Impact case study (REF3)

Institution: The University of Manchester	
Unit of Assessment: 33B (**Music**, Drama, Dance, Performing Arts, Film and Screen Studies)	
Title of case study: Sonic Adventures: Enhancing Cultural Experiences through Geolocative Audio and Interactive Composition	
Period when the underpinning research was undertaken: 2011–2019	
Details of staff conducting the underpinning research from the submitting unit:	

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Ricardo Climent	Professor of Interactive Music Composition	2006–present

Period when the claimed impact occurred: August 2013 to December 2020
Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

The chief innovation of Ricardo Climent's LocativeAudio project was to create a framework employing location-aware technology (combining GPS, mobile devices and digital mapping) to explore new ways of connecting people, culture and space through musical creativity. The result was a new, highly accessible form of interactive media composition that focused on augmenting the aural environment for participants in real-time cultural experiences such as sonic walks and historical tours. The research created impact in three ways: (i) it led to the development of commercial applications via spin-off social-entrepreneurship companies created by two of Climent's PhD students. This in turn made the research available to thousands of users worldwide, leading to impact on (ii) a global network of creative artists and members of the public, who have been introduced to new ways of connecting sound and space; and (iii) professionals in the culture and tourism industries who have commissioned new multimedia visitor experiences.

2. Underpinning research

The research was developed through five incremental collaborative projects, collectively termed LocativeAudio [1], designed and directed by Climent at the NOVARS Research Centre, University of Manchester (UoM) from 2011 to 2014. In related research, Climent adapted game-engine technologies for new forms of interactivity combining geolocative data with musical ensembles. LocativeAudio began as the first generation of smartphones made it possible to use the geolocative tools of GPS satellite navigation and digital mapping to attach pre-recorded sounds to physical locations, such that the sounds are triggered by users as they move. Climent's principal innovation was to build an ecosystem synthesising location-aware technology with the creativity of interactive media composition to produce sound-based artistic experiences in real locations in which the aural environment is augmented to provide the listener with a new socio-cultural understanding of a place. His contribution was thus both creative – pushing the boundaries of the locative-audio experience by framing a new form of soundwalk – and technical – creating the practical and technological means of achieving this artistic goal.

For the technological requirements of the project, Climent worked initially with an existing geolocative tool, noTours (notours.org), created by Enrique Tomás. He then contributed to the creation by two of his research students of apps specifically designed to apply this geolocative technology creatively: SonicMaps (Ignacio Pecino; A.i) and Echoes (Josh Kopeček; A.ii). Climent's research outcomes from the projects are principally creative, including live interactive events at which his original compositions applying LocativeAudio's research goals have been performed. These made two main innovative contributions to the field of interactive media composition:

(i) Developing interactive sonic experiences defined by location

Hồ – A Sonic Expedition to Vietnam (2009) [3] was Climent's first output using location-based tagging to retrieve audio material. Presented as a media installation in an art gallery, it comprised an interactive virtual sonic expedition using game-engine technology where the user triggers sounds as s/he navigates through virtual space. Climent created a search tool using metadata to retrieve sounds linked to each virtual location, producing research insights into the creative potential of location-based tagging in interactive composition. This led him to create LocativeAudio, whose first collaborative project, 'City as Museum/City as Instrument' (2011), applied the idea of location-specific sonic experiences to ambisonic field-recording trips across Manchester and to sonic laboratories. This culminated in compositional outputs and the first

geolocative sonic walks, including *Havana* [4]. This research provided new insights into how connecting location-aware technology with multimedia composition can produce new creative interactions between people, culture and space.

(ii) Using sonic art to create aurally augmented interactive experiences in real city locations

The first LocativeAudio project to use sonic art associated with users moving through specific spaces was 'City as Augmented Aurality' (2011), which included Climent's *Hu: A Sonic Puzzle in Chinatown* [5]. The project employed GPS software to incorporate sonic art into soundwalks across key locations in Manchester, furthering the research insights of [4] by augmenting the walker's experience with aural stimuli relating to the locations' historical, cultural and sociological contexts [5]. This notion was expanded in scale in 'City as Network and Hyperwalk' (2013), a collaboration between NOVARS, the Universidad Politécnica de Valencia and Gallería Valle Ortí. In this project simultaneous soundwalks took place in Malaga, Blacksburg, Gävle, Avignon, Linz, Grenoble, Volos, Hanoi, Tampere and Valencia, livestreamed to Valencia's Galleria Valle Ortí where visitors could create real-time combinations of sounds produced by soundwalkers around the networked cities. Climent's main research output was an interactive media installation entitled *[5]* [see 6, section 3], recreating in virtual space Val del Omar's Circuito Perifonico of Valencia (1939–45). The project's major innovation was the interaction between the live game and real participants walking the route in the city space. This was developed fully in 'City as Game/City as Concert Hall' (2012), comprising simultaneous events in Manchester and Blacksburg, Virginia, which used the newly developed SonicMaps software [A.i] to transmit via geotagging live information from sound-walkers to musicians in the concert hall, the performers' improvisations being led by these live data. This demonstrated how physical barriers between city and concert hall can be broken down through live interactions between audience–participants and performers [2].

3. References to the research

1. Locative Audio: http://locativeaudio.com/
2. Pecino, I. and **R. Climent**. 'SonicMaps: Connecting the Ritual of the Concert Hall with a Locative Audio Urban Experience', in *Proceedings of the International Computer Music Conference* (ICMC'13), Perth, Australia (2013). Technical paper. Available at: http://hdl.handle.net/2027/spo.bbp2372.2013.044
3. **Climent, R**. *Hồ: A Sonic Expedition to Vietnam* (2009): interactive multimedia immersive environment performative work using Navigation System Through Sound, a sonic orientation tool for live performance or sound installation developed by Climent. Premiere: Transitio MX: Festival Internacional de Artes Electrónica y Video Transitio_MX, Fonoteca Nacional, Mexico City, 2009. Associated Paper: '*Hồ*: A Sonic Expedition to Vietnam', *Music Proceedings of the AudioMostly Conference*, Corfu, 2012 (available from HEI). Also documented at: http://wunderbarlaboratorium.blogspot.com/ and http://spatialisation.com/
4. **Climent, R**. *Havana* (2011): fixed-media soundwalk special mix using field recordings from La Habana from Climent's Archaeology of Sound project of 2001. Soundwalk available at: https://recursivearts.com/sonicmaps/player/index.html?p=147
5. **Climent, R**. *Hu: A Sonic Puzzle in Chinatown* (2011): interactive city soundwalk for GPS audioguide. Part of the walk is recreated at: https://vimeo.com/39753367
6. **Climent, R**. *[5]* (2013): for interactive game-audio installation with synchronised Locative-Audio walkers as part of international project 'City as Network and Hyperwalk'. Premiere: Valle Ortí Gallery, Valencia. A collaboration with the Val del Omar Archive, National Art Centre Museum, Reina Sofía, Llobet Family Archive, and Circuito Perifónico de Valencia. A reconstruction of what participants experienced in the Valle Ortí Gallery is available at: https://vimeo.com/77852198

Evidence of Quality: After its premiere, *Hồ: A Sonic Expedition to Vietnam* [3] was performed at Aberdeen Sounding Festival (2010); Push Festival, Gävle, Sweden (2011); BBC Academy Fusion Summit, Media City UK, Salford (2012); Locativeaudio.org 2012 festival; Audiomostly Conference, Corfu (2012); Simbiosis Festival, Pachuca, Mexico (2015); and Festival Mostra Sonora de Sueca, Valencia, Spain (2016). *Hu: A Sonic Puzzle in Chinatown* [5] formed part of the LocativeAudio project 'City as Augmented Aurality' (2011), sponsored by UoM's cities@manchester initiative (now part of Manchester Urban Institute). The interactive media installation named *[5]* [see 6 above] was part of a collaboration between LocativeAudio (Climent) and the Intermedia Lab,

Universidad Politécnica, Valencia (Prof. Miguel Molina), funded within the project 'Recuperación de obras pioneras del Arte Sonoro de la Vanguardia Histórica Española' by the Spanish Ministry of Science and Innovation (Grant no. HAR2008-04687/ARTE; 2008–13; EUR59,169).

4. Details of the impact

Location-aware technology was originally developed to deliver information (e.g. to assist navigation), rather than for artistic and creative purposes. Alongside his role in the creation of the creatively orientated apps [A.i] and [A.ii], professionals in the field today identify Climent's innovation as *"the idea of presenting geolocative technologies from a composer's viewpoint"*, through which he *"transcend[ed] the merely functional use of a particular technology by employing it within a new musical discipline"* [B; see also C]. This made Climent *"a pioneer in using location-aware technologies for music composition"*, enabling him to *"build bridges between academics and professionals working in the field"* [D]. Locative-media professional Geert Vermeire states that, in *"bringing together creators and experts [using] the first platform ever … made like that… [h]e was far ahead of his time"*; this led to people *"talking about … the influence of Manchester…. Now it is used in every festival, … but then it was all pioneering work…. What happened there inspired a lot of others around the world…. [H]e was doing ten years ago already the work that we do now"* [C]. Vermeire also stresses the pioneering creative community formed by Climent through LocativeAudio, noting that *"in the UK [it was] the only platform that [invited] various players to meet, to interact"* [C].

The beneficiaries of these outcomes comprise (i) professionals who have developed entrepreneurial applications for the research; (ii) members of the public introduced to this new form of sonic engagement via soundwalks and aurally enhanced cultural experiences; creative artists and members of the public who have applied it in diverse ways, and have formed a global creative community around it; and (iii) professionals in the tourism and cultural industries across five continents, who use the interfaces to enhance their visitors' experiences.

The key initial dissemination of Climent's research occurred at the international public Locative-Audio events listed in §2 above. Dissemination to the public and industry has subsequently been facilitated by events including My City, My Sounds (Karslruhe, 2014); the Digital Industry Day (Salford, 2015); and Climent's involvement in events within the EU-funded EASTN-DC network [A.v] (e.g. Entrepreneur Day, Manchester, 2018). Videos recording soundwalk material from Locative-Audio via acusmatica.org have enabled the research to gain global reach: the 2012 Manchester soundwalks were made freely available at vimeo.com/48068251 and had logged 1,060 views and 9,481 impressions to 31 December 2020, from 87 countries. 77,326 requests (51,771 nonSSL and 25,555 SSL) from locativeaudio.com (acusmatica.org/locativeaudio) were logged between January 2017 and 31 December 2020, comprising 8.05% of the site's traffic [E].

(i) Commercial and entrepreneurial applications of the research

Climent's LocativeAudio research resulted in the creation of two spin-off social-entrepreneurship companies by two of his former PhD students, which applied the research both technically and creatively in a commercial context, bringing it to a wide range of non-academic users. The research therefore had a profound impact both on the careers of the company directors and on expansive networks of creative artists, professionals and the public, who have benefited from the creative and commercial opportunities that these companies have brought to a worldwide community [F]. SonicMaps [A.i], now part of Recursive Arts [A.iii], was developed by Ignacio Pecino with Climent's assistance and was first launched as an open-source app through which users could create GPS-guided sonic walks. Climent continued to work on the app with Pecino via the EASTN-DC research network [A.v], with Pecino as visiting artist, leading to the creation in 2019 of Sonic-Maps 2.0 as a subscription service. Echoes [A.ii] was created by Josh Kopeček in 2013 as a direct result of the second LocativeAudio project. It provides freemium and subscription Creator and Explorer apps for creating GPS-led sonic walks, and additionally offers a service for creating bespoke experience packages that are purchased by arts, heritage and tourism organisations. Echoes has continued to expand with later research supported by Climent – for example, by developing ambisonics technology within the EASTN-DC project. Both Pecino and Kopeček credit the research with leading them directly to create these apps, as is also acknowledged by Adams and Vermeire [C]. Kopeček states: *"[Echoes] came out of my*

participation in the second of Ricardo's Locative-Audio research projects … so for me it began as an interactive composition project that led us to take the idea and make a company from it" [F]. Pecino states *"[M]uch of the current work I do for Recursive Arts, [was] developed directly from the approaches I learned under Ricardo's supervision, so it is all inspired by his research and methods"* [D]. Pecino founded the company while studying for his PhD under Climent's supervision *"as a means of developing practical applications of the locative audio research then underway at NOVARS"*; he now works for it full time [D]. [text removed for publication]

(ii) User-created sonic walks by creative artists and members of the public
SonicMaps and Echoes have provided thousands of users worldwide – primarily from North America, Europe and Australia – with the tools to create sonic walks and share them with other site-users and soundwalkers. In 2019 Echoes had approximately 41,990 sonic tours initiated by site users, with 23,220 hits to the website from 8,400 unique users; about 43.3% of site visitors used the app regularly. In 2020 a further 37,310 new tours were initiated by 10,107 users, with 51.4% as regular visitors. By December 2020 6,116 walks had been created on Echoes, 571 of which are documented at explore.echoes.xyz [E]. SonicMaps vsn 1.0 had 571 registered users by autumn 2019, who had created in total 743 projects; there had been 66,150 page views with 18,525 recurrent users; since January 2020, SonicMaps vsn 2.0 (subscription) has added 14,958 further page views with 168 projects created by 146 account holders, and 9,274 visits to the 55 publicly viewable projects [E]. Both apps have become part of a broader international creative community demonstrated by Sound Walks September, a global, month-long celebration of geo-located immersive listening and soundwalks co-ordinated by Geert Vermeire and co-facilitated by Echoes. In 2019 87 events took place in Europe, North and South America, Africa, Asia and Australia, while during the COVID-19 pandemic in 2020 50 live or online events took place; by November 2020 310 walking pieces were available (https://walklistencreate.org/walkingpiece/) [G.i; see also C].

Examples of projects created using the SonicMaps app and freemium version of Echoes include:
- 'Soundmap: People and Place' (2020): six sonic walks created as a community arts project for Live Life Aberdeenshire to encourage walking in Aberdeenshire communities [G.ii; H].
- 'Mirage' (2020): a nocturnal soundwalk by Tiffany through the streets of her community in Hong Kong, reflecting on the impact of the unrest in the city in summer 2020 [G.iii].
- 'Reflections' (2020), a walking experience by Ashton Phillips incorporating poetry, sound art and local people's reflections on the COVID-19 pandemic in Glendale, California [G.iv].
- 'Farm/Art DTour (2020): a 62-mile SonoTour created by Hugh Livingston for Fermentation Fest farming and culture festival, Wisconsin [G.v; H].
- 'Géosonic Mix, Normandie Impressioniste' (2015) [G.vi; H], an immersive soundwalk including 80 pieces and over 3 hours of sound created by composer Julien Poidevin as a sonic portrait of Caen, Normandy, that is randomised by the pathways chosen by participants.

SonicMaps has also been used for educational purposes as a tool for interactive composition, including in a four-week workshop hosted in 2016 by the University of Huddersfield for 25 A-level Music Technology students from Greenhead College, Huddersfield, where students used the app to compose soundscapes for five different locations in the town centre [G.vii]. Facilitator Jung In Jung chose the app for the project because it *"seemed the best option in terms of accessibility and affordability [and] allowed the users to interact with the soundscapes differently – the young composers had the opportunity to learn about a new compositional approach, and the audience had the opportunity to listen [to] their usual locational sound with different perspectives"* [H].

These examples reflect the research's wide-reaching impact achieved by enhancing creative experiences for creative artists and members of the public using geolocative technology.

(iii) Professional creation of audio guides, apps and installations for the culture and tourism industries and creative artists
Echoes uses the research's innovations in merging geolocative technology with audio creativity to produce bespoke professional products for the culture and tourism industries. Of approximately 30 commissions to date, including from the UK, US, Australia, Denmark and South Korea, examples with impacts on health and wellbeing include:

- Audio guides for museums, galleries, and National and Royal Parks, such as the 'Music for Trees' app for Regents Park with the Royal Academy of Music [G.viii]. Matt Steinman, Royal Parks arboriculturalist, testifies that Echoes *"produced a beautifully designed and effectively intuitive app, which delivers the soundscape installation as well as further information about tree species and the music.... This effective demonstration of Echoes' geolocation technology has proven its ability to deliver information for The Royal Parks.... [T]he result is an app which has gained national publicity for the organisation and very positive feedback from users"* [H].
- Historical and geographical tours, including bespoke audio tours for windswept locations within the Arctic Circle with little or no connectivity, created for Danish company Sansaga [G.ix; H] and a geolocative audio guide to Lewes Castle, Sussex, that is fully accessible for blind and partially sighted visitors [G.x]. For the latter, Kopeček worked with sound artist Joseph Young using *"multiple narrative voices and binaural field recordings"* to *"push the boundary of the form of the audio guide".* The product was described by audio and accessibility consultant Gavin Griffiths as *"a new age for V[isually] I[mpaired] visitors"* [H].
- City guides, such as 'A Short Tour of Chichester' [G.xi] and university campus tours such as the University of Birmingham Soundwalker app [G.xii].
- Creative projects, including interactive art installations and sound-art experiences, locative digital storytelling, and art trails, including:
  - An indoor sound installation, 'Wade in the Water' (2017), commissioned by artist John Duck-worth (Charleston, USA), where visitors 'walk through' a gospel choir's performance [G.xiii].
  - The Aurality app, created by Echoes in 2017 for acoustic ecologist Leah Barclay, whose externally funded project created 100 augmented-reality biosphere soundscapes across Queensland, Australia [G.xiv].
  - 'Celadonaphonic', a series of Arts-Council supported works for the Made in Korea project made by three Korean and three British sound artists using sonic art to explore ceramics practices within both cultures, performed in Stoke-on-Trent and Seoul in 2017 [G.xv].
  - 'Copenhagen Echoes' [G.xvi], a 'sonic remix' of the centre of Copenhagen, created by Hans Sydow, who testifies that *"Working with Echoes has given me a new tool to unfold sound, stories and music as part of a geolocative experience, addressed to a new audience, as art in public spaces"* [H].

These examples demonstrate the research's impact on enhancing cultural experiences in a wide range of international settings and environments, with the ability of the apps to circumvent technical challenges and maximise accessibility, extending the impact of Climent's research to the widest possible network of beneficiaries.

5. Sources to corroborate the impact

A. **Project websites:** i) Sonic Maps; ii) Echoes; iii) Recursive Arts; iv) Climent's projects on Acusmatica; v) EASTN-DC network.
B. Letter from Director of noTours (30/9/2020).
C. Extracts from interviews with locative-media professionals.
D. Letter from Director of Recursive Arts (including SonicMaps) (3/9/2020).
E. Collated analytics of web usage and reach.
F. Letter from Director of Echoes (27/10/2020).
G. **Soundwalks, apps and installations:** i) Sound Walk September (2019–20) and catalogue of walking pieces; ii) 'Soundmap: People and Place' (2020) (including links to all 6 soundwalks, e.g. Sandhaven soundwalk); iii) 'Mirage' (2020); iv) 'Reflections' and at Glendale Reflections (2020); v) 'Farm/Art DTour' and on SonicMaps (2020); vi) 'Géosonic Mix, Normandie Impressioniste' (2015); vii) Workshop hosted by the University of Huddersfield (2016), also documented on YouTube; viii) The Music for Trees app, also documented on the Echoes website; ix) Sansaga, also documented on the Echoes website; x) Geolocative audio guide to Lewes Castle, also documented by Joseph Young; xi) A Short Tour of Chichester; xii) The University of Birmingham Soundwalker app; xiii) Wade in the Water; xiv) The Aurality app; xv) Celadonaphonic; xvi) Copenhagen Echoes.
H. Collated interview comments and published testimonials from Echoes and SonicMaps users.