason than to share with others a glimpse of the physical environment from which they tapped into the global bitstream.

It was no great technological leap to realize that the digitized input from a camera could be distributed to a huge number of users via a computer network. This is just what a pair of Cambridge University computer scientists, Quentin Stafford-Fraser and Paul Jardetzky, did in 1991. After connecting a camera to a computer equipped with a video frame grabber, the pair chose as their subject a humble coffee pot next to a lab known as the Trojan Room. They wrote a simple client-server program that captured images from the camera every few minutes and distributed them on a local network, thus enabling people throughout the building to check if there was coffee before embarking on the long trek downstairs. Eventually Stafford-Fraser and Jardetzky began serving images over the web itself, in the process giving birth to the Internet’s first ‘webcamera.’

By the mid-1990s there were hundreds of webcams on the net. Following the geography of the net itself, the early units were all located in the United States, Europe or Japan. But they appeared rapidly in places farther off the digital mainline – from Mexico to Pakistan, South Africa to the Czech Republic. Today, most major cities in the world – with the exception of those in Africa, North Korea, and mainland China – can attest to at least one, and often scores, of webcams. The advent of this collective electronic retina brought new meaning to the old maxim about the sun and the British empire. With webcams, any modem jock

could prove that when the sun went down in Atlanta, Georgia, it was only just coming up over Tokyo bay. As the electro-optical matrix expanded around the globe, it became possible to simultaneously watch the sun rise and set at the same time – something that, as little as a decade ago, would have been the stuff of science fiction.

Webcams are liminal devices. They operate on the threshold of the physical and the cybernetic, like points of contact between reality and the virtual realm. The cameras grab data from the real world and translate it into machine-readable code. Those bits of digitized information may be no different from stored data on a hard drive; but because they are only briefly separated from the pulse and hue of life – for a time at least – they are infused with a touch of magic. Webcams begin to yield what Mark Stefik (1996, 263) has called ‘a rich interaction that interweaves the images and agencies in the real world with those of the imagination and cyberspace.’ Put another way, they ‘map’ reality onto cyberspace, and vice versa.

Contrary to projections that computer-based virtuality would abrogate traditional qualities of place and diminish our attachment to particular real-world environments, webcams prove that we are actually using networked computers to give real places new meaning in the cybernetic world. Webcams are especially common means to allow iconic global tourist cities such as Florence to be visually ‘consumed’ at a distance (Plate 5). In major global cities like Paris whole suites of webcams are now marshalled to allow a comprehensive real-time picture of the elements of the subject city to be built up (Plate 6).

Few sites better illustrated the use of webcams to give urban places new meaning than the late, great, UpperWestSide Cam in New York City (Plate 7). Installed by David Spector in 1995, the webcamera was for a time among the most popular on the net. This was due in large part to the close-range view it afforded of a busy Manhattan street corner, and to the quality of the image served (details as fine as a person’s face could be distinguished). The camera was mounted in a window above the intersection of 73rd Street and Columbus Avenue, where it took in an archetypal street corner in one of Manhattan’s most vibrant neighborhoods.

As news of the webcam spread, its community of users expanded around the world. People held banners within its range, broadcasting messages to friends and relatives on the other side of the world. Old residents

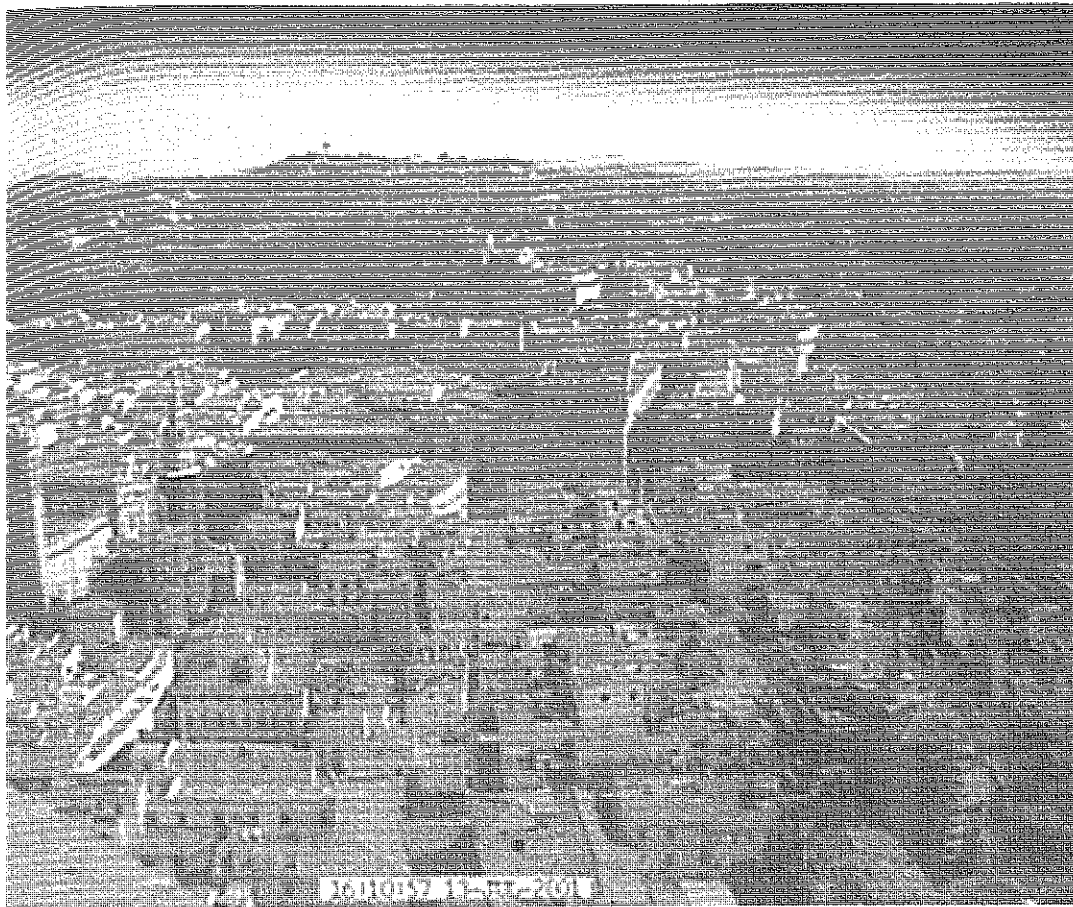


Plate 5 The Florence Duomo Cupola webcam.

of the neighborhood used the webcam to glimpse back nostalgically. One couple planted themselves periodically in front of the camera to 'be' with their daughter in Sweden. More, genuine interest developed in the built environment captured by the lens; inquiries poured in about a particular restaurant in view, or a shop across the street, even about a certain delivery truck which continually appeared curbside. The UpperWestSide Cam Frequently Asked Questions (FAQ) filled with detailed information about a unique urban environment. The webcam generated real interest in a real place – a Manhattan street corner and a New York neighborhood. The camera added a whole new stratum of cultural space to the corner of 73rd and Columbus; now, it was not only a bustling New York intersection, but a street corner in cyberspace as well.

On a broader scale, webcams have also brought about something of revolution in our perceptions of time, space and global geography. Before this technology, the *synchronous* observation of distant places (those beyond, say, the reach of a telescope) was for all practical purposes an impossibility. To watch the sun

set over Mount. Fuji in real time would have required either physically being present in Japan, or having access to a live television broadcast of the mountain at dawn. Webcams are byte-sized portals into distant worlds; they have, like the telephone and the Boeing jet, helped dwindle the one-time vastness of the earth.

Indeed, the story of technology is largely one of abnegating distance (time expressed in terms of space, or vice versa). For millennia, real-time communication was limited to the range of sound and sight. Signaling devices such as smoke, drums, cannon (or Paul Revere's belfry-borne lantern) were effective only as far as weather and topography permitted. Asynchronous communication, using drawn or written messages, was being carried around the globe by the time of the Renaissance, but the lag between dispatch and receipt could be years. In the middle ages the average person's world was small indeed – limited by the hills or walls surrounding their town. Travel was costly and dangerous; those who took to the roads were often criminals and outcasts from society. Indeed, the etymology of the word 'travel' is the Old French *travailler* or 'travail' – to toil and suffer hardship.

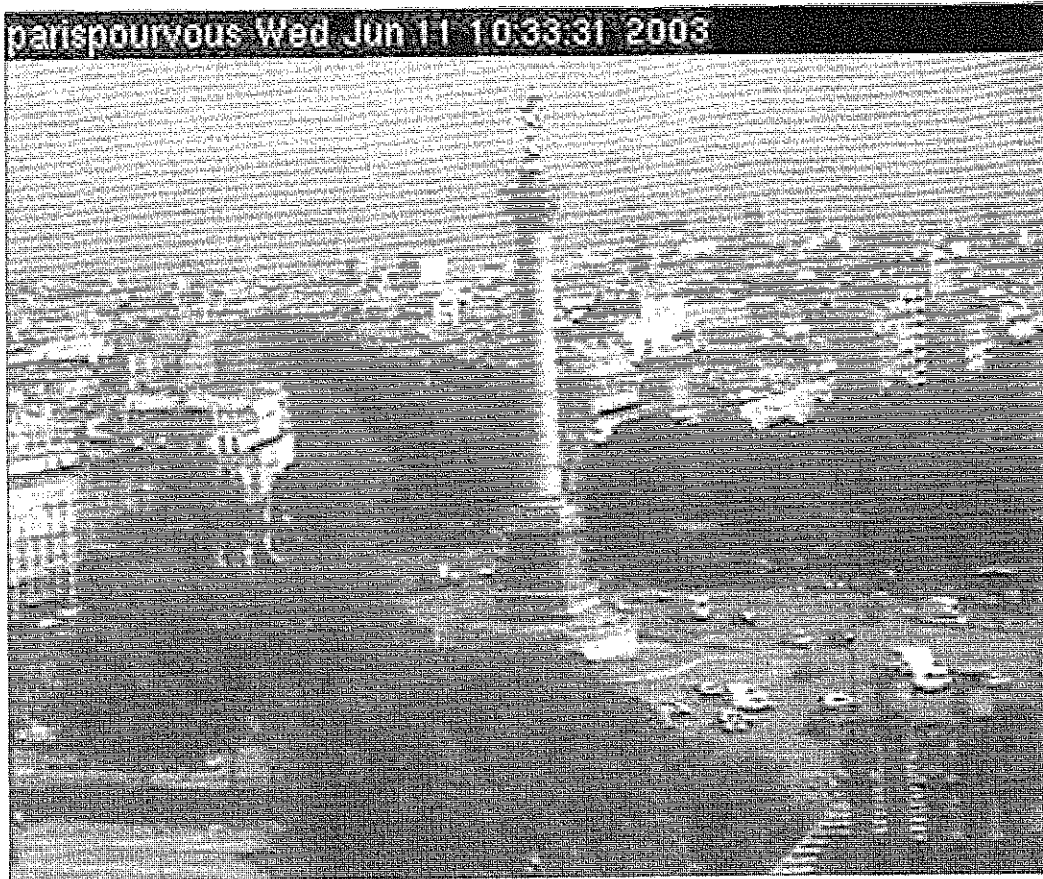


Plate 6 Webcam from the Place de La Bastille. (Source: Parispourvous.com)



Plate 7 The Upper West Side webcam in New York City.

It was not until about 1850 that technology began to profoundly expand the spatial parameters of daily life. The development of rail transport had the greatest impact. The locomotive destroyed the tyranny of distance, and ended what Stephen Kern (1983, 213) has called 'the sanctuary of remoteness.' Once-distant rural towns suddenly found themselves newly within reach of urban markets (if they were fortunate enough to be near a rail line; places bypassed by the train, such as many New England hill towns, often found themselves newly remote). Rail transport also brought about a new temporal order: an abundance of local time zones made the scheduling of trains a logistical nightmare, and eventually led to the adoption of a uniform time standard in the United States.

Subsequent advances in transportation technology – fast steamers, the Suez Canal, and eventually the airplane – compressed the great distances separating Europe, Asia, and America. Circumnavigation of the globe, a dream of ages, became reality not long after Jules Verne's *Around the World in Eighty Days* was published in 1873. Inspired by the novel, American journalist Nellie Bly became, in 1890, the first to circle the earth in less than the vaunted eighty days. In the following two decades, the scale of the globe itself progressively shrank. A journey to China had, by 1936, been reduced to a two-day flight by China Clipper. With the arrival of commercial jet aviation, traversing the earth was within a day's travel and a middle-class budget.

Innovations in electronics further annulled the old order of time and space. The first electric telegraph line, linking Baltimore and Washington, went into service in 1844; a mere twenty years later the first transatlantic cable was installed – the first segment of today's global telecom network. Marconi discovered that telegraphic signals could be transmitted via electromagnetic waves, and in 1902 he succeeded in sending the first transatlantic wireless message. The telephone, which spanned the United States by 1915, brought the power of distant synchronous communication into the kitchen and prompted predictions of home-based work as early as 1914.

The development of the digital computer – and especially the Internet – further neutralized the old order of geography. The net was conceived to do just that. PRATT, a Cold War-era defense initiative intended to create a multi-nodal knowledge-sharing infrastructure that could withstand a nuclear strike to one or more of its nodes, effectively made

geography irrelevant. If any one part of the system was destroyed by a Soviet Intercontinental Ballistic Missile – New York or Washington, for instance – mission-critical data would simply re-route itself around the blockage.

While the development of the worldwide webcam network has helped span the gulf between place and cyberspace, it has also yielded something of a great grassroots telepresence project. *Telepresence* is a term applied to a wide range of phenomena, often inaccurately. It was coined in 1980 by MIT Artificial Intelligence pioneer Marvin Minsky, who applied it to tele-operation systems used in remote object-manipulation applications. One working definition of telepresence is 'the experience of presence in an environment by means of a communication medium.' Put another way, it is the mediated perception of a distant real environment.

The genealogy of telepresence begins with simple optical devices such as the telescope, microscope, *camera lucida* and *camera obscura*. Each of these ported an observer into a remote scene in real time; but it is the latter that is the webcam's most proximate antecedent. Though its optical principles were described by the fifth century BC, the camera obscura is generally attributed to the German astronomer Kepler, who designed a portable instrument for use in a tent. Guyot later described a camera obscura which projected an image upward onto a transparent tabletop, foreshadowing the desktop monitor. His device enabled viewing by those gathered around a table, and could also accommodate tea cups or a book.

Camera obscura technology scaled easily, and eventually room-size stations were built. One of these was at the Royal Observatory, Greenwich. Using mirrors and a lens, the camera image was projected on a concave plaster of Paris table, viewable by many people at once. Like so many webcams today, cameras obscura were often situated to enable a sweeping view of cityscape – the most famous of which was the Outlook Tower in Edinburgh, later acquired by the redoubtable town planner Sir Patrick Geddes.

Synchronous co-presence by electronic means remained a dream until relatively recently. The earliest depiction, published in an 1879 edition of *Punch*, imagined an 'Edison Telephonoscope' enabling family members in Ceylon to be telepresent in a Wilton Place villa. The first experiments in transmitting still images



by telegraph took place in the 1840s. Twenty years later Abbé Caselli devised a system which used rotating cylinders wrapped with tin foil to transmit and receive photographs and handwritten notes. As early as the 1880s, photographs had been transmitted via radio signal in England; and by 1935, Wirephotos enabled the rapid transmission of photographs around the globe.

The electrical transmission of *live* images was first explored by the German physicist Paul Nipkow in the 1880s. Nipkow understood that the electrical conductivity of selenium changed with exposure to light, and that all images were essentially composed of patterns of light and dark. Based on this, he devised an apparatus to scan (using a rotating disk) a moving image into its light-and-dark components and convert this into electrical signals. The signals would then illuminate a distal set of lamps, projecting the scanned image on a screen. Nipkow's ideas, which remained theoretical, provided the basis for the early development of television.

Until the advent of the net, television remained the closest thing to telepresence most people would ever experience. And while videoconferencing technology has become more accessible in recent years, it has yet to move much further than the company boardroom. The arrival of the web, by providing inexpensive and ready access to a global computer network, made elementary telepresence a reality for anyone with a modem, PC, and an inexpensive camera such as the original Connectix QuickCam. The world wide web brought telepresence to the grassroots.

Admittedly, webcams hardly satisfy the more rigorous definitions of telepresence. David Zeltzer, for example, has argued that to achieve a true sense of 'being in and of the world' – real or virtual – requires full sensory immersion, a 'bath' of inputs, as he puts it. This is something that can be only be achieved with high-bandwidth, multisensory streams of data from the remote world. Held and Durlach have similarly argued that 'high telepresence' requires a high resolution image, a wide field of view, and a multiplicity of feedback channels – visual, aural, and tactile. The

system should also afford the user dexterity in manipulating the remote environment, where the user's movements are correlated to the actions of a remote 'slave robot.'

Obviously, there are few – if any – webcam sites on the net today that would meet such strict standards. Even with dramatic recent improvements in image quality and interactivity, webcams constitute only the most basic kind of telepresence. In the end, webcams afford what might be described as 'low telepresence' or 'popular telepresence.' But their limitations are, in this writer's view at least, compensated by the vast extent of the webcam network, which itself can be seen as offering remote-world mobility simply by enabling viewers to hop around the globe from one webcam to another.

'Telepresence' is an ambitious term in any case, and the virtual observation of any scene via cable and modem is but a pale cousin to the robustness of being there. No one sends postcards from cyberspace, not yet at least. Webcams will not cure seasonal affective disorder, and nobody in their right mind would turn down a junket to Bali for the BaliCam URL. Yet webcams retain a certain magical quality. That we can set our eyes on a sun-tossed Australian scene from the depths of a New England winter night is somehow reassuring, as if there on our desktop is proof positive that the home star is burning bright and heading toward our kitchen window.

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