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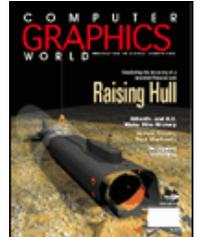
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virtual course | real sweat

VR applications take the tedium out of indoor exercise

By Ben Delaney

Imagine that it's February 26, and winter has already gone on too long. The temperature at 7:00 am is hovering around 25 degrees F, but your legs are feeling spongy and you need a workout. You could take a run in the frozen air, but that has all the appeal of a visit to the dentist. What you really want is 10 miles or so on your bike before work-in a warm climate. If only you could...

As it turns out, you can. In fact, that's just what Byron Rieper does every winter morning at his home in Overland Park, Kansas. Rieper is a long-distance cyclist who has completed the Seattle-to-Washing ton DC Ride Across America, as well as many shorter races of under 500 miles.



For 20 years, he had spent lonely winter hours pedaling a stationary bike, working hard not just to stay in shape, but to remain motivated despite the boredom of going nowhere indoors. Then, about two years ago, Rieper discovered CompuTrainer, a VR system that connected to his own bike and enabled him to pedal through a variety of virtual landscapes.

Compu Trainer's interactive system consists of hardware that provides resistance to the rider (when going up a hill, for example) and 3D graphics software that displays a variety of terrain on a monitor watched by the cyclist. (For more about CompuTrainer, see pg. 55 of the February 2000 issue.) Since discovering this application, Rieper has ridden happily across miles of imaginary courses.

Today, CompuTrainer is just one of several companies, including Eloton, FitCentric, FitnessHeaven, and GameBike, that provide low-cost, realistic virtual training systems for athletes. Though each system uses a different approach, they all "move" a user through virtual worlds, thereby providing all-season training for athletes and helping to reduce some of the boredom of exercising indoors.

False Start

Using interactive simulation as an exercise aid is not a brand-new idea. In 1994, Tectrix introduced VR Bike, a stationary recumbent bicycle with a 20-inch monitor with which the cyclist moved through virtual scenes. VR Bike had several innovations that set a standard still unmet by most currently available exercise equipment. Its base was designed to permit up to 13 degrees of tilt from side to side, simulating the lean of a bicycle in a turn. In addition, twin fans mounted beneath the monitor blew air at the rider at a rate that increased with speed. Pedal resistance was variable in relation to apparent slope, and stereo speakers provided ambient sound. Finally, VR Bike featured an RS-232 serial port that allowed several bikes to be networked for competitive riding.



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House-bound athletes can still take to the road with applications such as FitCentric's NetAthlon, which connects to an exercise machine and offers varying scenery, terrain-based resistance, and even heavy-breathing competitors. (Image courtesy FitCentric.)

Tectrix also introduced a virtual climbing system, VR Climber, a few months after VR Bike, but both VR Bike and VR Climber hit the wall. Their near-\$8000 price tag put them far out of the reach of most home exercise enthusiasts, and was also about twice what fitness clubs were willing to pay for a single piece of equipment.

Exercise as Play

Since then, however, other companies and individuals have created virtual exercise applications. One such person is Dr. Ted Parks, an orthopedic surgeon in Denver, Colorado. After a new baby arrived in 1997, he became frustrated and bored by exercising indoors when it was his turn for childcare. "I couldn't do it for more than 20 minutes," he explains.

Parks had always enjoyed building things. So when he got fed up with his stationary bike, he built a system that would turn off the TV, his exercise distraction, if he did not ride fast enough. That worked for a while, but soon became just as tedious. One day he thought, "What if I could ride through a video game? Wouldn't that be a lot more fun?"

The result was GameBike, an after-market accessory for bikes that consists of a front-wheel stand with steering sensors and handlebar-mounted control buttons. It is used in conjunction with a rear-wheel training stand available at most bike shops, and adds a sensor on the rear wheel that measures speed. The GameBike system plugs into a PC or videogame console, and replaces the joystick or game controller with input from the bike, making it possible to cycle through any 2D or 3D video game, steering with the front-wheel sensor. Since there are thousands of game titles available, users are spared the boredom of racing the same course over and over.



NetAthlon users can compete with each other over the Internet, using the Web site FitnessHeaven.com as a meeting place. (Image courtesy FitCentric.)

Oddly enough, says Parks, "You'd think the best game would be a guy riding a bike around. But any racing/chasing game-with boats, snowmobiles, cars, spaceships, motorcycles-works well. Every month there are three or four new games. And with Microsoft's X-Box on the way, there will be even more." The most popular game among GameBike enthusiasts? LucasArts' Star Wars Pod Racer.

Parks thinks using commercial videogames gives GameBike an advantage over dedicated fitness systems. Videogame quality is high, thanks to the economy of scale that mainstream game developers have. "I find that graphics quality makes a big difference,"

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he explains. "The more you can do to trick your brain into thinking you're in that game, the more fun it is."

Cross Training

Cycling is not the only sport that lends itself to VR applications. Since selling the GameBike licensing rights last spring to Cat Eye, a Japanese bike accessory company, Parks has been considering another project: an interactive boxing game. It would be a first-person application in which players see their opponents on a computer screen while hitting an instrumented punching bag.

Another VR fitness product that connects to exercise machines and supports a variety of sports, including running, cycling, climbing, and rowing, is FitCentric's NetAthlon. In 1988, Dr. Ken Burres, an avid endurance athlete who has completed 72 marathons and more than 145 triathlons, met fellow triathlete Paul Stewart, who had developed a training log program, Tri-Log. Burres bought a copy of this DOS program and soon afterward teamed up with Stewart to see whether they could expand on it.

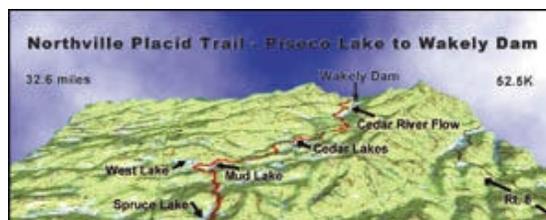


Virtual exercise applications can help combat boredom with surprising and unusual race locations, such as the moon. (Image courtesy FitCentric.)

Burres and Stewart, who founded FitCentric, refined Tri-Log and changed the product name to UltraCoach. They added rule-based artificial intelligence functions that created training plans from workout data, and later upgraded the product to accept input from a heart-rate monitor.

FitCentric's latest product, NetAthlon, provides 3D graphics, LAN and Internet connectivity, and more sophisticated AI functions. The graphics even show jiggling scenery in "first-person mode" as the user/rider's head bobs up and down. A user can also choose third-person mode, in which the camera follows the user, or TV mode, in which the system changes camera shots in much the same way that a TV director would during a live race. To keep the workout interesting, the user can choose to have other runners on the track, and each can be programmed separately. There can be a fast "rabbit" leading the pack, and a group of others to add a sense of competitive realism. In fact, the athletes even hear the breathing of nearby competitors, and the cheering of the crowd as they pass the grandstand.

FitCentric's proprietary software stands out because of its AI capabilities, which makes the simulation seem more realistic by providing autonomous competition from computer-generated competitors, and by planning workouts to optimize the athlete's training regimen. The course and contestants are all fully 3D modeled and rendered under Microsoft's DirectX API for good performance on Windows machines. Every object on screen is texture-mapped, including the course backgrounds. Distance culling, the use of reduced-polygon models for objects far from the viewer, keeps imagery moving at a swift frame rate, depending on the computer configuration.





A 3D course created with MapTech software and topographic maps helps long-distance runners plan their strategies for a race. (Image courtesy Jim Houghtaling.)

FitCentric currently offers 50 different courses, about half of which are based on real locations such as the Colorado Springs Olympic Velodrome. There is also a Field of Dreams fantasy course, in which a user might enter a covered bridge in New England, and exit into the Arizona desert, among other surprise venues.

NetAthlon runs on a standard PC with a 3D graphics accelerator, and when connected via Ethernet can support competitive racing among people on different machines in different locations. FitCentric has teamed up with the fitness Web site, FitnessHeaven.com, which provides an on-line meeting place for people looking for race partners. The interface to many exercise machines are bi-directional, so that when you are going up a hill on the course, your treadmill will slant up, or your bike will provide greater resistance. The system costs \$90 for the software, and is included with some training systems, requiring only a connection to the user's PC. It connects to many rowing machines, treadmills, steppers, and bikes, and can be retrofitted to a bike training stand for less than \$200. The logging functions evaluate a user's stated goal, such as a 5K, marathon, or Ironman race, and measure strength, calories burned, heart rate, and speed, compiling a detailed training plan to help athletes meet their goals. If desired, the system can email a report to a coach.

Visualizing Success

Not all virtual athletic applications hook up to equipment such as stationary bikes or treadmills. One example of a tool that is more of a mental than a physical aid is a terrain mapping system developed by Jim Houghtaling, who has been participating in "ultra" races (long trail runs), for about 12 years. Thanks to him, runners planning on entering the Damn Wakely Dam Ultra Run in upstate New York this summer have a novel planning aid. Such races require not only heavy training, but also a strategic plan to get the runner through the diverse aspects of the course. In order to help runners understand the Wakely Dam Ultra course, Houghtaling built an accurate 3D representation of the terrain, which is available on the run's Web site.



FitCentric's software can provide rivalry from CG competitors with "minds" of their own. (Image courtesy FitCentric.)

This run is nearly 33 miles, and includes a total climb of 3903 feet. Using MapTech software, which draws its data from the US Geological Survey topographic maps, Houghtaling created a 3D texture-mapped reconstruction of the course, at a scale of 1 inch to 1 mile. MapTech also includes an Elevation Profile Tool that creates cross-section terrain profiles. With these tools, the entire course can be visualized, and seen from above or on the trail. Even sight lines can be calculated, so that runners can determine, for example, that from point A they will be able to see points B and D, but not C. Houghtaling says that with MapTech "you can almost put yourself down on the map. You can really see the trail, the turns, and how far you have to go. It lets you plan your approach to the run."

At the Finish Line

As the quality of computer graphics continues to improve, it's likely that graphics will become an increasingly important part of training for both full-time and weekend athletes. "It's the closest thing you're going to get indoors to riding in a open situation," says Rieper, whose quest for verisimilitude includes having his kids yell at him while he's training to simulate the experience of running past crowds lining the road. He says that one hour on Compu Trainer is like two hours outside because there's no coasting.

Parks even postulates that VR fitness applications could address a societal problem-the poor physical fitness of today's youth. Using interactive sports applications, kids who'd rather stay indoors playing video games than go outside could still get some exercise. Parks believes this area has tremendous potential. He cites his next-door neighbor's kids, who love GameBike and play against other kids on the Internet. "I think interactive exercise is just in its infancy," he says. With recent government reports that our kids are getting fatter as they become more sedentary, anything that gets them off the couch is welcome.

Ben Delaney is President of Cyber Edge Information Services, a re search and marketing firm. He has been studying and writing about Viz/Sim and the impact of technology on society for the past 10 years. Reach him at ben@cyberedge.com.

Virtual Fitness Tools and Sites

GameBike * www.gamebike.com
CompuTrainer * www.computrainer.com
Eloton * www.eloton.com
FitCentric * www.fitcentric.com/

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