Inverting the 'black box' of technology: The Digital Ghost Hunt

The *Digital Ghost Hunt* was a 2017-2019 collaboration between The University of Sussex, King's Digital Lab and KIT Theatre. The project was funded by AHRC in the Immersive Experience funding stream (UKRI, 2018) and was awarded a full grant for the pilot and an extension to build and widen audiences in the second phase (UKRI, 2019). We were primarily interested in how immersive experience can be designed so as to emphasise and deepen sociality and engagement with the physical world, in contrast with the idea of 'black box' applications; a design paradigm that remains prevalent in IT (Castelvecchi, 2016). We also wanted to explore the interactions between design and technology as means to bring people of different ages and attitudes to technology together through shared learning and problem-solving, with a nod to the popularity of escape rooms (Nicholson, 2018).

Designing technology-led experience to enhance engagement with external worlds rather than enclosing the attention and focus of the 'user' or audience within display-dependent experiences raises many challenges and opportunities (Westling, 2020). First and perhaps foremost among challenges is the degree to which control can be exercised over the environment and the interactions of the audience, but also what type of environments and stories will lend themselves to storytelling that appeals to a range of audiences; different technological abilities, different experience of participatory experience, and different ages (Alston, 2016; Biggin, 2017; Dixon, 2015). We decided to focus on heritage venues, as they offer rich histories and collections but also 'worlds' that are, at least to some degree, contained. Our stated aims and objectives included not only the design of a replicable live immersive augmented reality experience for young audiences, but the production and publication of scripts and open-source code libraries for other producers (primarily in the third sector) to use and adapt for other heritage venues and audience cohorts (Hall, 2018).

Staged development in three renditions for three types of audiences

To date, the *Digital Ghost Hunt* has been produced in three renditions for three different venues (Digital Ghost Hunt, 2019), submitted for discussion separately. The first rendition, developed in collaboration with Shaftesbury Park Primary School, London, took place at Battersea Art Centre on

14 and 15 November 2018. The second, which was redeveloped for wider audiences without the preparatory induction in school, was adapted for and produced at York Theatre Royal in collaboration with Pilot Theatre and was performed to live audiences on 9-11 August 2019. The third rendition was adapted for 'museum lates' mixed family audiences with children from 8-13 years of age at the Garden Museum in London, and was performed on 1 and 3 November, 2019. The subsequent section outlines the three renditions, followed by analysis of audience experience from ethnographic observation and participant studies.

First rendition: Keystage 2

For the first *Digital Ghost Hunt*, we developed the basic script and classroom experience for Keystage 2 pupils. This research comprised creating prototypes for the ghost hunting devices and the first set of code libraries. Our aim was to create an AR experience that spanned the classroom and the live experience, centred participants and inverted device focus to enhance engagement with the social and physical world. Our cohort, Keystage 2 pupils, were introduced to 'MORPH', or the Ministry of Paranormal Hygiene, when KIT Theatre facilitators working undercover as agents of the Ministry appeared in their classrooms. The 'MORPH agents' enrolled students as junior agents through a series of team exercises, introduced simple programming and electronics and engaged learners in the longer story arc. This ultimately took them out of the learning environment to the performance venue where the live experience played out.

The classroom experience included training activities for fledgling MORPH agents using traditional, age-appropriate team building activities and simple electronics and coding to build 'ghost hunt' devices based on Raspberry Pi and Micro:Bits. Three types of devices were built and equipped with sensors for different types of problem solving during 'ghost hunting' during the live event for 'tracing ectoplasm', sensing the distance to ghost activities, and decoding communication from 'ghosts'. The live event, which followed after nearly three weeks of classroom activities, took place at Battersea Arts Centre (BAC), a heritage venue in south London. The venue had been discreetly instrumented and transformed into immersive scenography, without visible changes to the fabric of the building. Actors whose characters were unknown to the school children had rehearsed the play in

advance, including the Ghost of Molly Perkins and Michael Desouza, who was first introduced to the audience as a 'building manager', but was later revealed to be the culprit of the misdoings that held the ghost trapped. The transition from the classroom to the live experience was facilitated by the MORPH agents that the students had trained and worked with in their school, and class teachers accompanied the children throughout, supported by additional KIT Theatre stewards who participated as MORPH operatives.

Facilitation was of critical importance both in the school and the live events, with the participating children noticeably looking to their teachers for support both for suspending disbelief in preparatory activities and for managing emotional suspense at the live events. In contrast with adult audiences, whose immersive experiences may be enhanced by separation from regular friends and familiar circumstances (Westling, 2020: 16, 88), young *Digital Ghost Hunt* audiences looked to adults they trusted for 'clearance' and support. Initially this role was fulfilled by their teachers, but as familiarity and trust was built, the 'MORPH agents', who had been introduced and worked with them in their classrooms, stepped into this role. Field observations in the school environment and during the live event confirmed the importance of mediation of children's transition into storyworlds, and reassurance as needed within the storyworld, from trusted adults. On one occasion, a young audience member was overcome with emotion even in the absence of any 'ghostly' activities or ominous atmosphere and needed to sit to one side with a teacher. The teacher was able to reassure the pupil and direct them towards quieter activities of the programme, without further upset. Other participants sought confrontation with the 'ghost' eagerly, demonstrating the range of preferences for level of challenge. Through interaction with the live experience, participants with different aptitude for suspense gradually built confidence, which levelled the field. When the Ghost of Molly Perkins finally appeared to the whole cohort the result was generally high levels of excitement, shared by young and adult participants.

Second rendition: mixed family groups, 5-60

Having observed that young audiences had specific requirements for both building and managing dramatic tension in immersive experiences, we wanted to explore a different induction format in the

second rendition of the *Digital Ghost Hunt* to be able to reach wider audiences. While rewarding and effective as an induction into the storyworld and the contingent development of simple coding and electronic making skills, the classroom induction phase was time consuming, and not always possible. We were aware that we would not always be able to introduce the *Digital Ghost Hunt* with lengthy educational induction periods. We also wanted to explore experience design for mixed-age audiences, including (again) young audiences but with a wider age range, and accompanied by parents or other adult carers. For the second phase of the project we worked with Pilot Theatre in York, where we adapted the recruitment process, replacing the classroom component with remote communications by email and advertising and a shorter induction into MORPH that took place in the venue as part of the performance. Rather than staging the production traditionally, we made use of a small, informal theatre inside York Theatre Royal, auxiliary rooms normally used for rehearsals, backstage and basement areas, with only the dénouement (the reveal of the culprit) using the central stage.

The production incorporated theatre lore specific to the venue, woven into the scenography (comprising backstage and rehearsal areas as well as the lobby and the central stage), which were adapted and instrumented for the production using similar techniques as at BAC. The instrumentation of the venue created poltergeist effects that appeared quite realistic. This device was necessary to create a performance that adult audience members could go along with but created a challenge with regard to younger audience members, some of which found the heightened dramatic atmosphere in the first rendition at BAC overwhelming. To ameliorate this, the York Theatre Royal rendition of the *Digital Ghost Hunt* was adapted in a lighter and more humorous tone.

As the younger audience members in York had not participated in a lengthy induction and not been able to arrive with ownership of the technology and narrative to the same extent as with the production for BAC there was heavier weighting towards adult guidance by parents. Their presence provided the support or licence to suspend disbelief that younger audience members had received by their teachers and the KIT Theatre facilitators acting as agents of MORPH in the BAC rendition. Parents were inevitably more naïve participants in comparison with the schoolteachers and facilitators of the first rendition, which became clear in handling and using the ghost hunting devices. Their operation presented more of a challenge in the York experience, as neither young nor adult

participants had prior exposure to the technology. The adults, who for the most part were parents of the young audience members, thus had to take the lead in their use more often than ideal, although they took care to step back where possible to allow their children a primary position. The result was a less spontaneous dynamic than observed in the first rendition, with more focus on the emergent parent-child relationship.

Third rendition: mixed family groups, 8-65

For the third rendition of the *Digital Ghost Hunt*, we wanted to broaden programming possibilities further and test the implementation of the experience in a museum setting for mixed family groups. The production was adapted for an audience of 8-13-year-olds accompanied by adults and used the code libraries and devices designed and developed for the first and second iterations, but the script was adapted for the new setting and incorporated artefacts held in the museum. The MORPH training was scripted as part of the live performance in shortened form. It was performed at London's Garden Museum as part of their Museum Lates programme. A total of 76 attendees for the five performances over 1 and 3 November 2019 roamed the interior and exterior of the museum, which is situated in a deconsecrated church. The architecture afforded longer lines of sight and access to one of the towers for the company and actors than previous venues. This allowed the *Digital Ghost Hunt* team to create a rendition with a more 'gothic' atmosphere and greater suspense. About half of the participants were adult, and with the enhanced dramatic atmosphere even they found that the experience created a sense of eerie suspense, evidenced by adult voices joining the children when the 'ghost' appeared in the tower above the grounds.

The venue – a 12th century decommissioned church – helped create a powerfully dramatic atmosphere, and the story was redeveloped with historical persons linked to the museum. Captain Bligh and Hester Tradescant – whose tombs are on display in the internal courtyard garden of the museum – were two of the three people suspected to be the ghosts in the Garden Museum rendition, and Elias Ashmole was the third. The ghost story was developed around these historical persons and integrated within the architecture of the venue. For the climax, the 'ghost hunters' and their parents climbed a 900-year-old spiral staircase up to the top clocktower, where there was no wired electricity

and the team had to use batteries to drive theatrical effects. One of the artefacts uncovered was a map, leading the participants to the location of the final piece of the puzzle. The finale took place in the inner courtyard where the tombs of the protagonists are situated. With the help of the map, a bag of seeds was found, with sunflower seeds to distribute for home planting to 'set the ghost free'. The three renditions were created around the same formula with regards to resolution of the narrative, but for the Garden Centre, the device of plant seeds to be the hidden treasure was particularly well-integrated in the situation and heritage of the venue.

Audience responses

The longer induction and familiarity with the technology afforded the school children who attended the first rendition of *Digital Ghost Hunt* at Battersea Art Centre a more immediate sense of ownership. Attendees were impressed with the integration of the performance and their operation of the 'ghost hunting devices', demonstrating their confidence: "It was amazing when all the detectors flashed at the same time when the ghost came in at the end"; "When we used the SEEK detectors to find a key/talking through the hole in the wall" and "I liked the way that when we were in the attic room, the piano and the lights were operating themselves". Some criticism of the robustness of the devices was collected, e.g. "The clips on the SEEK detectors kept falling off" and "The Ectoscope didn't seem to work in most areas", although it was noted that their failure was discussed within context of the integral storyworld.

Observations gathered from the participants after the live performance confirmed the integration of performance and technology, and the sense of ownership that we sought to facilitate with the classroom programme leading up to the live performance. In the same context that they discussed the ghost hunting devices, participants complimented 'traditional' dramatic devices, including: "How the ghost could disappear without us knowing how"; "When it suddenly switched to Michael being the villain, I felt shocked"; "I found it amazing when the ghost knew where we were and when we were talking about her"; "I liked how we were chasing Michael; it was like a movie"; "I liked how we found out that it was Michael's grandfather was the one who stole the necklace, and

blamed it on Molly Perkins" and "Every time we saw the ghost, she was communicating to us; when we saw her going up the stairs, she let us know that she was innocent".

The reduced induction for the rendition developed with Pilot Theatre in York changed the experience to be more like a traditional family show; an impression that was enhanced by the greater emphasis on comedy in the script. The on-site, rather than classroom induction of participants as MORPH Junior Agents, together with the added layer of complication in device use that drew parents/adult guardians into a more active role, positioned the young attendees in a more conventional theatre audience role.

At the Garden Museum, the production was adapted to the more dramatic venue and played at a higher pace. Although we had minimal preparation time (as the entire show was compressed to 45 minutes to suit the Museum Late format), this was perhaps the most dramatically successful of the three renditions. Participants reported that children had talked about the performance all the way home, and that although the experience had been fairly scary at times, it created a positive and bonding effect. Feedback gathered after the show suggested that groups of friends who participated made deeper bonds with each other through the experience, as it felt like they had met a genuine challenge together. This raises the issue of what is a 'good' level of tension. Between the three renditions, the Garden Museum one had the highest level of dramatic tension, and feedback suggests that this was well-received even by audiences as young as five (accompanied by their parent/guardian).

Conclusion

The *Digital Ghost Hunt* realised, and in some dimensions exceeded our aims and objectives. The classroom journey incorporated in the first rendition afforded a sense of ownership of the technology, and pupils responded with confident and well-informed feedback "It would be even better if we got to touch the ghost"; "It would be even better if there was more ectoplasm that we could touch" and "I would like it if the ghost was able to fly" and suggestions for a more complex plot; something the research and development team are hoping to build on in future iterations: "1) If there were four

ghosts, and each group was able to work with a different ghost. 2) Professor Bray could share some cooking tips and tricks".

By comparison, our young York audiences engaged less confidently with the technology, and the feedback instead focused on narrative and special effects. We took observations from York forward to the rendition at the Garden Museum and integrated the technology and narrative of the designed experience more closely with the heritage venue and the museum collection. The heightened drama of the space, carefully augmented, expanded the 'box' or frame of the performance to include the heritage building itself, revealing its architecture as a form of technology for experience (Westling, Hall and Krell, 2020).

We seek to develop this integrated perspective on technology, heritage and experience design in our next project, XR^3, an expanded mixed-reality story framework for heritage venues and organisations. The *Digital Ghost Hunt* addressed our central concern, allowed us to pilot the software, hardware and the dramatic experience, and successfully engaged our participants in digital making, collaborative problem-solving using technology, and practical heritage research. The three renditions afforded experimentation with different approaches to inviting audiences into technology-driven performance spaces in the capacity of agents, as suggested by this comment from a group of participants: "this was a totally unforgettable experience, and we will always be available if you ever need our help again".

Bibliography

Alston, A. (2016) Making mistakes in immersive theatre: Spectatorship and errant immersion. *Journal of Contemporary Drama in English*, 4(1), pp.61-73.

Biggin, R. (2017) *Immersive Theatre and Audience Experience*. Basingstoke: Palgrave Macmillan.

Castelvecchi, D. (2016) Can we open the black box of AI? *Nature News*, *538* (7623), p.20.

Digital Ghost Hunt (2019) The Digital Ghost Hunt. *Digitalghosthunt.com*. Available at: https://digitalghosthunt.com. [Accessed 30 September 2020]

Dixon, S. (2015) *Digital performance: a history of new media in theater, dance, performance art, and installation*. MIT press.

Hall, E. (2018) The Digital Ghost Hunt: A New Approach To Coding Education Through Immersive Theatre. *DH2018*, Mexico City, 26-29 June 2018.

Nicholson, S. (2018) Creating engaging escape rooms for the classroom. *Childhood Education*, *94*(1), pp. 44-49.

UKRI (2018) The Digital Ghost Hunt. *GTR.UKRI. org*. Available at: https://gtr.ukri.org/projects [Accessed 30 September 2020]

UKRI (2019) Digital Ghost Hunt – Impact and Engagement. *GTR.UKRI.org*. Available at: https://gtr.ukri.org/projects [Accessed 30 September 2020]

Westling, C.E.I. (2020) *Immersion and Participation in Punchdrunk's Theatrical Worlds*. London: Bloomsbury.

Westling, C.E.I., Hall, E. & Krell, M.A. (2020) Reimagining heritage buildings as technological spaces. *AMPS Special Issue*: Connections: Exploring heritage, architecture, cities, art, media.