Designing Backpacks for High Fidelity Mobile Outdoor Augmented Reality

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An Overview Of The Tinmith 2004 Backpack System

This poster presents the design for our latest Tinmith 2004 backpack to support high-fidelity mobile outdoor augmented reality applications. This design has evolved from our previous designs since 1998, and we present some of the features of our current design.

By committing to certain components and limiting the flexibility of the design, the overall size and weight are greatly reduced. The polycarbonate box provides protection for the devices as well as a flat mounting surface. A baby carrying harness permits easy wearing of the backpack with little extra weight added. Plastic Velcro is used to permit simple reconfiguration of devices and provides a cable routing infrastructure. USB is embedded into devices to remove the need for legacy interfaces, and provides a compact power and data distribution mechanism. We have also been testing specialised video overlay units and FPGAs to perform CPU intensive tasks with minimal power consumption and fast performance compared to standard laptop hardware.

Fig 1 – Rear view of backpack (without FPGA or video overlay)

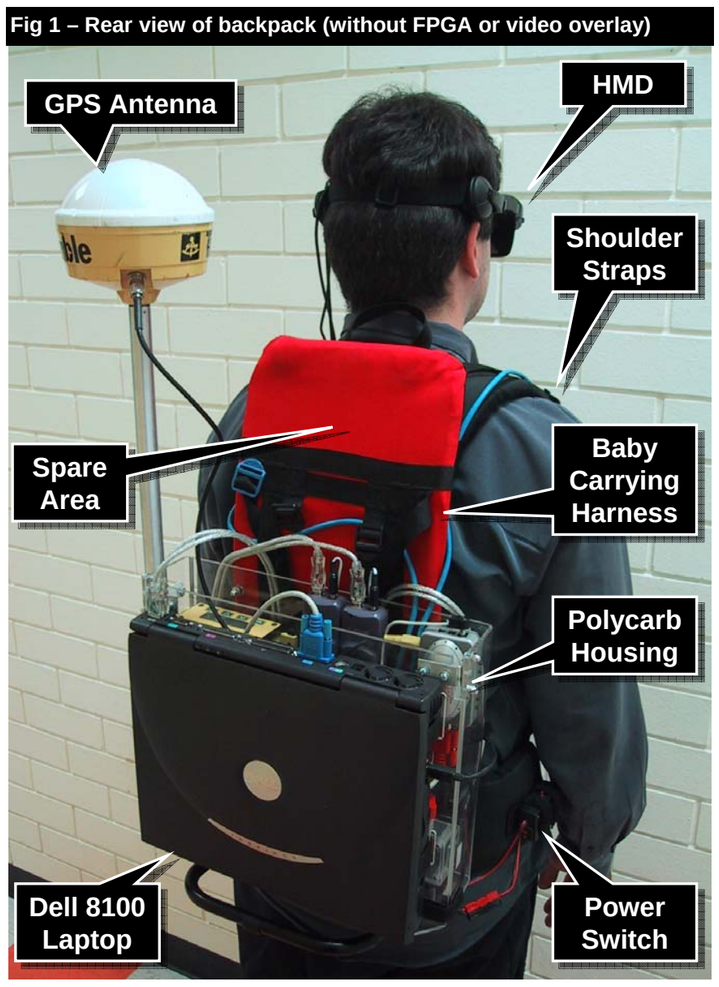

Fig 2 – Internal view of the polycarbonate housing, showing the layout of the various components and interconnecting cables. The cables are routed between the Velcro pads of the components.

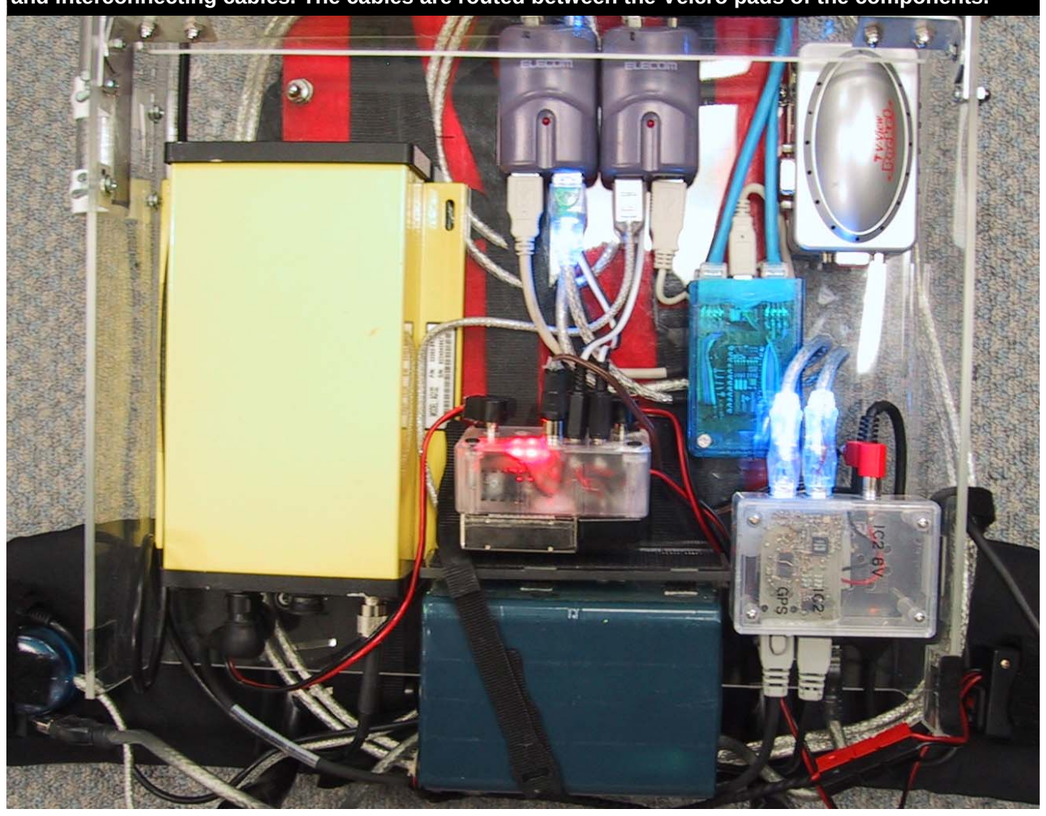

Fig 3 – USB hubs provide data for all devices, as well as 5V power in the same cable for suitable devices

Fig 4 – Legacy glove controller with embedded FTDI 232BM chip to connect data and power by USB only

Fig 5 – Video overlay is traditionally implemented by a laptop. By using a video overlay device, the AR overlay is performed in dedicated hardware. This configuration is more power efficient and requires no processing by the laptop.

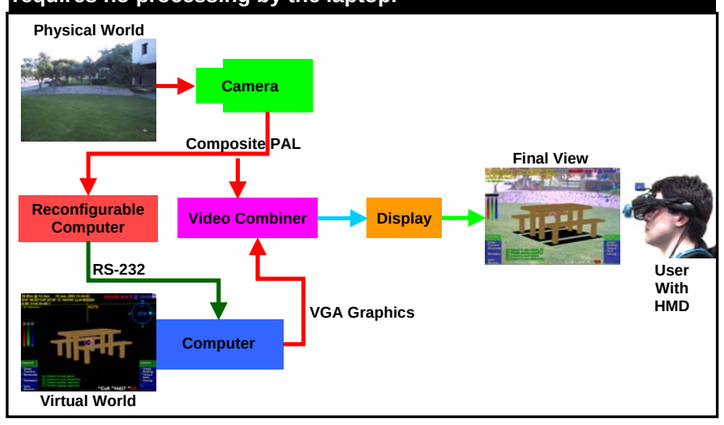

Fig 6 – InertiaCube2 and GPS interface box, with FTDI 232BM serial to USB chips on custom boards to remove the need for large DB-9 connectors and integrate properly with the design of the backpack

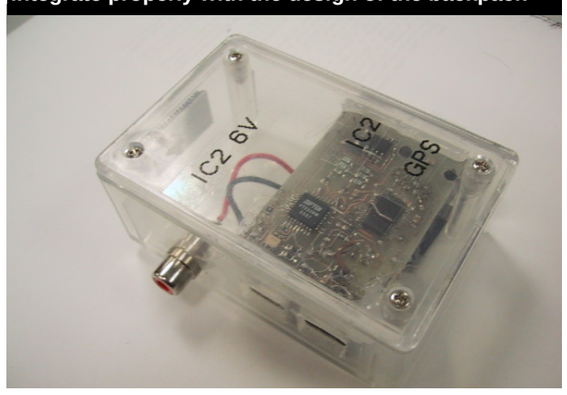

Fig 7 – Velcro feet are used to mount the device rigidly to the back plane, and provides clearance to run cables underneath for easy routing

Fig 8 – External USB, HMD, and Firewire connectors are mounted on the waist straps for easy access. The master power switch is on the opposite side of the user.

Fig 9 – Backpack with RC200 FPGA and GrandTec MagicView video overlay unit in available spare area

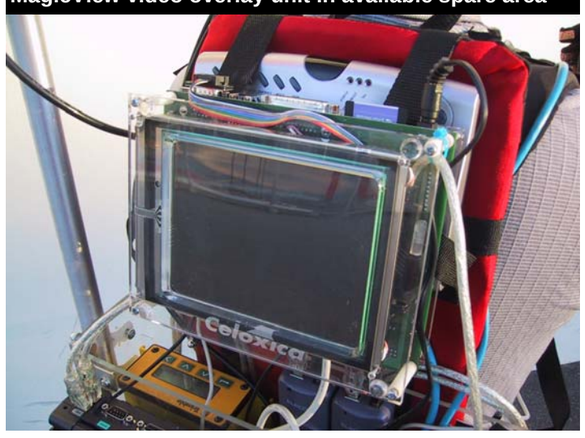

Fig 10 – Internal NiMH battery provides 100 Wh to operate the system (except laptop) for 3+ hours

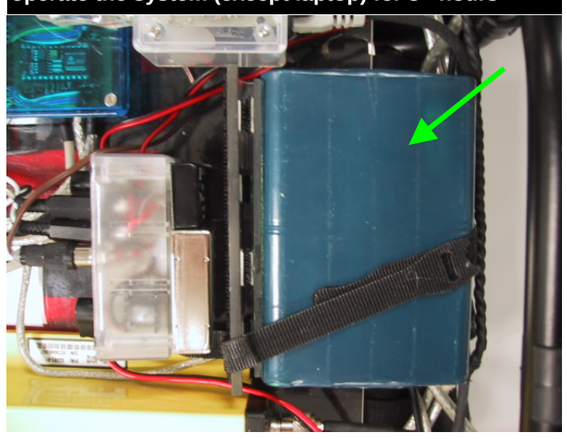

Fig 11 – Power distribution box, with DC-DC converters (at rear) to provide 5V, 6V, and 12V on varying plug sizes. 5V plugs are provided to power the USB hubs, which feed power to all 5V devices.

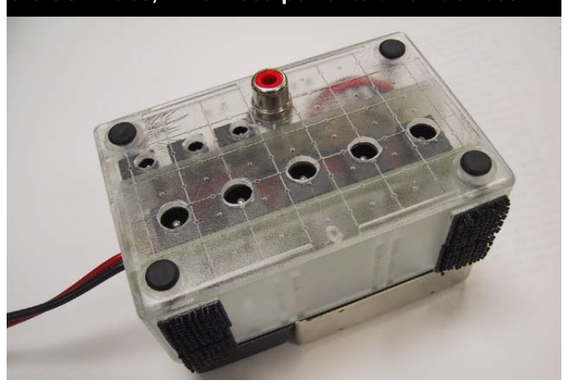

Fig 12 – The original Tinmith backpack was unorganised wires and components, with frequent equipment failure

Fig 13 – The Tinmith-Endeavour 2002 backpack was properly manufactured and more refined, but was large and bulky in order to provide protection and flexibility for future change

Fig 14– Side view of new 2004 backpack

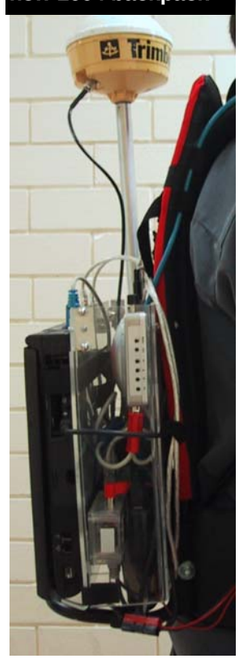

Fig 15 – IO-Glasses HMD, with InertiaCube 2 and PAL standard video camera for use with FPGA/MagicView

Fig 16 – Glove connectors are mounted onto the shoulder straps for easy access by the user

More Info at http://www.tinmith.net and http://wearables.unisa.edu.au

Please visit the Tinmith and Wearable Computer Lab web sites to find out more information about this project, as well as other interesting projects currently in progress.