



Exercise

PC becomes home aerobics instructor

VIRTUAL aerobics instructors could soon be shouting encouragement at fitness fanatics in their own homes, *writes Mark Prigg.*

James Davis of the Massachusetts Institute of Technology has invented a system that will help to beat the boredom of exercising from a video or television programme.

"We looked at the way people exercise at home and it seemed very random," he says. "People just leave an exercise tape running and it spews out inane comments. Also, a tape has just a few fixed routines, which aren't suitable for everyone, and repetition is a real problem."

Davis's system, called the Personal Aerobics Trainer (Pat), tracks the user's movements. It can change routines and shout encouragement.

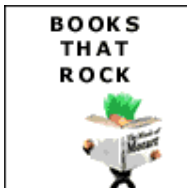
Before starting a workout, the user chooses the length and type of programme as well as the type of instructor he wants.

Davis says: "If you are having a hard workout, you don't want some nice old lady teaching you, so you would choose an army drill sergeant. You could even have a cartoon character, which makes it attractive for kids."

Pat will also help users choose their optimum workout by suggesting exercises and the number of times they should be done. "You can say you want

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15 minutes of work on your upper body and the system will make a routine for you and teach it to you," says Davis.

Users stand in front of a screen that shows their instructor. Behind the user is a second screen, which covers several infrared lights. Once the lights are on, a silhouette of the user is projected onto the rear screen, which is then captured by a video camera with an infrared filter and digitised before being sent to the main computer.

From the silhouette the computer can work out exactly what movements the user is doing, and how closely they match those of the instructor.

"The system we have at the moment is accurate enough to check that you are doing the right movement, but the next-generation system will be able to tell exactly how much you are bending your arms and legs, and will tell you if they aren't bent enough."

The camera in front of the user displays his actions on the screen in front of him.

"I spent a lot of time researching aerobics and how the classes work, and I found that almost all the rooms are mirrored, allowing participants to see what they are doing, which helps them know if they are doing something wrong. Of course we have the advantage of being able to alter the image. For instance, if the user is bending his back too much, we can put a red line on his back on screen, showing exactly what he should be doing," says Davis.

The Massachusetts Institute of Technology is also working on a system that can hold classes in step aerobics. It relies on a sensor wire across the step to determine whether the user is on the step.

Davis also plans to incorporate heart monitors into the equipment.

"There are already several heart-rate monitors that can send data directly to a PC, so we think we will eventually use one. Being able to monitor the heart rate of the participants makes it a lot easier to

customise their workout - if the rate gets too high, we can slow down the workout," he says.

Users can also choose their own music, which is stored in the PC and automatically plays during the session.

Davis eventually hopes to create a home version of the system, but believes he will have to wait several years for the technology to become more affordable.

"At the moment an entire system, including all the infrared equipment, costs about £4,000. Obviously that is too much for home use, so we are working on a system that uses a single camera on your television to track you. This would allow the whole system to fit in a VCR-style box under your television set," says Davis.

The main cost of the system at the moment is the large display screens and the powerful computer needed to process images. However, Davis believes that prices will soon drop to an affordable level and that, by sacrificing some features, a home version could be made available now.

"What is possible now is a box that senses when you come in to the room and runs the workouts without any monitoring. This easy enough to do, and would be fairly cheap to produce, but still offers a lot of benefits over a straight exercise video," says Davis.

The current system is likely to be sold to health clubs, according to Davis.

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