# Creative Coding for the Raspberry Pi using the HappyBrackets Platform

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## Abstract
This workshop will introduce creative coding audio for the Raspberry Pi, using the *beads* platform for audio programming, and the *HappyBrackets* platform for inter-device communication and sensor data acquisition. We will demonstrate methods to allow each self-contained battery-powered device to acquire sensor data about its surroundings and the way it is being interacted with, as well as methods for designing systems where groups of these devices wirelessly communicate their state, allowing new interaction possibilities and approaches.

## Author Keywords
interaction, physical computing

## ACM Classification Keywords
H.5.5 [Information Interfaces and Presentation]: Sound and Music Computing; H.5.2 [Information Interfaces and Presentation]: User Interfaces—Haptic I/O

## Introduction and Call for Participation
This workshop will introduce creative coding audio for the Raspberry Pi, using the *beads* platform for audio programming, and the *HappyBrackets* platform for inter-device communication and sensor data acquisition. We will demonstrate methods to allow each self-contained battery-powered device to acquire sensor data about its

surroundings and the way it is being interacted with, as well as methods for designing systems where groups of these devices wirelessly communicate their state, allowing new interaction possibilities and approaches.

The Raspberry Pi is an ultra-cheap, ultra-small Linux microcomputer. Introduced in 2012, it is a flagship device lighting the path towards generally available ubiquitous computing technology. The creative potential of cheap, tiny network-connected general purpose linux computers that are the size of credit cards is immense. Similarly, Java is one of the world's most popular general purpose programming language, and underlies the creative coding environment *Processing*, itself one of the most popular environments for creative coding. Java opens up a world of infinite possibilities, and the coding examples in this course have been designed to be incredibly easy to learn, allowing you to get stuck into your creative goals from the get-go.

In this course you will learn the essentials of programming real-time audio software and apply these skills to the exciting world of the Internet of Things. You will use the Raspberry Pi as a rapid prototyping platform, exploring the creative potential of real-time sensor and network interaction, combined with real-time sound generation, creating systems that respond to user input, communicate with other devices and play sound. Make your own musical instruments, develop devices for sonic artworks, and create new sound design concepts for sonifying everyday objects. Through this course you will develop a basic understanding of audio programming and the core concepts behind programming for the Internet of Things. You will be able to conceptualize and design your own innovative interactive devices.

## Topics

This course will include the following topics:

Morning Session:

- Introduction to Beads and IntelliJ, Continuous and Event-Based Control in Beads
- Sampling and Synthesis, Introduction to Audio on the Pi
- Live Coding the Pi, Network Communication with the Pi
- Responding to Sensor Data

Afternoon Session:

- Collaborative Exercises.
- Composition Tasks

## Logistics

This workshop will be a **full-day** session framed as a pedagogical workshop which will introduce the platform in an interactive hands-on manner.

To undertake this workshop effectively, we would need the following resources to be supplied:

- a room with sufficient desks for participants
- a projector
- power sources for each participant (extension cables and power boards).

All other equipment we will provide. Participants in this workshop will require a raspberry pi, sensor system, battery system and access to a wifi or wired network which we will provide. Some participants may wish to purchase these devices in advance of the workshop, so that they learn on equipment they can take with them, and for these participants we will provide a description of the equipment we use and suggestions for how to buy them and set them up in advance of the workshop. For participants who do not bring their own

equipment we will provide a device for the day. If there are a large number of participants sharing may be necessary.

Participants will benefit from some experience in programming Java. No electronics knowledge will be necessary but familiarity with linux and/or raspberry pis would be advantageous also. This course will not introduce Java from first principles, although the coding examples will start off being very simple and easy to pick up. Specific programming examples and techniques will be explained as a central part of the workshop.

## Partner Online Course

This workshop will benefit from an online MOOC course we have recorded and which we will make available to participants in advance of the course. Kadenze provide best of breed online resources for teaching creative topics. We will expect participants to have enough time to review the course materials and videos in advance of the workshop, but not to have completed the assignments. The workshop itself will focus on reviewing the material, running through and clarifying any unclear content, and then on completing collaborative composition asssignments in the second half of the workshop.

## Previous Workshop Iteration

This workshop was run at the 2016 edition of the International **New Interfaces for Musical Expression** confernece. It was highly subscribed, and also won the **Best Workshop** award for this conference. Given its focus on technical skills of a leading-edge nature, we have found demand is generally quite high.

## Biographies

Sam Ferguson (Workshop Presenter) is a musician and a researcher in audio technology. He is currently a lecturer at the University of Technology, Sydney associated with the Creativity and Cognition Studios in the Faculty of Engineering and IT, but in the past he has also worked at the University of Sydney (where he gained his PhD) and at the University of NSW. He has worked in a number of fields, from designing audio alerts for air traffic controllers, to developing methods for understanding data through listening to sound, to investigations of the relationship between emotion and music, to the quantitative analysis of singing and contemporary dance. He is also an enthusiastic educator, designing and teaching audio, acoustics, human computer interaction and programming courses at both postgraduate and undergraduate levels.

Ollie Bown is a researcher and maker working with creative technologies. He comes from a highly diverse academic background spanning social anthropology, evolutionary and adaptive systems, music informatics and interaction design, with a parallel career in electronic music and digital art spanning over 15 years. He is interested in how artists, designers and musicians can use advanced computing technologies to produce complex creative works. His current active research areas include media multiplicites, musical metacreation, the theories and methodologies of computational creativity, new interfaces for musical expression, and multi-agent models of social creativity.