

Mapping buildings on the move

10

In urban military operations it can be highly advantageous to know a building's structure and ground plan without entering the premises. For an assignment from the Electro Magnetic Remote Sensing Defence Technology Centre (EMRS DTC) in the UK, TNO has developed a radar that can map buildings from a passing ground vehicle.

The radar system uses mirror reflections of RF signals. Dr Felix Smits, the project leader, draws an analogy to explain how the reflections are used. 'Imagine a car on which the sun is shining. As you walk past it, the point at which the sun reflects off the surface changes. Knowing your own path and seeing how the sun passes over the metal surface, you can establish the shape of the car.'

REFLECTION POINT

'When we compose a picture of a building we focus on the walls, floors and ceilings,' Smits says, and returns to the analogy. 'When you drive past a straight wall, the reflection point moves along with you. That helps you deduce that there's a wall. Suppose that you pass another wall at right angles to the first. The reflection point no longer keeps pace with you; it stops. That allows the two walls to be distinguished. As well as distinguishing between two walls, a vertical array allows you to determine the transition between a wall and the ceiling. The angle between two walls and a ceiling or floor is a special case. This never moves along with you, whichever way you measure it. This may sound simple but applying it in practice is a tricky business. As this principle hadn't been applied before, we were able to patent it.'

FIFTY-CENTIMETRE RESOLUTION

The first test, involving a radar on a rail carriage passing a building, was successful. The radar produces images with fifty centimetre resolution in every direction. 'The next steps are to integrate the radar on a vehicle, to compensate for vehicle motion and to investigate the system's robustness when imaging various different buildings,' Smits explains.

It's taken Smits and his colleagues eight to nine months to get to where they are today. Similar research is being carried out in the US as part of the VisiBuilding programme. 'They are a little further along than we are,' Smits concedes, 'but then they've been at it for three years on a budget that's somewhere between ten and one hundred times larger than ours. However, in view of America's export restrictions on military equipment, there's some doubt whether the knowledge they develop will be put at Europe's disposal.'

Info: felix.smits@tno.nl



The radar, mounted on rails, and (below) the result of the first experiments

ALL KINDS OF APPLICATIONS

Where and how intervention is possible and how spaces in buildings are being used; this is the rapid assessment a soldier needs to make. In a known building, the soldier wants to see any changes that could indicate certain activities. A real-time plan of a building would be a very helpful tool.

Such a plan is also of interest to civilian parties. Before entering a building, a fire-fighter would prefer to see an up-to-date ground plan. Units attempting to end a hostage situation need to know exactly which entrances are usable. And in the wake of a disaster, emergency response workers benefit from knowing whether a building's walls have shifted, affecting the risk of collapse.

