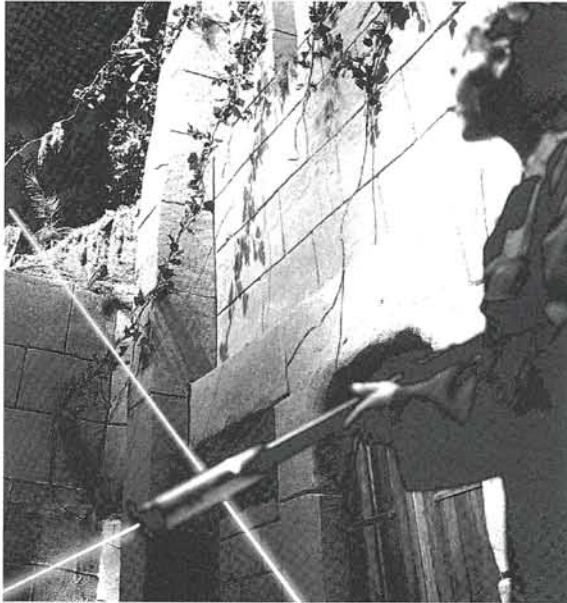


# PSD sensing for Adventure Shooting

Brunelco Electronic Engineering develops all kinds of electronic equipment for third parties. Last year, we were asked to develop a recreational team shooting game. It wasn't easy. In the game participants are supplied with a gun which shoots an infrared beam. Moving animal and character targets are projected onto screens around an arena and players try to shoot them. Our objective was to find out which player hit the target, and at which point, so we needed to detect the beam's horizontal and vertical position on the screen, without picking up any signal from the projections. Looking at several solutions we concluded that few detection systems were up to the job.

Because we also needed to know who pulled the trigger we had to use an ID code for each player. Since several players can shoot at the same time, we had to add



a mechanism, which doesn't corrupt the information in case shooting pulses collapse. To overcome this problem, we placed infrared transmitters in front of the screen to enable each player simultaneously. This has to be done quick enough that players won't notice they are actually playing one after the other. This is why other sensing devices were not an option. CCD sensors were not fast enough to scan the whole screen in this short time, and still be sensitive enough to detect the low milliwatt infrared spot from the gun (the budget was

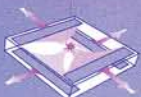
limited of course, as well as the battery power source in the guns).

Finally we decided to use a two dimensional PSD from SiTek for the detection. Because of its analogue nature, it could be made fast enough to detect the 100 microsec. infrared pulses and at the same time measure the position of this spot.

Because the infrared ID transmission, for releasing each gun, is synchronous with the Sitek PSD detection, we can see which ID is active the moment we receive a "hit". Finally we have to receive the incoming pulses and find out at which x-y position they hit the screen. Because there is a big difference in light intensity between players we needed a high dynamic detection and processing range. Therefore we decided to calculate the light current ratio with an analogue processor. We implemented this part in a Zetex programmable



analogue device (TRAC). The calculated result is captured with a sample and hold amplifier, where offset and gain can be adjusted, before AD conversion takes place. Finally we have a simple AD converter, connected to an 8 bit microcontroller. This controller sends the gun ID, and both x and y coordinates through a serial link to a Windows NT computer. At the computer, we made an OCX, which takes care of communication with the Sitek PSD sensing device. It also converts the analogue measured values to screen coordinates (through a calibration table) and then generates an event for the multimedia part, which is playing the animation. The multimedia part was developed by another company, called Archivision. Finally it matches





the incoming coordinates with the actual “hot area” from their creatures and has the thing exploded or not, complete with corresponding sound effects.

The whole system is integrated in a large indoor entertainment centre, where 24 of these systems are placed. They are all connected via a network, with dynamic tracing of the groups (with RF tags), so we can send new player ID s as soon as a group gets near to the

adventure shooting area. Before entering the arena, each group is entered into a database where gun-ids, RF tags and other equipment (wireless information system), are coupled to the players. This part was developed by Media Bytes, and takes care of information distribution to all different systems in the arena.

A stand alone version has been developed for use in Cafés, which is simple to install and provides a lot of fun in a minimum space!