Where did hiCams come from?

(Jon) The three of us were initially discussing the notion of mirrorness and surveillance together — how mirrors can feel like portals, evoking a 'through the looking glass' idea of a place that is the same but different from our own. In thinking together about what it would mean for the mirror to be looking back at you, and how this is very much the case with a lot of our digital devices (where third parties can see our data, hear our voices or see our images), we talked about when someone seeing into your life could feel different to surveillance? We wanted to explore a design where the three of us were connected — it was something we'd never done before and a way for us to bring something very personal into the project. Being able to see each other through connected objects, felt like a very un-surveillance idea that we wanted to play with.

To draw further on mirrorness and the self-reflection aspect to this project we also made a matching mirror each to sit alongside our two hiCams.

As with much of my practice, the hiCams came out of a process of play. There wasn't a point that I sat down and 'designed' the hiCams. It quickly dawned on me that Raspberry Pi computers can be used to make very powerful cameras. I wondered what it would be like to make a simple connected camera. The result: after long hours of play and some very informed conversations with Jayne and Justin, I created the hiCam — using a Raspberry Pi Zero (£10),

a highly affordable single board computer, a ZeroCam (£15), a Hyper Pixel round 2.1" screen (£54) and 60g PLA (£1).

Each hiCam is paired with another. By having three pairs of hiCams, I was able to connect myself, Jayne and Justin in a social network of three people. Only three people. I had designed the back of the hiCams to be adaptable. To bring Jayne and Justin into the making process. To cut a long story short, Justin got very into designing a system for attaching anything to the back plate to allow everyday objects to become the hiCam legs (pencils, chopsticks, hooks, magnets, LEGO® and camera tripods).

Jayne got very into thinking about how we could reflect on how we live with them and made a series of probes (objects that act like physical questions) for us to live with as we experienced the hiCams. Everything was ready to go live within August 2023.

We have now been living with the hiCams for eleven months. In the following text we share thoughts and reflections on living with them in our homes and also provide reflections on our relationship with the internet; on our own practices; on the relationship between us as friends, and how craft-oriented thinking has been important in making it distinct from established forms of digital connection.

Let's talk about connected cameras and video

Connecting people by video has its earliest roots a century ago. A number of experiments successfully transmitted images between devices over cables in the 1920s US and Europe. Further experimental Picture Phones were developed as prototypes in the 1950s and 60s, but it was through computing and the internet in the late 90s that connected cameras became possible. There was something about the beauty of the mundane. The Cambridge University Trojan Room Coffee Pot was an early internet connected camera from 1991. It ran for a decade until 2001 and at one point was the most visited tourist attraction in East Anglia — with one million visitors! There was, and still is, something so compelling about the story of a coffee pot that launched the internet. The first snap-chat was a bunch of computer scientists working through the night drinking coffee and needing to know the coffee pot status. It says so much about coding, culture and connectivity. The coffee they were drinking, made by themselves. We've come a long way in webcams since those days. But we have also travelled far from the innocence and simple social beauty of a webcam of filtered coffee. A very long way.

The current proliferation of cameras that are always recording, very often connected to the internet and very often with highly advanced AI to allow for facial and behaviour recognition, is a serious threat to public and neighbourly trust. The use of public and private film recordings are encouraged in the UK as crime prevention approaches. Commercial uses of facial recognition in

UK shops is used to go beyond crime and identify shoppers' purchasing habits, emotions and profile. This is happening with very little public debate. One of the reasons for this is that the systems are based around frictionless technologies that for the most part are hidden from view, carry no visible warnings, and use advanced AI that the general public has little knowledge of and who are unlikely to be able to provide informed consent.

The use of cameras that are connected to the internet is one of the most unhealthy aspects of the internet. CCTV-type devices by themselves have serious implications for public trust and private relationships and in the UK they are everywhere; often disguised as other familiar objects... An electric car passing by your front door will be sending live foot age to Tesla's data centre. The Amazon doorbell across the street looking into your window looking at you on your sofa. Your TV watching you watch your favourite show or perhaps watching you doing the vacuuming. The vacuum cleaner with a camera watching the whole scene. Cameras are so intertwined in

our lives, it is hard to escape from their gaze.
Throw in the power of AI to recognise you, your home and your street and we have a deep surveillance system that we are choosing to pay for.

And yet there is another side to video. Staying in touch with friends and family through video on your phone can be a lifeline. Working remotely using video conferencing on your laptop is likewise an incredibly powerful way to connect people. During the pandemic, we all pushed video to new limits. It became the only way to be 'with' people. Using cameras to communicate is one thing. To surveil is another. We may be unaware that the doorbell, car, TV or vacuum camera is being watched by others, and we may be uninformed about the use of the data from our connected devices being used to train massive AI systems; systems that will be used to further tighten the net of machine surveillance.

hiCams are a point of resistance to this. They are in many ways a designed-contradiction. They are cameras. They are connected to the internet. But they are made by us. Every part of them is known. This shifts the narrative from surveillance to shared viewing. In doing so they become more of a social object — that supports, rather than counters, friendship and connectivity. Context is everything. If I put one on the street opposite your front door, how would you feel? Seeing me on the screen looking at your door... the fact that you can see me — you could wave or hold up a sign with some text on it — would that make you feel you had agency? Would you feel you were holding me to account? I wonder what it would be like if Amazon doorbells were forced to put a screen showing a live feed of who was watching through the doorbell camera. Would this shift the narrative?
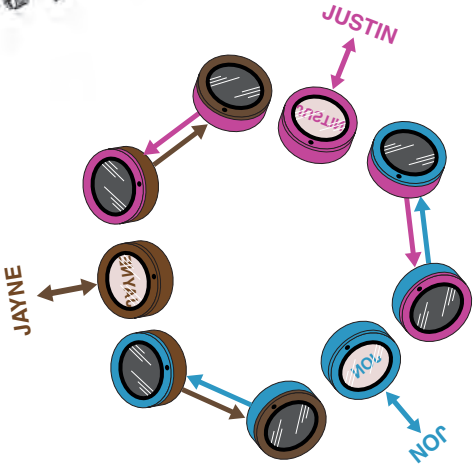

hiCraft

What are hiCams?

hiCams are a closed network of interconnected cameras, screens and mirrors. A camera on one hiCam sends an image to a screen on another. Within the network each pair provides a one-to-one viewing experience. Connection between them is direct — there is no third party (a server) that mediates the communication. hiCams were built to explore the role of craft in the design and making of connected devices.
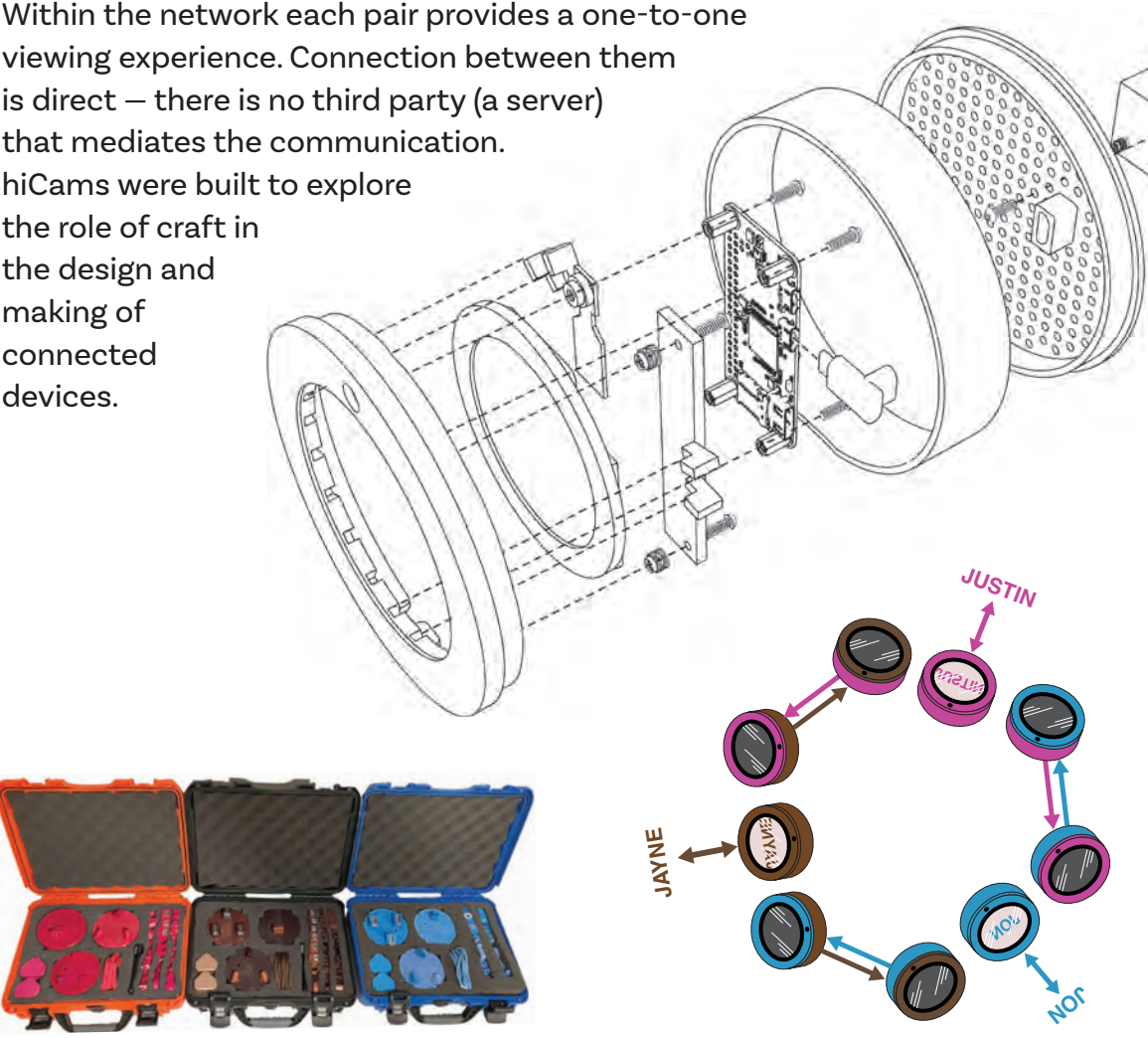

Cases containing hiCam kits for Justin, Jayne and Jon

How the hiCams connected

In this essay three professors at Northumbria University, as part of the hiCraft project, are in conversation about what it was like to create, make, maintain, adapt and live with these devices. Devices that in a sense are nothing new, but the process of living with hiCams provides a compelling mirror on the relationship between the internet, connectivity and craft.
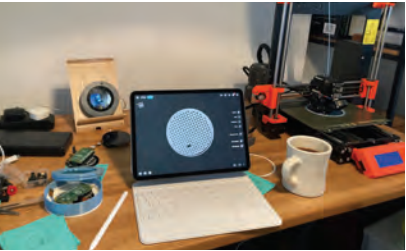
Jon designing the hiCams

Living with the three hiCams

Bespokeness — open, standardised platforms and personalisation fun

(Jon) Though perhaps not part of the initial design thinking for the hiCams, the 'neutrality' of the form may not have been 'crafty' in and of itself, but it did prove to be an open platform for crafty interventions. The hiCams are (bar the colours) standardised, but the opportunities for bespoking that we developed through the pegBit attachments (see pegBits poster) and other strategies provided rich opportunities for individualization. The pegBits system we designed allowed us to create bespoke stands/ perches, adornments and attachments that could be fixed to the hiCams. Outcomes ranged from the use of pencils (and pencil sharpeners) and chopsticks to create legs, LEGO® flowers and real flowers as adornments and the use of recycled aluminium in a homemade smelting forge to sandcast elements for a bespoke adjustable three-cam stand. Many of these experiments were playful, humorous and ultimately not terribly practical (or stable!), but they did flag that there are things going on with these devices that are perhaps not what you might expect and they acted as an experimental space for us to try ideas out over time.

This 'open platform' approach has some parallels with the wider open source ethos (which we have followed in terms of sharing hiCam design files and code on Github) but in that it provides an accessible platform that others can build on (or dismantle), literally and otherwise. Contrasting with commercial products that are inaccessible in terms of both locked-down software and impregnable hardware, hiCams (and pegBits) have been designed for ease of accessibility and adaptability— the code is open and editable, all the physical components are push fit or screwed— no glue, no single use fixings or specialist security bolts.

(Jayne) I have a lot of plants in my home and my hiCams were usually sat alongside and in the midst of them. Part of my play with them was to use the pegBits (see pegBit poster) to hold plants and to make LEGO® flowers that could act as supports and adornments to the very geometric shapes of the objects. The artificiality of the LEGO® colours felt right with the pink and blue of the hiCams and appeared like headdresses to the screens — and to Jon and Justin (akin to Florence Pugh's character at the end of Midsommar).

I asked if we could make a new, specific pegBit to hold a number of LEGO® flowers and Justin designed and printed this up. Making this pegBit piece inspired him to take the idea for a walk...

(Jon) Justin wanted the 'craft' to be more materially and visually manifest. In terms of aesthetic, one, rather obvious, but still irresistible strategy to emphasise his craft credentials, was to use natural local materials, hand processes and bricolage — all associated with craft practice, to individualise/personalise the hiCams.

(Justin) As I was making the pegBit for the LEGO® flowers I could see the potential to use it to hold more natural materials. Incorporating my interest in green wood carving within the hiCam project gave rise to some bespoke outcomes that we found particularly intriguing. The contrasting of locally-foraged and naturally irregular twigs, sticks and logs — hand cut, carved and bent — mixed with the uniformity, symmetricality and regularity of the 3D-printed hiCams created a sense of the uncanny. The organic forms of the carved wood and twigs and the hiCams do not sit easily together — digital products are meant to be manufactured, not grown.

The combination of the organic with the electronic has undertones of a dystopian sci-fi scenario where things go badly when the natural and artificial are synthesised. While technologies are created and (meant to be) ultimately controlled by man (sic), nature is more unruly, unpredictable and less controllable. Mix them up, even if only in terms of aesthetics, and there is a troubling sense of unease.

Digital products are meant to be reliable 'finished items' when they are put out in the world — they are not supposed to twist, move and warp in response to their environment and how they are manipulated, treated and cared for — these are more craft-oriented characteristics.

In craft materials are often more 'alive' in a making process. Rather than the more extractive nature of industrial mass manufacturing that 'uses materials', craft is more collaborative, where makers 'work with materials' in order to negotiate an outcome. There is also some recognition and expectation that things need some degree of continuing care and attention — in use as well as in production — and that these is value and meaning in these activities.


hiCam as picture making *not* image production — animations *not* movies

(Justin) The quality of the low resolution screen has the appearance and qualities less of a photographic image and more of a painting — it is inherently impressionistic, not representational. In addition, the refresh rate of the screen is about one second, so you experience movement not as seamless video, but as a series of animated stills. This leads to a different experience of what you digitally share and receive. Try to communicate detail and you will likely fail — this may entertain or frustrate the receiver, but either way hiCams are not about hi-fidelity. Shared views are like mini paintings (or animations) that share an atmosphere — e.g. it looks a bit wet, shiny and grey on Jon's patio today, but the pigeon nest action that he intended sharing is left to the imagination, with only merest hint of an amorous flutter.

The aspiration for more speed, more power, more processing, more detail, more 'quality'? at a very quantified level, is a powerful driving force within technology development and consumption. Striving for this leads creates a parallel need for more scale, more power, more consolidation, more market share... more money for big global tech companies. But does this always equate to 'quality' of experience for the user? Do we need the highest tech all the time, and is the price we pay too high in terms of; finance, environmental sustainability and the control and power we cede to the companies that provide the allure (and illusion?) of a better life through 'better' technology?
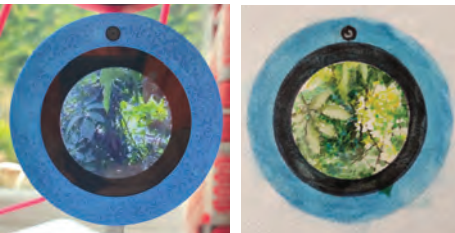
Curated experiences, unexpected pleasures, unnerving interventions and missing the moment

(Jayne) We've definitely each wanted to give the other two some kind of special experiences. As an example, over Christmas Jon played an Agatha Christie film on a laptop for Justin and I — placing our hiCams in front of the laptop screen as if we were at the movies. The slow frame refresh rate gave a particular quality to the film and the fact that Jon had enabled subtitles added to the feeling of watching a silent movie. It really felt as though we were sharing in a Christmas event together.

I've mostly had the hiCams in my makeshift pottery space at home and wanted to share the making and the joy of being in there with Justin and Jon. They must know the space pretty well now as the hiCams have been placed in as many angles in there as I could manage over the months. As well as holding some of the pots-in-progress up to the cameras for them to see them better on a few occasions I've set the hiCams up 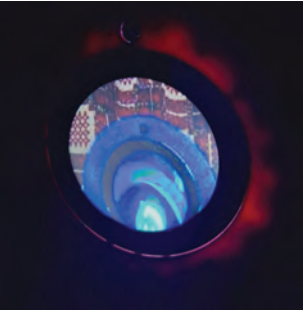at the end of the potters wheel while I was throwing to try to share the minor spectacle of this with them — but on each occasion neither of them were in the room! The casualness of the hiCam interactions is at odds with a perception that with digital connection comes a presumably constant audience.

(Justin) On Valentine's day, Jon decided he would make some amorously inclined changes to all of our hiCam screens.

I wrote in our hiCam-related WhatsApp stream; 'You have taken 'love' control of my hiCam even when yours is off... that's kind of disturbing.' This was Jon's independent decision, both as an act of friendship and as a technical challenge to himself, but the legibility of this intervention was not as clear as it could have been. Even in our tiny network, the person controlling the interface controls the user experience, and bringing this into focus allowed us to reflect more on how people's experiences are not just digitally mediated, but consciously curated by online platforms.

This event, amongst others, also provided Jon with the opportunity to reflect on his role — was he just a network manager or more of a network caretaker? The notion of a carer, rather than a service manager, sits well with our broader craft ethos. Craft, as a process of 'doing things well, for its own sake' (see Richard Sennett's 'The Craftsmen'), embodies a care-full approach to the way we act in, and on, the world.

In a reimagined world of smaller, more localised networks the role of digital caretaker (taker of care), perhaps with their own local digital broom cupboard that you can pop into to get support and advice, is an interesting one. Care roles include practical and emotional work — one without the other is either just a service. The role of a digital caretaker could be a strategy for (re)asserting human(e) values in the way we connect, while also sorting out those tricksy IP issues that have been bugging you!

(Jon) What does it mean to be the sole developer and IT support for a social network? Spoiler Alert! — it's quite lovely. The light-touch role involves being at the end of a WhatsApp group message (for the entire network of three) and being prepared for a 'my screen has gone blue/ brown/pink' — that signifies that you are no longer receiving images from Mr Blue/Ms Brown/Mr Pink.

As IT support, you then need to log into each of the hiCams and ensure that the IP address of the hiCam that is being streamed to has the correct IP address. That means logging into the receiving hiCam and checking the dynamically allocated public IP address (type 'curl ipinfo. io/ip') and see if it matches the one that the sender is sending to. If different, then you need to change the code, recompile it and reboot the non-compliant hiCam. Let Mr Blue, Ms Brown or Mr Pink know that you are rebooting and that all should be well in a few minutes. Give a reassuring couple of comments on just how good things look. Make a cuppa and wait for the returning WhatsApp 'Oh wow, back online' and go back to what you were doing before... job's a good 'un.

The thing is, this could be automated. It would be fairly simple to put some network hand-shaking in place to ensure that the senders and receivers let each other know when their public IP address changed and then to adjust accordingly. But in doing so, it would take the IT support person (me!) out of the equation. There's something nice about knowing how often (or not) public IP addresses change. It adds a piece of friction to an otherwise hidden part of the network, immersing you as a coder, and the network members as participants, a little deeper into some of the more technical areas of how the internet works. Of course, this is a little romantic and only works because of a network of three. But isn't that the point? That we can have things that we find interesting/charming is how we code something. That interesting and charming isn't always smooth. That it also keeps the coder/IT-admin person in the loop. That it builds a relationship around repair and maintenance.

Mirrorness

(Jayne) Bringing the thinking back to where we started — to mirrorness — the hiCams spoke to this for me in a couple of ways. The idea of a mirror as a portal felt very real in the low fidelity nature of the silent images I could see from Jon's and Justin's homes that refreshed each second. There was something akin to an animation or story about it — the circular screen adding to the porthole/portal connotations that relate to a journey or travel to another place. Justin placing Jon's hiCam facing the one to me creating a scene where I could see through my hiCam, through Justin's and into Jon's home is a good example of this portal mirror-like nature at work.

Mirrorness also came to the fore for me in the sense of seeing something of yourself in someone else. Seeing Justin burning the midnight oil, working at his desk some evenings, when I had been doing the same made me feel a particular connection and a care for him. On some occasions I was making things while either Justin or Jon were doing the same. We didn't do anything to communicate with one another, we were just involved in our own making, simultaneously and there was an unspoken kinship that I felt and a sense of sameness between us. These moments felt a million miles away from the spectacle or the broadcasting of your activities to a huge audience that we've come to see so often in social media. It wasn't about receiving validation or attention, but just about three mates being co-present occasionally and witnessing bits of the everyday.
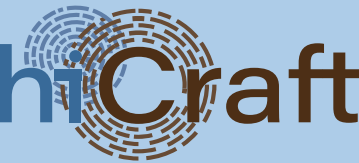
Friendship

(Jayne) Friendship has been something that not only led us to the idea of hiCams in the first place, it is also a dynamic that has been the glue to how we have lived with them and the moments when the hiCams became more meaningful to us than experiences of mere interest.

Let's face it, it is a bit weird to have objects in your home that are sending live images of you to someone else and vice versa. 'Weird' is certainly how all of our families felt about it when we went through the ethical consent process with them. All of our three families said that they would only consent to us placing the hiCams in rooms where they would not be (or not often be). The proposition of living with hiCams felt very different to the three of us. This is not down to us being on a research project together or just being interested in the experience; it is completely due to us having a long friendship. We had, for a number of reasons, not been able to be together in the same place more than a handful of times in the last two years. There was a sense of closeness that we were wanting beyond that of the global embrace of Teams or Zoom!

Friendship was our overarching methodology in the hiCam project. Friendship as a method for research enquiry, activist researcher Tillmann-Healy argues, is legitimised partly by the authenticity of the relationship friends have. We had already 'gained entrée' to our lives and experiences, we already have deep ties where roles can shift or blur between researcher and participant as the context requires. Friendship can be a relationship where, rather than being an echo chamber, it can be a place where you can push, test and explore who you are in an environment that has a safety net. Friendship can also be a space where frivolity gets allowed in — where daft, safe, banter can be rife. There was a child-like window of opportunity with the hiCams because they blurred the boundaries between work and home life too. We did things to make each other laugh, be that through bizarre dioramas or silly messages held in front of the cameras, and our banter often played out on the specific WhatsApp channel we set up for this project.

Friendship, mirroring, trust and ethics of chilli sauce

(Justin) Although the hiCams were originally intended (and agreed by other family members) to be only located in our workspaces and not in commonly used family spaces, sometimes the boundaries blurred.
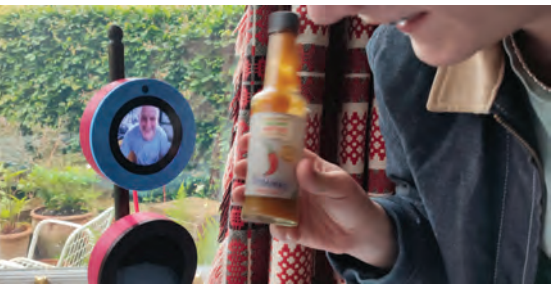
Jon and my son know each other and have a shared appreciation of chilli sauces. So when my son wandered into my studio and saw Jon at his stove taking a swig from a ubiquitous bottle of chilli sauce, he immediately rushed off to match Jon's bravado (which it turned out was fake, as Jon was only pretending!)... he did not, and took a big glug... and swiftly left seeking some milk! The experience has not put him off chillies or Jon, but is a lesson learned.

Less positively, it also highlights the way in which online interactions can lack authenticity, i.e. can you trust what you are being shown? In a world where digital profiles and associated imagery can be core to someone's self image, and so self-worth, the curation and manipulation of people's looks, personas and lifestyles has resulted in attempts to mirror the unobtainable and fictional ideals portrayed online by others. This creates a doom spiral in which everyone thinks that by 'swallowing' the painful elixir of digital life, they can achieve the fictional good looks, body, home, career, etc that are so widely promoted... It's a trick in which people seem to be both complicit and a victim.

hiCraft

hiCams — hiCraft