

# Playful Interactions with Body Channel Communication: Conquer it!

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## ABSTRACT

Conquer it! is a lightweight proof-of-concept exertion game that demonstrates Body Channel Communication (BCC) in a smart environment. BCC employs the human body as communication medium to transfer digital data between physical objects by using electric fields that are coupled to the body. During the game participants are provided with BCC wearables, each of which represents a specific RGB color. When the user stands, walks on, or touches with a hand the BCC tiles, communication is automatically established: the corresponding sensor area decodes the message (RGB value) originating from the wearable and lights up according to that color for two seconds. The goal of the game is to try to light up as many tile cells simultaneously as possible. Participants can try to keep alive the colors by continuously moving around on the tiles. In the multiuser version, by stepping on or touching a blinking cell, users can immediately claim the area and overwrite the color of that subtle.

## Author Keywords

body channel communication; capacitive coupling; human-computer interaction; wearable; smart floor

## ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI):  
Miscellaneous

## INTRODUCTION

Body Channel Communication (BCC) is a communication technology that - as opposed to traditional media like air or wires - uses the human body as transmission medium. If BCC interfaces are added to physical objects, digital data can be sent between them through touch: the communication is established when (and as long as) the user is in contact with all those objects. Previous BCC systems had serious limitations: they were unable to function with full body range distances, operated only in a laboratory (with various extra devices attached), disallowed free movements (i.e. were tied to fixed

installations like chairs or desks), or simply had high cost and complexity.

A recent BCC implementation (*TouchCom* [1]) overcomes these obstacles to widespread deployment and provides a prototype platform than can be used for portable as well as for stationary objects, has low cost and complexity, works throughout the whole body, works standalone (does not require any additional devices), and supports basic networking by building on bidirectional communication. This demo aims to demonstrate the interaction possibilities of this BCC system through a playful application called *Conquer it!*.

## BODY CHANNEL COMMUNICATION

BCC can be realized using electric fields [2]: the transmitter device encodes its digital data into an electric signal that generates a small electric field. If the user is in close proximity to this field, it can capacitively couple to his/her body, and the signal can propagate on the body's surface. Consequently, the signal will be accessible in longer distances, while the user acts as medium. Figure 1 shows a user wearing a BCC wristband: the signals are originating from the band and propagate through the whole body.



Figure 1: A user wearing a BCC wristband: the signals are originating from the band and propagate through the whole body.

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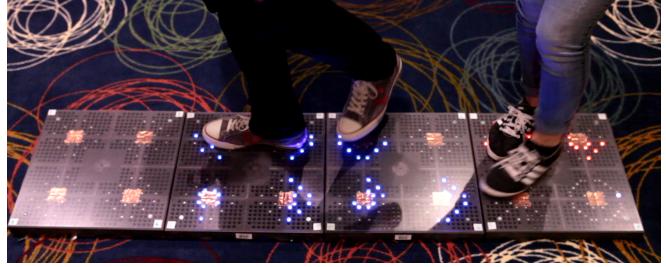
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(a)



(b)

Figure 2: Conquer it! can be played either by touching the tiles by hand or by walking on them. The cells of the BCC tiles recognize the (instrumented) players who are touching them and they light up with the corresponding color of the user. The goal is to conquer as many cells as possible.

### SYSTEM SETUP

Four off-the-shelf outdoor floor tiles were instrumented with BCC sensors, as discussed in [1]. Each tile has a size of  $40\text{cm} \times 40\text{cm}$ , and protective acrylic glass is added on top of them. The tiles are arranged in a line, providing a  $160\text{cm} \times 40\text{cm}$  play area. Moreover, to increase stability, the tiles are mechanically interconnected. In addition, power distribution wires are added to make it possible to easily power up the whole system from one power outlet.

Simultaneously, the users are provided unique BCC wristbands [1], each corresponding to a (configurable) color. The wristbands do not need special attention to be attached on. Each wristband is operated by battery.

### CONQUER IT!

Conquer it! is a lightweight exertion game that consists of several BCC instrumented tiles, each of which can be activated by wearables: the users having BCC wristbands can stand or walk on the tiles (or just touch them directly with hands). While the user has the wearable strapped on and is in contact with the tiles, communication is established automatically between these objects using the user's body.

If a tile cell successfully receives and decodes the message (RGB value) originating from the wearable, it lights up for

two seconds according to the color chosen for the wearable. The goal of the game is to simultaneously light up as many floor cells in your color as possible. Users can try to keep alive the colors by continuously moving around on the tiles. In the multiuser version, by stepping on a blinking cell, users can claim the area and immediately overwrite the color of that subtile.

Figure 2 shows the working setup when played by two individuals.

### SUMMARY

Conquer it! is a demonstration of a recent BCC system [1]. It aims to show how *TouchCom* can be used for full body, body coupled data transmission using BCC wearables and BCC tiles.

### REFERENCES

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