N95- 14060

VERDEX: A VIRTUAL ENVIRONMENT DEMONSTRATOR FOR REMOTE DRIVING APPLICATIONS

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The National Advanced Robotics Centre was founded in June 1988, by the United Kingdom's Department of Trade and Industry and 11 industrial and academic shareholding organisations. The Centre acts as a focal point for the development of the core technologies which facilitate the next generation of robots, and is geared toward projecting the UK to the front of this international arena. One of the key areas of the Centre's enabling technologies research programme is that of the human-system interface, phase 1 of which started in July 1989 and is currently addressing the potential of virtual environments to permit intuitive and natural interactions between a human operator and a remote robotic vehicle. The aim of the first 12 months of this programme (to September, 1990) is to develop a virtual human-interface demonstrator for use later as a test bed for human factors experimentation. This presentation will describe the current state of development of the test bed, and will outline some human factors issues and problems for more general discussion.

In brief, the virtual telepresence system for remote driving has been designed to take the following form. The human operator will be provided with a helmet-mounted stereo display assembly, facilities for speech recognition and synthesis (using the Marconi Macrospeak system), and a VPL DataGlove Model 2 unit. The vehicle to be used for the purposes of remote driving is a Cybermotion Navmaster K2A system, which will be equipped with a stereo camera and microphone pair, mounted on a motorised high-speed pan-and-tilt head incorporating a closed-loop laser ranging sensor for camera convergence control (currently under contractual development). It will be possible to relay information to and from the vehicle and sensory system via an umbilical or RF link. The aim is to develop an interactive audio-visual display system capable of presenting combined stereo TV pictures and virtual graphics windows, the latter featuring control representations appropriate for vehicle driving and interaction using a graphical "hand," slaved to the flex and tracking sensors of the DataGlove and an additional helmet-mounted Polhemus IsoTrack sensor.

Developments planned for the virtual environment test bed include transfer of operator control between remote driving and remote manipulation, dextrous end effector integration, virtual force and tactile sensing (also the focus of a current ARRL contract, initially employing a 14-pneumatic bladder glove attachment), and sensor-driven world modelling for total virtual environment generation and operator-assistance in remote scene interrogation.

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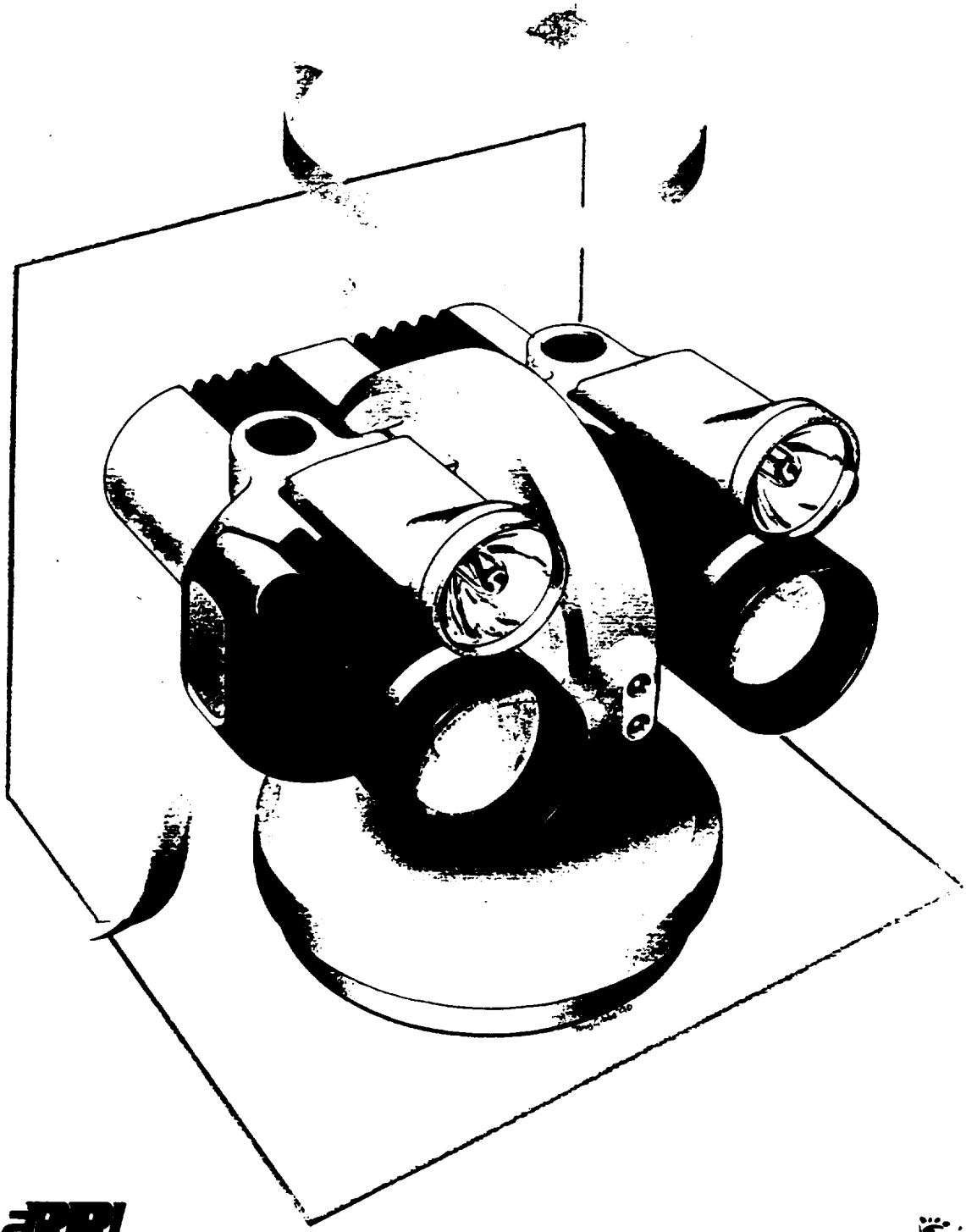
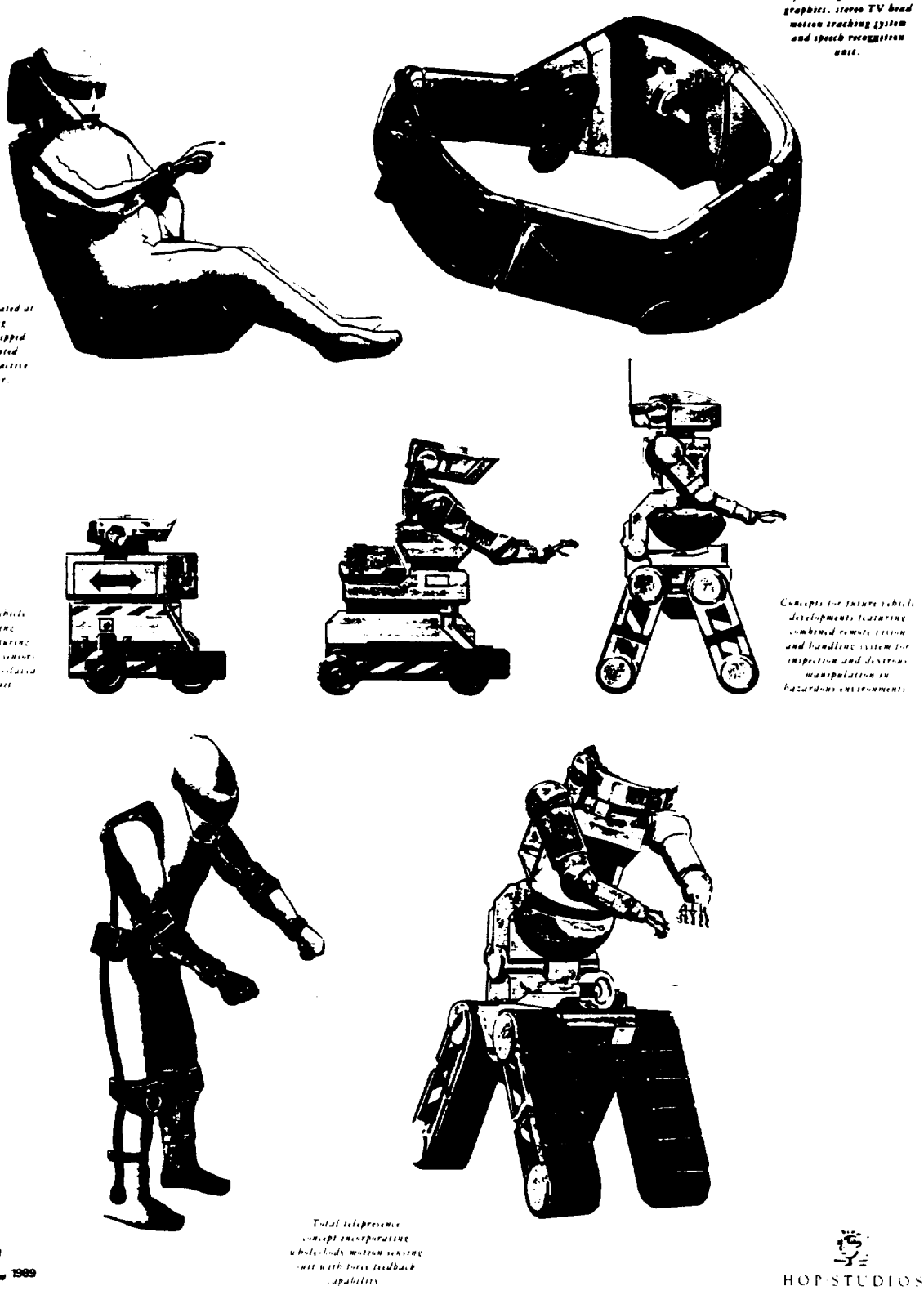


aRRL

Slaved stereoscopic pan and tilt head [redacted] HOP·STUDIO



VIRTUAL MMI FOR ADVANCED ROBOTIC TELEPRESENCE