

# Sensor-driven Computing

## Making Computing Systems Aware of the Physical World

- *In order to adapt to a changing environment, computers and systems must be able to sense it*

- *Even the simplest sensory information can be used to great effect*

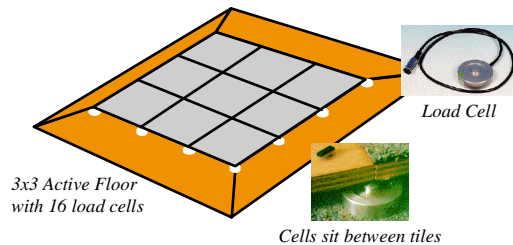
- *Sensor-driven Computing offers a variety of mechanisms for discovering and interpreting the state of the world*

### The Active Floor

The prototype Active Floor uses an array of load cells underneath the floor tiles. Each load cell measures weight differences of 100g

Snapshots of the weight distribution across the floor can indicate where objects have been added or removed

Dynamic analysis can classify activity on the floor



3x3 Active Floor with 16 load cells

Preliminary trials using Hidden Markov Models to analyse 'footprint signatures' achieved a 90% recognition rate amongst 15 individuals

A larger Active Floor will be built in collaboration with Cambridge University Computer Laboratory

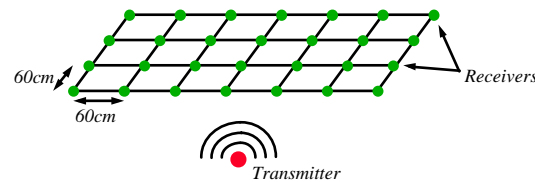
### Ultrasonic Location

A fine-grain location system involving ultrasonic transmitters, detected by an array of ceiling-mounted receivers

Positional accuracy of 10cm in three dimensions is possible

Each transmitter or group of transmitters locates a different object, and can be individually addressed by the system

Redundant information from the receivers is used to filter out reflections



An ultrasound transmitter and array of receivers

### Other Sensors



Active badges use infra-red to locate people and equipment to the room-scale

GPS systems provide position and velocity information in three dimensions and can be embedded into a variety of devices



A cluster of accelerometers can provide 3D orientation information

A chair equipped with a flux-gate compass can indicate its orientation to within 0.1 degrees

