Raspberry Pi PIR sensors hidden above visitors' heads trigger the video projection on to the plates

When no one is in the room, the setup goes into standby and the lights dim

Responsive lighting indicates areas of interest and interactive elements of the exhibition

Migration Museum

A museum celebrating the diversity of London's residents comes to life when visitors linger near its artefacts. **Rosie Hattersley** discovers more

MAKER

Chris Owens

Chris Owens is one of the founders of Clay Interactive, a company that specialises in creating interactive exhibits for museums.

clayinteractive.co.uk

A few weeks before this spring's lockdown there was a buzz of excitement among visitors to Lewisham Shopping Centre in south-east London. Slabs from the Berlin Wall emblazoned with brand-new street art greeted visitors at the entrance to the former H&M store, while the storefront display is one of assorted luggage with tags from around the world and many generations.

Thoughtfully curated bookshelves in the gift shop contain tales and memoirs from Windrush Generation writers and set the tone for the rest of the exhibition. The reconfigured former retail unit now contains TV set-like areas with a classroom, kitchen, bedroom, and a hairdresser's shop. Peeking in the bedside drawer or rummaging among the clutter on the mantelpiece, the curious visitor finds postcards, paintings, maps, and photos revealing the lives of those who made London their home. Taking a seat in the hairdresser's, you're invited to don headphones and listen to the stories recounted by the figure who appears in the mirrored screen. Gazing at the dressed dining table prompts a light to beam images onto the bare dinner plates, with recipes and muttered memoirs of favourite dishes.

Visual storytelling

The Room To Breathe interactive displays are the handiwork of Chris Owens and his colleagues from Clay Interactive. Commissioned by Aditi Anand, The Migration Museum's head of creative content, they created interactive sets created from artefacts that help tell immigrants' tales.

Quick **FACTS**

> Chris and his team have projection-mapped food before…

> …for an exhibition at The British Library

> Their data mirror guessed Science Museum visitors' ages

> But they'd never used Raspberry Pi for a museum project before

> They're now helping The Migration Museum add more RFID features

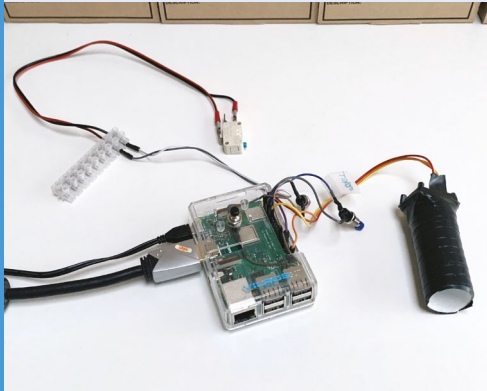## " The technology had to work unattended all day, every day "

"Our role was to try and make the various rooms in the exhibition as interactive and engaging as possible within their very tight budget," explains Chris. "We knew we needed to have perfect full HD playback and the technology had to work unattended all day, every day, so reliability was also key."

Chris says he needed a 'makers' mindset' as off-the-shelf hardware setups typically used by museums were simply too expensive. "Having used Raspberry Pi for a home automation project, I knew a bit about the platform and saw the benefits of the built-in GPIO combined with a compact low-power platform that could support pretty much any programming language."

▲ Framed pictures in the living room become videos of people sharing their memories

◄ A dish for making byrek, a traditional Albanian filled pastry

BYREK DISH

I cook byrek in this dish. I start with the dough, which is made with flour, water, salt and olive oil. I cover it with a towel and leave it for two hours. Then I make the filling with spinach, cheese and yoghurt. (In Albania, I would use the gize my mother used to make, which is like a salty curd cheese. I miss that taste, but you can't buy it in England.) I quickly twist the dough into shape because the baby won't let me spend too long on it! It's really important for me to cook Albanian food as it keeps me close to my culture.

Lilian

Interactive display details

01 A PIR sensor is used to trigger an object to respond to someone's presence.

02 The PIR is enclosed in a tube to limit its sensor range, meaning it only triggers when someone is close by.
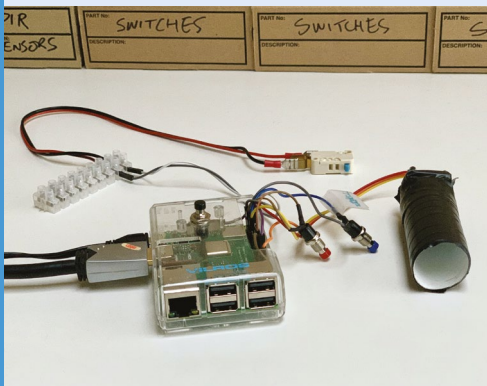
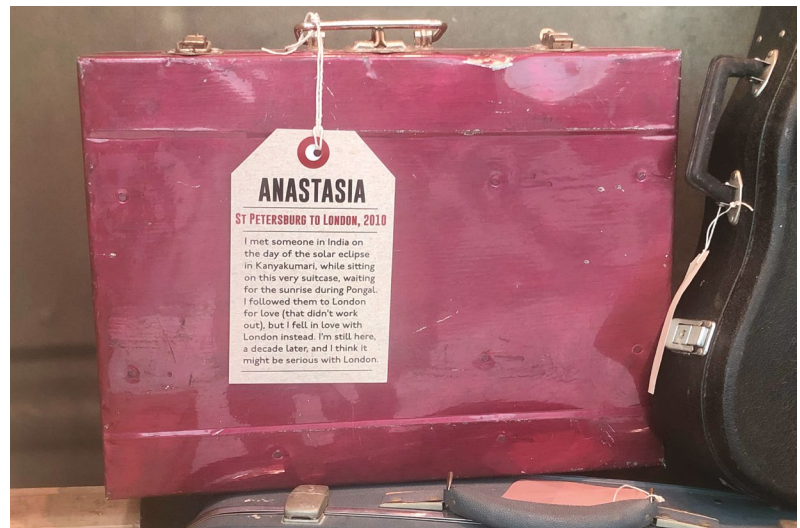**03** Discreetly placed Raspberry Pi-controlled switches trigger the audio when the headphones are picked up.

▲ Interactive rooms, such as the Golden Scissors barber's, bring personal stories from new arrivals to Britain to life in unexpected ways

▼ Like the other items, this case bears a label telling the story of how its owner came to Britain

They created the digital signage themselves using hardware from The Pi Hut, as well as Amazon. "It was really easy for us to get a prototype of the hardware up and running as the GPIO pins on Raspberry Pi make it easy to connect up and test switches and sensors," says Chris.

The broader picture

"The PIR (passive infrared sensor) has a very wide viewing angle as it's designed to look at a whole room," says Chris. "We wanted only small areas to trigger the media, such as sitting on a chair or standing very close to something." To reduce the PIR's field of view, they simply put it inside a tube so it could only 'see' what they wanted it to see. Occasionally, the PIR would be triggered by

ANASTASIA
ST PETERSBURG TO LONDON, 2010

I met someone in India on the day of the solar eclipse in Kanyakumari, while sitting on this very suitcase, waiting for the sunrise during Pongal. I followed them to London for love (that didn't work out), but I fell in love with London instead. I'm still here, a decade later, and I think it might be serious with London.

► The Migration Museum, housed in Lewisham Shopping Centre, features pieces of the Berlin Wall

▼ Postcards, letters, and spoken stories tell children's stories about coming to live in the UK

WiFi activity, but they fixed this by switching off the wireless LAN adapter on Raspberry Pi since it wasn't used for this project.

The team used switches to trigger audio playback when visitors picked up headphones. Other switches were added to restart an audio or video feed, or to shut down Raspberry Pi.

> ❝ The software is mainly just keeping track of whether someone is still present ❞

Achieving smooth 1920×1080 video playback was one of the trickier elements. Chris and his colleagues decided to use omxplayer (**magpi.cc/omxplayer**) because it can fade in and out. This was controlled using the omxplayer-controll package (**magpi.cc/omxcontroll**).

The main program was written in Node.js as that's where their programmer's expertise lay, and also because it offered several useful libraries. Clay's expertise is in creating exhibits with projection mapping, presence detection – ideal for the PIR motion sensors – and two-way mirrors.

"After being triggered and starting to play media, the software is mainly just keeping track of whether someone is still present," says Chris.

Once there's nobody around, it will stop playing media. In the case of the barber's, the mirror becomes a normal mirror again and, in the kitchen, the animated plates and tablecloth will return to normal.

"Raspberry Pi is a really interesting platform for museum work as it's small, flexible, and cost-effective. Its popularity also means it's easy to get hold of. We are definitely thinking of it as a possible solution to all sorts of needs."

The Migration Museum is planning a phased reopening in late summer / early autumn. For more details, visit **migrationmuseum.org**. Ⓜ