

MAR 22 1997

BURRELLE'S

2223
C.A...

HZ
bs..in

SCIENCE AND TECHNOLOGY

Looking out, looking in

IT IS never the same on television. Sport, that is. And it probably never will be. The roar of the players and the smell of the crowd will not be easy to duplicate remotely. But if Takeo Kanade, of Carnegie Mellon University in Pittsburgh, has his way, televised sport may, one day, in one crucial way, be better than the real thing.

Dr Kanade, who is the director of Carnegie Mellon's Robotics Institute, is experimenting with a system that could allow a television viewer to watch the action not just from the sidelines, or even in close-up, but from anywhere on the field of play. If someone so desired, he could see a game from the referee's point of view, or even from the ball's.

The system, which Dr Kanade refers to as "virtualised reality", works by creating a three-dimensional representation of a bit of the real world inside a computer. Ordinary television pictures are composed of pixels—coloured dots arranged on a surface. The virtualised system takes this idea one stage further, storing its images in the form of three-dimensional "voxels". The space to be televised (in this case a five-metre diameter hemisphere) is divided into small imaginary cubes (in the experimental set up, they are a centimetre along each edge) It is then merely a question of recording what is going on in each cube 30 times a second in order to produce the three-dimensional equivalent of a video.

This is no small task. To construct

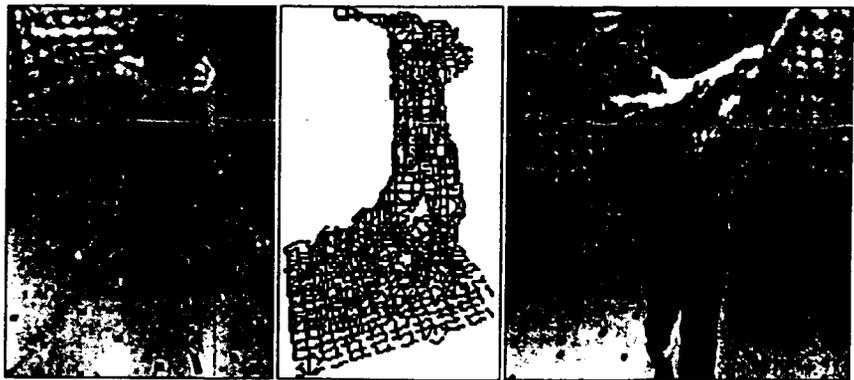
such a 3-D video means being able to see the space represented by each voxel all the time from many different angles. To do so, Dr Kanade needs to employ 51 video cameras just for his small experimental arena. Then there is the question of the software needed to integrate all 51 images. Each bit of each object in the arena must be triangulated continuously, so that the computer can keep track of which voxel it is in. Writing the programs that do this has been the team's main task.

The result is a representation of the hemisphere, and anything in it, in the computer's memory. That, in turn, allows the computer to behave as a so-called "synthetic camera". It can generate a moving two-dimensional image of any view that can be seen from any point inside the hemisphere. And with only a few extra

lines of code this "camera" can be "attached" to an object within the virtualised reality, and thus move around with it, recording what that object can "see".

Unfortunately, the processing required to perform the integration of all 51 two-dimensional images into a three-dimensional one is so demanding that the computers Dr Kanade has available take five days to produce ten seconds-worth of video. It will, he reckons, be at least five years before machines fast enough to process the images as they are generated are available.

So far, Dr Kanade has not managed to film an entire game of anything (indeed, in the space available, the biggest field of play that would fit is a pool table). He does, however, have virtualised-reality recordings of a man swinging a baseball bat, and two people bouncing a basketball between each other. Perhaps a game of chess could follow.



From this

via this

to this