

## GravitySpace shows how floors will smarten up (w/ video)

January 24 2013, by Nancy Owano

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Credit: Hasso-Plattner-Institut

(Phys.org)—Year of the smartphone? So yesterday. Year of the smart room? So promising. In scientific circles, conversations are moving down from smart doors, fridges, stoves, and toilets, as computer scientists visit and revisit the technology potential of smart floors. With enhanced sensory powers, the idea is to have floors able to interact with

the persons walking on them. The floor gets to "know" its own geometry as well as people's actions, and can display interactive video.

With this potential in mind, a team from the Hasso Plattner Institute in Germany have a research project called GravitySpace.

At the Institute, the project team members are Alan Bränzel, Daniel Hoffmann, Marius Knaust, Patrick Lühne, René Meusel, and Stephan Richter supervised by Christian Holz and Dominik Schmidt at the [Human Computer Interaction](#) Lab of Prof. Patrick Baudisch. They are exploring high-resolution pressure-sensitive floors as a way to track people and furniture in smart rooms. They see the device as a potential forerunner to pressure-sensing floors in people's homes.

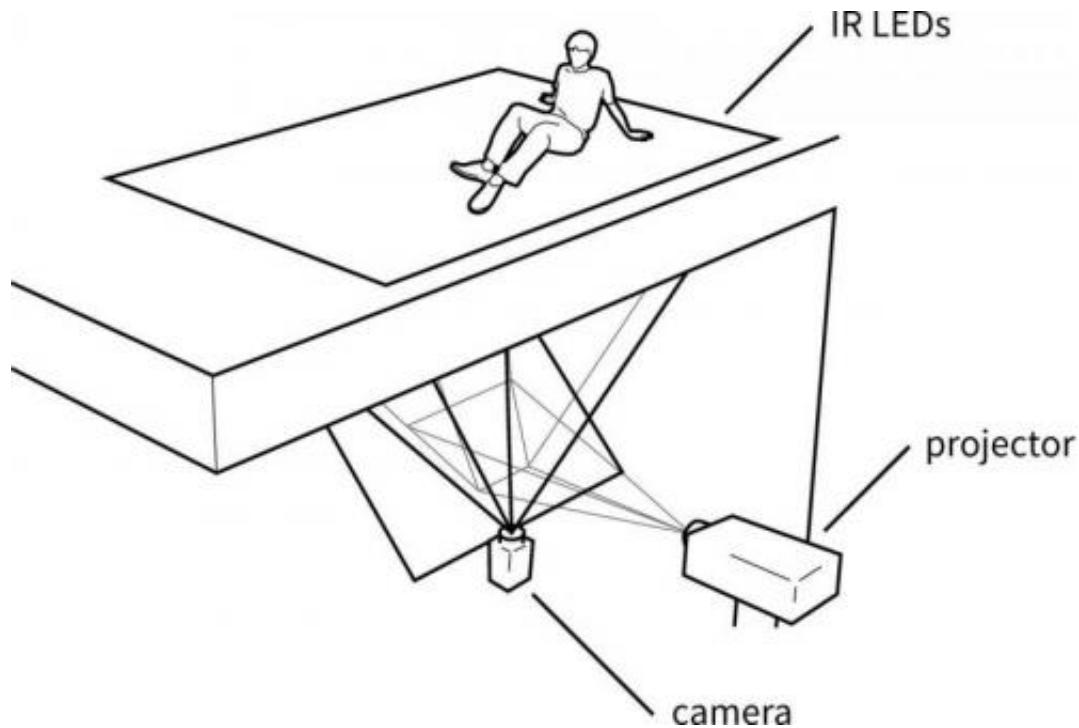
They have devised an eight-square-meter pressure-sensing [floor](#), where people are recognized by their weight. The team will present GravitySpace at the Conference on Human Factors in [Computing Systems](#) in Paris in April.

"We have created an 8 m<sup>2</sup> back-projected floor prototype," they said, which they define as "a set of passive touch-sensitive furniture, as well as algorithms for identifying users, furniture, and poses."

Baudisch, chair of the lab at the Hasso Plattner Institute, has put their efforts into somewhat loftier terms. He said "The objective of our work is to unify the [virtual world](#) of the computer with the physical world of the user into a single 'Euclidean' space. We argue that this is the key to intuitive or 'natural' user interfaces."

They installed a slab of glass, which is 6.4-centimeters-thick, in a hole cut into a floor. Their construct calls for an [infrared camera](#) and high-resolution video projector in a room below that can track footprints, and beams video up onto the glass. Infrared LEDs surround the flooring,

coated with a rubbery, pressure-sensitive film.



Credit: Hasso-Plattner-Institut

A foot stepping on the surface makes the film interfere with the infrared light, creating an image of the footprint that is captured by the camera below. Software on a linked computer recognizes what those objects are doing and generates video in response.

One example is using the smart floor for domestic indoor play, a type of rainy-day weekend football. The floor generates a football that can be kicked about by people in the room. The floor measures the rate of change of pressure on the non-kicking foot to determine when the person is kicking.

Another imagined scenario is sitting on the floor and, because the floor can recognize the sitter's weight, can turn on the television to that person's favorite channel.

Their project has been helped along with funding from Microsoft Research in Cambridge, UK.

While the smart floor concept can easily inspire thoughts of fun at home, there are practical applications that sensor-rich floors may provide, such as use in home security, in detecting unfamiliar steps, or, in the case of the elderly, alerting caregivers if a patient falls. Last year, IBM was granted a patent for a smart floor designed to detect intruders or alert medical support. The technology would involve a database of objects and sensors for tracking numbers, eights, shapes, and locations of objects in a room.

**More information:** [Project site](#)

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