INTERIM REPORT

Prepared by Ambient Information Systems, Ltd. for Future Physical, Ltd.

30 November, 2002

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flipflop

1. LIVE STREAMING AS DRAMATURGY

1–31 July 2002

Script development sessions took place throughout July 2002. Cooperative scriptwriting workshops led to the filling out of the main themes and identification of points for improvisation and live A/V feeds from the roaming performer. The performance is structured into vignettes. The story-generating structure and key vignettes focus on humanity's ambivalence to technology and bionic extension. Dreams of overcoming distance, of being in many places at once, are realised, but their nightmarish character is also explored. An important idea is that of 'loneliness in an over-connected society'. (On a more philosophical plane, there is the question: "where does the self reside?" If our experience happens through telepresence, is our true self – or mind – where the brain sits, or where the sensors and actuators are, or somewhere between? This question is a rephrasing of the classic "brains in vats" thought experiment, as explored by Douglas R. Hofstadter and Daniel C. Dennett in: *The Mind's I. Fantasies and reflections on self and soul*, New York, 1981).

The in-venue performer develops into a megalomaniacal character who wants to conquer time and space with his omnipresence mediated by technology. He is on a search for enhanced social connectivity, even enhanced human being-hood, but in the middle of a very social setting, a party. He extends himself through bionics – the roaming performer is his avatar, in the 'real' space outside the venue. The in-venue performer directly addresses audience members, allows himself to be interrogated by them, provokes them in humourous ways, and in a way serves as human interface between them and the roamer – since these interactions are caught by the roamer and thrown back.

Reflections

Structurally, flipflop progresses through digressive and episodic narrative moves. The theme and structure of the piece are woven together by crisscrossing of telematic links between performance space/performer and street space/roamer. These links explore the correspondences between the digressive and fragmentary narrative outbursts of Ajay and the wanderings of the roamer. Streetwalking is presented as a narrative act; and the details of the stories and episodes elaborated in the performance space punctuate and dictate the directions and encounters of the roamer – cycles of telematic feed-back draw performance space and street, performer and spectator, together. The crossroads and the network node present

themselves as archetypal narrative sites. Rehearsal, orchestration, choreography, improvisation, the unpredictable responses of the audience and the unknowable paths that city walks trace through the expanded performance space are brought together by the crossing of streams that technology allows. As flipflop's narrative structure is essentially digressive, and deals to a degree with the building of a character through fragmentary vignettes and sketches, and with self-encounter also, the streaming might be seen to figure how we weave stories and sense from the streets and their chaos of traces; traces from which we project a transcendent geography of the self.

Flipflop seeks to explore the folds and contours of a performance space whose definitions and possibilities are shifting. The theatre has always been the shelter of projection and make-believe; it has always been the material shelter of the imaginary and the virtual. Flipflop twists the interplay between real spaces and imaginary realms. The performance incorporates geographically distant real spaces into the theatre space. Those places beyond the walls, however, are received as virtual, as thrown images and sounds; these in turn dematerialise the walls of the performance space, they are literally rendered as dramatic projections. The body of the performer and its relationship to character turns through corresponding twists and flips. Thematically, the vignettes, sketches and scenes that the in-house performer spins explore the way a 'self' is figured through an unruly tangle of tales and projections. The relationship between Ajay and his roaming avatar plays out this elaboration of stories about the self, of eccentric projection.

Feedback

Flipflop explores various choreographic and compositional dimensions of feedback. The horizons of the everyday are increasingly saturated with technologies of surveillance – some of which trap and store data, some of which feed it back into the ambient environment after various degrees of manipulation. Entering a bank we are met by our own image walking towards us, reaching across the counter at a petrol station our gesture is repeated on a screen above us; when looking up from a supermarket aisle, we glimpse our reflections wrapped around the black plastic dome of a security-camera. In such moments we imagine ourselves seen from a place we do not know. These moments of encounter, while thoroughly mundane, can never be ones of complete indifference. Flipflop elicits something of this uncertain and residual fascination at the interplay of everyday-gesture and its image.

It can be traced in the hesitant choreography of passers by on Tottenham Court road – they glimpse themselves in a screen facing out to the street from a window display, they pause,

peer through the reflections at play on the plate glass; people in pairs or groups huddle close into frame, point at each other while mapping out the correlations and relations between real space and screen space. Striking poses, making faces, or staring with a strangely blank curiosity at the image of our own blank stare, and making sudden gestures as if to startle the steady gaze that meets us from the screen, in order to trick our doubles, as if countless childhood leaps towards our shadows had not already taught us frustration.

This frustration and this fascination are perennial; a form of feedback at the root of identity and (mis)recognition. There, too, is this elaborate choreography – the leaps towards shadows, the sudden gestures, the hand reaching flat against the screen or mirror, the face pulling, the turning of a cheek to the camera and the straining of the eyes toward the screen to one side of it. These motions are often attended by the fantasies that being on screen precipitates.

Flipflop charges both those data circuits that loop back and those that hover and store. Raiding the spectrum, flipflop gathers information, throws it in to the mix, and sends it back out through the airwaves. Radio-talk, phone-talk, cctv, the whispered conversations and surreptitious glances of the audience, captured, reconfigured, rebroadcast. Spectators find themselves unwitting participants, hear themselves echoed on the soundtrack, find that they are dancing to their own projected image – perhaps even arriving at the party to find themselves already there. Scenes are infiltrated by human avatars, wired for sound and image and feeding the DJ and VJ with angles on the audience. And there's a performer on the floor, ranging through moves and masks; another one elsewhere - but no one's quite sure who's watching who.

flipflop

2. MOVEMENT WORKSHOP

8–19 July 2002

Participants:

Manu Luksch (camera and live video manipulation)

Ajay Naidu (co-choreographer and dancer)

Mukul Patel (live sound manipulation)

Michael Uwemedimo (co-choreographer and dancer)

Andrea Zimmermann (of *Vision Machine* – camera)

Aims:

• To explore movement in capoeira and its potential meeting with breakdance

• To experiment with live sound and video manipulation techniques using software such as Image/ine and hardware such as tape loop machines

Seven days of workshop sessions were held at the ambientTV.NET space over two weeks in July, punctuated by a preproduction trip to Makrolab in Scotland. There follow some reflections on forms and technologies explored.

Photo courtesy Vargas Organisation

Reflections: form

Capoeira finds a salient place within the technical and thematic framework of flipflop – a framework of surveillance apparatus that stages the compositional aspects of feedback and exploits them to dramatic effect through a series of projections, echoes and shadows. As a form, capoeira shares the terrain that the performance explores. It is a form of corporeal dialogue – an exchange in which one's partner is a mirror possessed of a will to deceive, dissimulate and disguise. Each capoerista shadows and echoes the other, a shadow play in which it is possible to out-manoeuvre one's own shadow, an echo that tends to a Chinese whisper. Each partner extends the movement of the other and turns it against them, as the technological apparatus shadows and mirrors the spectators, confronting and disconcerting them with their own moves.

Photo courtesy Vargas Organisation

Dissimulation is central to the form; not only do participants deceive each other, but the spectacle of the *roda* (circle: the space where capoeira is played), is used as both an attraction and a distraction – it gathers a crowd and then diverts them while their pockets are lightened and the load of the baggage relieved. As distracting spectacle, it plays an analogous form within flipflop.

Further, the form itself is a disguise. Martial practices amongst the slaves who developed capoeira were prohibited. The martial implications of the form had to be disguised as a recreational, quasi-religious dance. Capoeira is a *syncretic discourse of deception*. *Syncretic*, in as much as it draws on and fuses, martial, musical, religious and dance forms from the communities along slave routes that reached from the coast deep into the African interior. Along the course of its development, it has also incorporated movements and strategies from a number of other martial arts, most notably Tae Kwando. And it is a *discourse of deception*, in two senses. Firstly, the martial practice itself had to be disguised as a recreational, quasi-religious dance form. It is a ruse, a camouflage, double-talk. When, after Brazil's late abolition of slavery, capoeira was outlawed, the stakes were raised – to execution and amputation – and it became a form that had to hide itself; emerge, take form, and disperse.

Photo courtesy Vargas Organisation

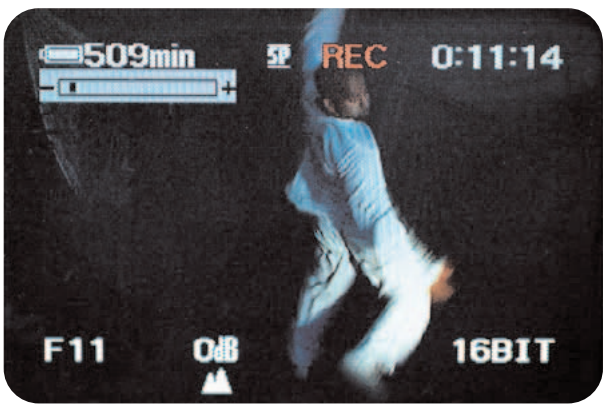


Photo courtesy Vargas Organisation

Practices of deception and dissimulation characterise relations between participants as well as those between the form and structures of societal authority.

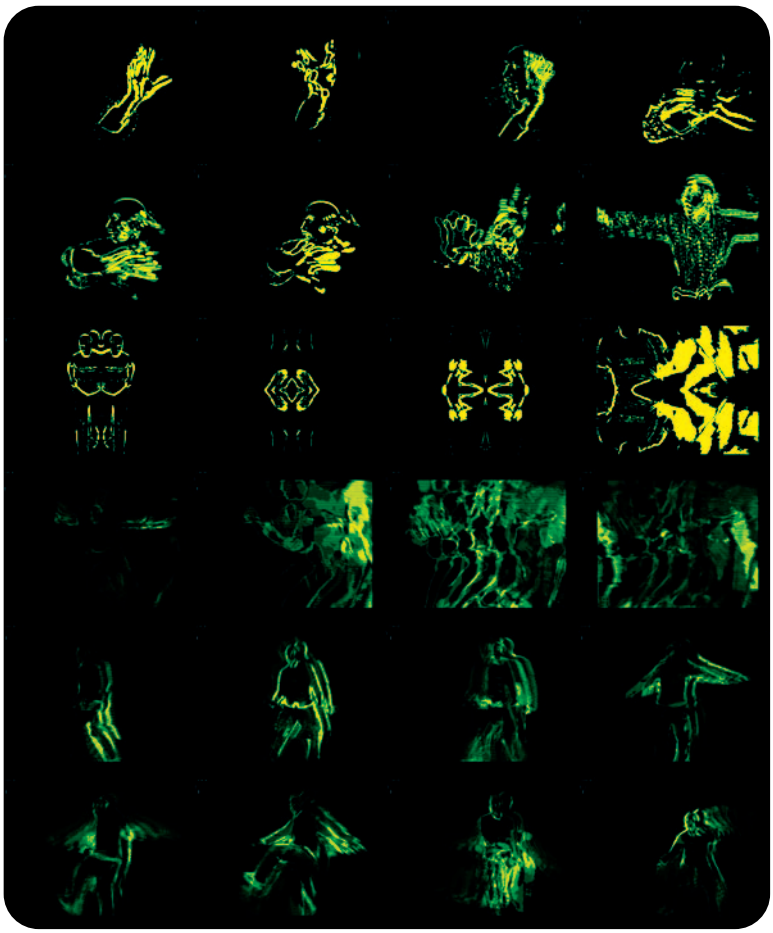
From capoeira's contact with other cultures new forms, such as breakdancing, have evolved. Though there are salient differences between form in breaking and capoeira (most notably, that breaking is

generally carried out solo), flipflop draws together breaking and capoeira. In the course of doing so, flipflop follows rules and deploys strategies drawn from capoeira, such as the maintenance of visual contact through movement (tracking), and the use of spectacle as decoy – playing for tourists as they have their pockets picked.

Reflections: tools

A short Quicktime movie, 'You May Stop Dancing' *(stop.mov)* on the accompanying CDROM illustrates some of the keying, feedback, strobing and freezing effects we have been experimenting with using Image/ine. Image/ine is a relatively stable and efficient program that runs on MacOS 8–9. We have also been investigating VDMX, a virtual video mixing program for MacOS 8–9 that has some useful "time slicing" -type effects. However, the most promising tool that we have used so far is FreeJ, a VJ software (still in development) that is extremely powerful and efficient (running in Linux on x86 and PowerPC processors). We look forward to further development of FreeJ and also experiments with the Max/PD/Jitter environments.

Sound manipulation was carried out live on the performers voices (picked up by radio microphones) using hardware (KAOSS multi-effects units and Line 6 EchoPro analogue delay modeller). Further development work will be done in the MAX and Supercollider environments.



Stills from FreeJ experiments
Dancer: Michael Uwemedimo

flipflop

3. PREPRODUCTION WORKSHOP

12–15 July 2002

Participants:

Manu Luksch (director)

Ajay Naidu (actor)

Mukul Patel (sound and special effects)

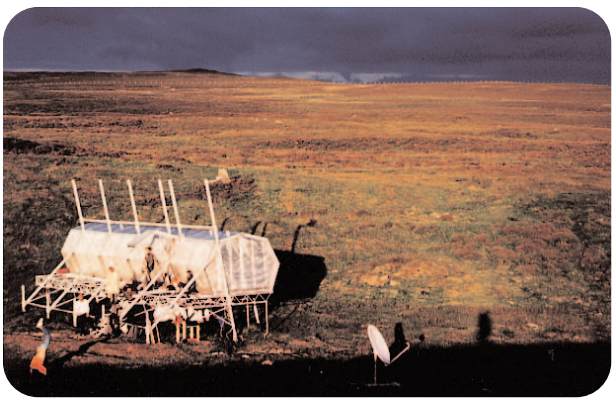
Michael Uwemedimo (performer and choreographer)

Andrea Zimmermann (of *Vision Machine* – camera)

With the kind assistance and hospitality of everyone at Makrolab

Aims:

- To preproduce video materials for two vignettes
- To further explore the meeting of capoeira and breakdance



Makrolab at Blair Atholl, Perthshire, Scotland, 2002

Makrolab is a self-sustaining mobile research laboratory for scientists and artists who work with communications technologies and meteorological data. The flipflop team visited Makrolab while it was located in Perthshire, Scotland, to preproduce video materials for two vignettes, 'Synchronicity' and 'Dance with the Wind'. Rough cuts from the tapes are provided on the accompanying CDROM.

'Synchronicity' *(encounter_with_yourself.mov)*

A song carries Ajay in unknown lands, audio waveforms turn into undulating terrain. After a long journey Ajay finds himself alone, desolate, and begins to explore what his own vast, unbound inner space. He re-encounters his self as newly arrived from a planet of alienation.

'Dance with the Wind' *(dance-with-the-wind.mov)*

Michael and Ajay involved in playful dance and martial arts with each other and the wind turbine. Their silhouettes are reminiscent of the processions of archetypical characters in Bergman's *The Seventh Seal.*

4: TECHNOLOGY TRIALS WITH XYBERNAUT MATC
1–30 September 2002

Primary evaluation: Ambient Information Systems Ltd. (6 testers)
Additional consultation: Gavin Starks (Tornado Productions); Kass Schmitt (NYC Wireless)

Requirements:
A light, robust, portable hardware solution that can transmit audio and video (and receive at least audio) over WLAN (IEEE 802.11b) over 1–2 km. The hardware is to be worn by a performer as s/he walks around outdoors and dances indoors (capoeira/breakdance).

Hardware:
2 sets of:
Xybernaut MATC 400 MHz Celeron / 200MB RAM / 10GB HD with thumb mouse, wrist keyboard, head-mounted display (HMD), USB webcam, earphone, microphone, USB floppy drive, battery and holder, spare battery, charger, power adapter, battery pouch, belt & headset
1 x wrist mounted LCD panel

Additional hardware provided by Ambient Information Systems:
2 x PCMCIA WLAN 802.11b cards
USB CD ROM
Assorted webcams, microphones, headphones
Access point to WLAN and Real server

Software:
Windows 2000 Pro
Netstumbler (WLAN utility)
iVisit (videoconferencing)
RealProducer, Helix Producer, RealPlayer (encoding/streaming)
Inference Group, University of Cambridge: Dasher

First impressions:

The units arrived well packaged. From its external appearance, the MATC appears well built, and the attachment hardware (belt and pouch) for the main unit and battery pack is secure and comfortable. Documentation was adequate for the main unit, but very limited for the peripherals (for example: no assembly diagrams for the headset; no specification for the headmounted display to indicate voltage of DC OUT socket).

GENERAL FUNCTIONALITY

For the initial testing and feasibility study, Windows 2000 and a driver for a PCMCIA WLAN card were installed from a USB CDROM drive. (For future trials, the MATC will be configured as a dual-boot Win/Linux system.) From the start, one of the MATC units has proved unreliable – it boots only intermittently, indicating a poor connection between motherboard and HD. For most of the evaluation we have been limited to using the one reliable unit.

MATC was able to run RealProducer / Helix Producer and iVisit adequately. Predictably, frame rates and connection reliability were higher with iVisit videoconferencing than with Realvideo streaming. iVisit tests were made between both units (when both were functional) and between MATC and PC and Macintosh laptops, using peer-to-peer connections on the WLAN. Realvideo tests were run using AmbientTV.NET's wireless access point and Tornado Production's streaming server, with streams being replayed via the same access point.

MATC runs the Cambridge Inference Group's Dasher predictive text input program well (given the limitations of the HMD screen). If fully integrated with the operating system and other software, Dasher would make the keyboard redundant.

Power

• Power supply socket – the power socket, on the MATC body, and the plug, from the battery holder or charger, are nonstandard and could be made much smaller. The power plug is too wide – it overhangs the adjacent headphone socket to the extent that a standard headphone minijack plug cannot be inserted fully into the socket *(fig. 1, right)*. This is a major design fault.

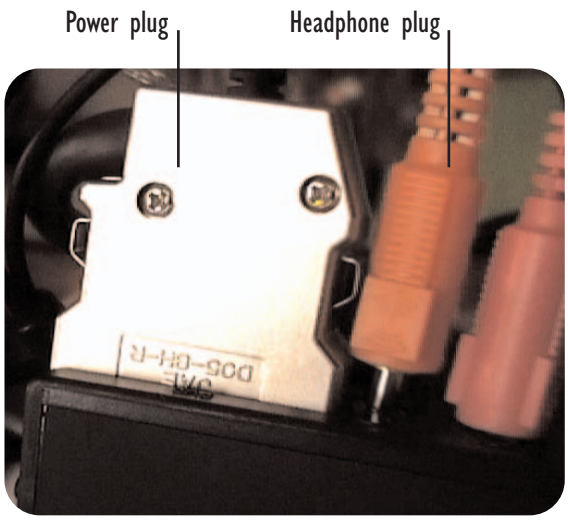


Fig. 1 Power plug obstructing headphone socket

• Battery life is adequate and charging is reliable. However, the on-battery charge indicators do not function and there are major power supply problems when the charger station is used to recharge a battery while simultaneously powering the MATC (this procedure is not contraindicated in the documentation) – the power to the MATC fluctuates and it crashes.

• Standby functionality – There appears to be an issue in waking from standby mode. The unit does not respond to any keyboard or mouse input, and a forced reset is required.

Ports and slots

• USB – three USB ports are need to plug in the supplied keyboard, mouse and webcam, but there are only 2 ports on the MATC body. This necessitates the use of a USB hub, encumbering the user and adding to the tangle of cables *(fig. 2, right)*.

Fig. 2 Additional USB hub required

• PCMCIA card slot – the double card slot has a hinged lid (with cutout for cables) to protect the slots and installed cards; however, the lid cannot be closed completely once a standard WLAN card is inserted *(fig. 3, below)*. This results in the card being left exposed and vulnerable, and makes damage to the card slot lid itself more likely.

Sound

The soundcard is unusually noisy, and makes continual buzzes and hiss. This may be a driver issue; as yet we have been unable to resolve it. The lapel remote control for the earphone and microphone ought to have included independent mute and gain controls for the two devices, instead of a single mute switch.

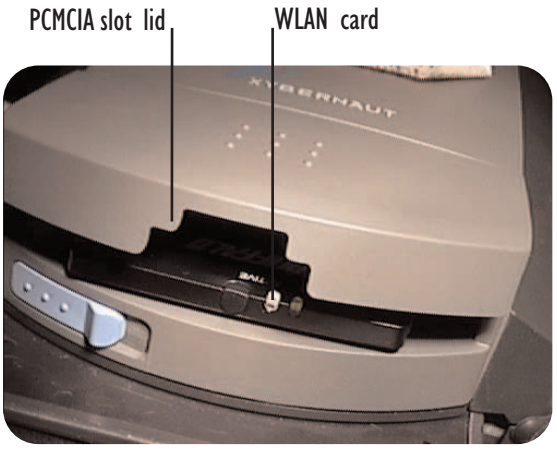


Fig. 3 PCMCIA card slot lid does not close

PERIPHERALS

Trial results with the peripheral devices are reported individually below. One general point of note is that the use of a several wired peripherals led to a tangle of cables – "cable

spaghetti" (*fig. 4, right*). A more practical portable solution would employ Bluetooth or a similar wireless protocol.

Fig. 4 "Cable spaghetti"

USB webcam

The camera sensor quality is adequate, although it does not perform as well as some other models in conditions of low or very bright light. There is a major problem with the camera mount. The ball mount has a limited range of tension adjustment (by screw), but cannot be made stiff enough to hold the camera steady while the user is moving. The camera works loose after a few moderate shakes of the head *(fig. 5, below)*.

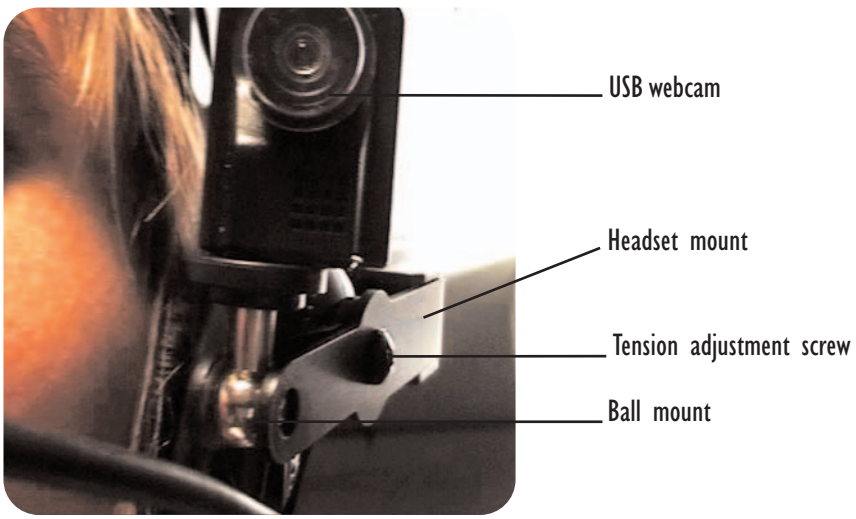


Fig. 5 Headset mount for USB webcam

Keyboard

The wrist mounted keyboard has a positive feel, though substantial pressure is required to operate the keys. The keys could have been made to switch under lighter pressure, with a keyboard lock switch to prevent accidental keystrokes. The wrist band, which holds the keyboard, is comfortable, but it is asymmetric and sits differently on the left and right arms. On the left arm, the keyboard sits on the extensor aspect of the arm, whereas on the right hand side, it sits on the flexor aspect. Also, when mounted on the right arm, the keyboard cable emerges from the distal (rather than proximal) end – leading to more "cable spaghetti". The design could be modified to allow for either orientation on either side. Perhaps a more

elegant solution overall would have been to use a textile keyboard, or even a cursor-based predictive text input system.

Mouse

The USB thumb-mouse or mini trackball has full three button functionality. Most users felt that there should have been greater resistance to ball motion. A mouse holster, for storing the mouse when not in use, would be very handy.

Displays – general

The resolution of both the HMD and wrist-mounted LCD is low at 640 x 480. This provides insufficient screen area for many applications. Functionality would be passable were it possible to attach a third-party display for configuration of software, prior to use, but this is discouraged by the use of a proprietary A/V connector (without adapter to standard VGA) on the main unit.

Displays – HMD

The HMD can be mounted on either side of the headset. LCD brightness is adequate for indoor conditions but not for bright sunlight. The supplied silvered and half-silvered screens are operationally very similar. Both require very critical adjustment to be at all visible, let alone adequately so. Even when oriented optimally, both screens still require the user to squint with one eye to view the screen. Some users even felt it necessary to close the other eye when reading the screen. Detailed work or feedback from text input is very difficult and almost impossible when on the move. Both screens are equally straining on the eye and require the user to divert their attention very significantly from their environment, which is not only of little utility but also dangerous. Also, since the user needs to squint, with both eyes open the fully silvered screen appears semi-transparent, so there is effectively little difference between the two screens. The screens are also quite fragile, and are as liable to snap as they are to slip safely out of their mount. More robust alternatives to the HMD such as lightweight stereo goggles that project images at infinity into the user's field of vision have been commercially available for a number of years.

Headset

The headset, which carries the HMD, USB webcam, earphone, and microphone, is light, but not adjustable. This was felt by all testers to be a very serious oversight. On most of the testers, the headset was too loose, and in combination with its side-heavy design (most of the mass being at the extremities of the headset, at the webcam and HMD), this led to the

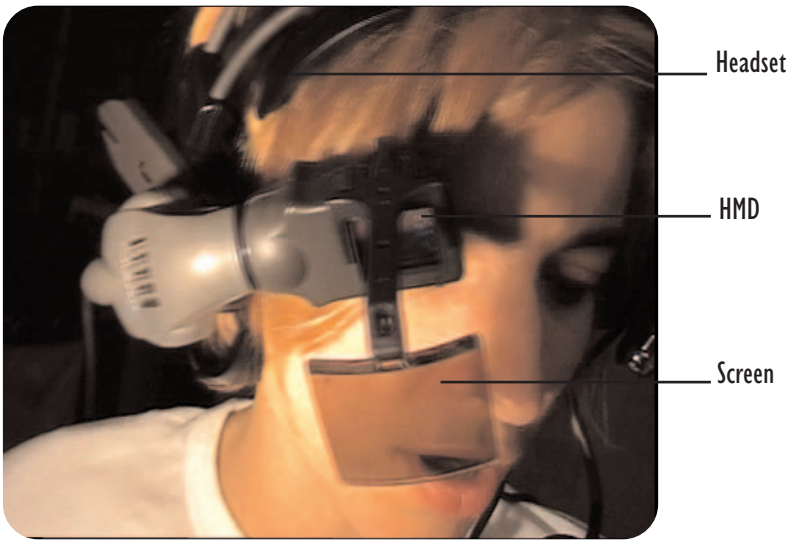


Fig. 6 HMD slips forward with moderate head movement

webcam and HMD swinging out of optimal alignment following any moderate head movement *(fig. 6, above)*. The open backed design of the headset could also have easily accommodated either a cutaway or a grip for the earphone lead, to safeguard this vulnerable component.

GENERAL ERGONOMICS

Although the biggest single problem ergonomically was with the HMD / headset combination, a more general issue was of the proliferation of wired peripherals (and their associated cables). When the keyboard, mouse, battery, HMD, webcam, microphone, earphone, and USB hub are connected, there are 7 cables running around the user's body. Long loops of slack cable form as the body changes shape. Apart from the severe safety (tangle) hazard, there is a constant risk of unplugging cables; the user must at all times be very conscious of the various components and cable runs. Using a wireless solution such as Bluetooth, and with a mouse integrated into the keyboard (or the keyboard ditched in favour of a predictive text input system via a more sophisticated mouse-type hand controller) and with the camera, earphones, and microphone integrated into display goggles, the number of peripherals could be reduced to two and cable runs almost eliminated. The result would be a much more practical and discreet machine.

RUGGEDNESS

With large fan vents on the body, MATC is neither water- nor dust-resistant. None of the ports have rubber seals (for deployment when the port is not in use). A practical wearable computer needs to be ruggedized at least to meet agreed standards such as the US MIL-STD-B108 specification – movement-based performance makes similar demands on hardware. The Panasonic Toughbook is an example of a robust notebook that exceeds these specifications. Ruggedness (and elegance, for movement-based work) also requires that peripherals be connected wirelessly wherever possible.

AESTHETIC CONSIDERATIONS

The philosophy of Ambient Information Systems it to treat form and function as equally important and mutually reinforcing considerations in any contrivance, whether mechanical, electronic, or more ephemeral (compositional, narrative, etc.). Nevertheless, we recognize that form must in many cases follow function, and we strive to reflect such exigencies in the overall aesthetic of our productions. That MATC looks like more like an early 1980s vision of the future computer than actually existing solutions in the year 2002, is no hindrance to the development of *flipflop* – and actually helps us to illustrate the recent history of human interface design.

More particularly, the MATC is not discreet, and when worn in the street elicits very strong reactions (of a range of modalities) from passers-by. While we look forward to the challenge of integrating such reactions into the narrative structure of *flipflop*, there is the issue of the personal safety of the roaming performer (especially given that s/he would certainly be exploring some less salubrious neighbourhoods). We are currently considering necessary safeguards.

OTHER GENERAL CONSIDERATIONS

The unit as a whole is bulky, heavy, fragile, and noisy compared to a wireless-equipped PDA of comparable processing power. MATC has neither Bluetooth/WLAN nor IrDA (infrared) wireless technologies inbuilt. High -specification PDAs are available equipped with both WLAN (802.11b) and Bluetooth cards, and many mobile phones are IrDA and Bluetooth-enabled. A portable computer ought to integrate Bluetooth and WLAN antennae at the very least, if not the cards themselves.

The choice of the PCMCIA form factor is also questionable. WLAN, flash RAM and other types of cards are available in the smaller CF (compact flash) format. A CF slot could also be used for a microdrive, so dispensing with the large, heavy 2.5" HD.

The PC platform looks increasingly to be a poor choice for a wearable computer, given developments in PDA and mobile phone technology (especially considering advances in low-voltage processor design). We feel that the future of mobile technology lies not in making computers wearable (even a desktop can be made wear*able*, given enough tape and string and some big batteries), but rather in building processing power into garments.

CONCLUSIONS

Within the context of *flipflop*, it is clear that Xybernaut MATC will not survive intact on the body during a vignette involving breakdancing or capoeira. However, the unit is functional, if awkwardly so, as a perambulatory streaming unit, and it will be in this manner that it will be deployed. Where energetic physical activity or discretion is required, a smaller and more robust solution will be used. We have, for example, recently begun testing UHF video microtransmitters in combination with miniaturised board-mount and surface-mount CCD chips and microphone capsules (the entire wearable assembly being the size of a mobile phone). Video-enabled mobile phones are another possible avenue. These alternative solutions have the disadvantage that they do not make use of wireless community networks (and their peculiar socio-political context, which is one we wish very strongly to draw attention to). So, despite disappointing trial results with the MATC, wearable wireless (802.11b) streaming solutions remain vital to the conception and execution of *flipflop*. We look forward to making best use of the MATC in performance in Spring 2003.