The OZ...International Virtual Reality Capabilities

OZ...International believes that the successful computer applications of the 1990s will include *human interaction with simulated three dimensional spaces*. Natural simulated environments mimic or duplicate physical laws, making computer generated effects (images, sounds, remote feedback) feel natural and appealing. The OZ corporate objective is to provide realistic real-time interactive 3D experiences at PC prices.

PEOPLE

The OZ technical team is world-class, with an established and unique performance record, including:

> * The first publicly accessible VR demonstration system, June 1989.
> * Development of the initial software which evolved into the products of both current leading software vendors for immersive VR.
> * Long-term experience advising and consulting with start-up VR companies.
> * Responsible for training and advising start-up VR projects at Boeing, Digital Equipment Corporation, Autodesk, and other large corporations.
> * Deep knowledge and expertise in advanced mathematical and computational techniques.
> * Successful VR prototypes and projects in education, scientific visualization, aerospace, exercise, ecology, and entertainment.

The technical team has be working together for many years, and has an established chemistry and performance history with all aspects of VR covered in depth. The team has invented and defined many of the popular VR techniques used today for operating systems, for interactivity, and for the generation of virtual experiences. The four team members have an accumulation of over 40 years of VR experience.

CURRENT TECHNOLOGY

The OZ prototype virtual reality system smoothly integrates these features:

Complete Inclusive Virtual Reality
> * 3D graphics for all objects
> * Inclusive (i.e. immersive) environments
> * Physiologically accurate scaling
> * Complete interaction with all objects
> * Customized individual experiences

Satisfying virtual experiences require high frame rate, low lag, multi-sensory displays, complex worlds, complete interactivity, full immersion, physiological comfort, and intelligent entities. The OZ system meets all of these requirements. Our system avoids physiological discomfort, provides the feeling of freedom and excitement, and promotes the desire to return to the virtual world.

Integrated Design of Virtual Experience, centered around the participant, enhances the feeling of comfort in the virtual world. The physical body is modeled accurately within the virtual environment. Simulator sickness is minimized due to appropriate physiological

constraints, cues, scaling, and expectation management. Integrating physical activity with virtual experience makes the virtual world feel good.

Multiple Participants are networked together in the same world, freely interacting with the world and with each other. The most interesting thing in a virtual world is other people. Multiple participants provide a compelling social environment which makes the virtual worlds stimulating, challenging, and fun.

Interactive Entities are creatures which act naturally in the virtual world and interact with all the participants. A virtual dinosaur, for example, can autonomously search for food while, at the same time, following a participant. When the participant moves the food in real-time, the dinosaur alters its behavior in real-time. Entities are sensitive to environmental conditions (acting differently in different situations), react conditionally (the dinosaur looks for food only when hungry), and have their own dynamic agenda (not scripted but context dependent). This amounts to real-time, interactive, participatory, 3D cartoons. Entities encourage emotional involvement, captivating interactions, and participant acceptance.

Revolutionary Software Tools and Techniques provide unparalleled capabilities for prototyping, development and performance. These tools were developed by the technical team over six years in academic and commercial research environments which led the evolution of the VR industry.

ADVANCED TECHNOLOGY

The **OZ Smart Spatial Engine** is a performance breakthrough for simulated physics and dynamics modeling, providing hundreds of times more processing power than conventional workstations, placing simulated physics within the reach of the mass marketplace. This capability is applicable to all 3D computer modeling. As well, it redefines performance expectations for virtual environments.

Using proprietary technology in silicon hardware, software algorithms, and interface techniques, OZ is developing extremely efficient solutions to the critical performance problems associated with 3D graphics modeling and spatial computation. Efficient solutions to collision detection, dynamics modeling, depth-complexity in rendering, and integrated numerical, symbolic, and spatial computation make the Smart Spatial Engine a supercomputer at PC prices.

The spatial engine is an add-on accelerator which enables a computer, in real-time, to:

* model real world physics with hundreds of dynamics objects
* detect collisions and model natural responses everywhere
* build virtual machines which actually function
* accelerate graphics preprocessing
* scale performance at linear cost
* maintain accurate physical dynamics
     for up to 1000 interacting objects, each modeled by 1000 polygons,
     at 60 Hz display rate, for $3K manufacturing cost.

CURRENT STATUS

Today OZ has very powerful and general software which supports immersive VR, multiple participants, and interactive entities. These capabilities define what people want (but have yet to experience) in VR systems. The software supporting these capabilities is robust and reliable. It is also general, which means that it supports a diversity of uses. The entity software can be used to animate and motivate any kind of interactive creature; the behavior software applies to any and all graphics models. Multiple participant software supports any configuration of users, each user doing whatever he or she chooses in the virtual world. People can roam by themselves, form teams for racing or exploring, and play with each other. The networking software supports all interactions.

The core hardware and software system provides 80% of VR functionality for *any application*. Games, training, architectural design, exercise environments, exploration experiences, medical applications, scientific visualization, etc. can all be built quickly and efficiently. Different experiences can be run on the same system and are relatively easy to construct using the same software tools. The generality of the software means that OZ can develop new and different applications within months. This translates to a product which can provide varied virtual world experiences at low cost and high profit.

OZ is currently porting the software from expensive development platforms to inexpensive product platforms. We expect to deliver high quality performance and complete functionality for under $20,000 per seat.

The Smart Spatial Engine is a patented technology, and has been developed in concept and in emulation. Prototyping the silicon implementation awaits funding.

Among its intellectual property assets, OZ holds the rights to a revolutionary mathematical technology called **Boundary Mathematics**. This technology is currently fully implemented, and has been demonstrated to accelerate logical and numerical computation by at least five times.

The OZ business plan includes extending the core technology with these functional components:

* a passive sensing tool for natural behavior input
* a logic accelerator for general behavior and control structures
* a renderer for inexpensive high-end scene rendering
* an interactive spatial interface

SUMMARY

OZ software technologies currently provide unparalleled performance for VR systems, at price points less than one-half of the current competition. These technologies are ready for productization and marketing, either horizontally to applications developers, or vertically into selected applications markets. OZ hardware technologies are developed in concept, patented, and ready for embodiment in silicon.