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# Design for Inclusivity

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The Power Of The Autistic Lens: Visualising Activity In Shared Architectural Space

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# The Power of an Autistic Lens: Visualising Activity in Shared Public Space

Stuart Neilson

#### Abstract

The explicit zoning of space into activities, and an understanding shared by all people who share the same space, contribute to social imagination and reduce autistic anxiety focused on unknown and unimaginable future happenings in the immediate vicinity. Knowing where to place oneself with respect to action is calming. Video processing provides a method of visualising motion through a designed space and to find ways to explicitly demarcate the spatial boundary (the locus, in mathematical terms) of an activity. Desire lines and their intersections can be exposed with video analysis to delineate regions within an activity and between activities. Regions of differing motion intensity may be perceived as anxiety-provoking or calming by autistic people. Images of completed actions or activities, the loci, are in themselves an interesting and often aesthetic outcome with value as inputs to the design process. Activity loci identify both potential conflict between different activities which share a space, and the potential to rearrange space and activity to promote peaceful co-existence of potentially

competing activities—and zones for self-calming inactivity—within the same shared space.

#### Keywords

Inclusivity • Neurodiversity • Autistic • Video analysis

# 25.1 Introduction

As an autistic person I constantly find public places "terribly chaotic and unpredictable" (Kinnaer et al. 2016) in common with other autistic people. The anthropologist Catherine Mary Bateson described how "Arriving in a new place, you start from an acknowledgment of strangeness, a disciplined use of discomfort and surprise" (Bateson 1994), a strangeness that dissipates with familiarity. My work is an attempt to share my own experiences and to "cultivate strangeness" to familiar places, especially amongst people who design or control built architecture. My images, if successful, depict the discomfort, surprise and necessity of careful attentiveness (Boys 2014) that neurodivergent people experience in spaces designed without reference to the neurodiverse population.

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Sensory and social overload, the hidden logic of wayfinding, anxiety-provoking transitions and insecurity reported by autistic people (Kinnaer et al. 2016) obscure the affordances (Peri Bader 2015) of public space. I experience a perpetual state of hypervigilance to the strangeness of public spaces. Architecture can be less or more disabling, by design.

Photographic images result from a chemical reaction in proportion to light captured while the shutter is open. In many senses photographs are a lie, often contradicting our individual memories of the same scene. As photographer John Berger said, "A photograph preserves a moment of time and prevents it being effaced by the suppression of further moments. In this respect photographs might be compared to images stored in the memory. Yet there is a fundamental difference: whereas remembered images are the residue of continuous experience, a photograph isolates the appearances of a disconnected instant" (Berger and Mohr 2016).

Digital cameras simulate chemical photography, but could equally capture motion intensity, direction of movement, edges, or other changing visual characteristics. I process video sequences to convey the confrontation between autistic people and our built environment (Baumers and Heylighen 2010), visualizing sensory exposure, active spaces, potential escape zones and desire lines. My images integrate visual change into "the residue of continuous experience", and not "a disconnected instant" of light exposure.

There is an overlap between my visual expressions of autistic experience and the seven criteria of the ASPECTSS<sup>™</sup> design framework (Mostafa 2014): Acoustics, Spatial Sequencing, Escape space, Compartmentalization, Transitions, Sensory zoning and Safety. I highlight connections with the ASPECTSS<sup>™</sup> criteria in **Bold** in Sect. 25.3.

#### 25.2 Methods

For this project I was kindly granted access to Dublin City University (DCU) and the Crawford Art Gallery, Cork City. DCU is the leading thirdlevel institution in Ireland designing inclusive learning environments with autistic students in mind (Mostafa 2021) and is a predominantly pedestrian campus. The Crawford Gallery is a national cultural institution dedicated to the public display of historic and contemporary works, located in a busy city centre. The art collection dates to 1820, housed in a building dating to 1724 (Crawford Art Gallery 2022).

My source material was video captured with a hand-held mobile phone and small video cameras on fixed mounts, at frame rates from 2 to 60 frames per second. Video was processed (Fig. 25.1) using OpenCV (Bradski 2000) using the Python programming language, available as free and open source software (OpenCV 2022).

## 25.3 Results

#### 25.3.1 Capturing Whole Events in Motion Composites

A motion composite accumulates all the elements of change over time, creating a residual image of completed actions and motion paths (Fig. 25.2). The activity boundaries are made visible, mapping **Compartmentalisation** of space.

## 25.3.2 Identifying Activity Loci and Desire Lines with Motion Intensity Maps

A motion intensity map displays accumulated changes in brightness or colour, visual effects



**Fig. 25.1** A visual summary of the video capture and processing, leading to a variety of outputs incorporating the dimension of time into static images of the changing

that draw attention towards the margins and away from focus on tasks or social interactions. Pedestrian desire lines emerge, delineating potential **Escape spaces**, conflict zones where paths intersect, and regions of **Safety** (Figs. 25.3 and 25.4). Desire lines are mutable, changing over the course of the day to suit the needs, and reforming again according to collective memory. It is hard to swim against or change a prevailing desire line.

Many autistic people experience small, repetitive changes such as light flicker as sensory

visual activity within the environment. Examples of each follow in the Results section below

overload. This is in contrast to the effect of filtering out small changes in Fig. 25.4b with an unfiltered intensity map containing artificial light flicker in Fig. 25.4d.

#### 25.3.3 The Feel of a Place in Sensory Composites

Video from a moving camera can simulate intentional camera movement (ICM) photographs, or retain details from equally spaced or



**Fig. 25.2** The entrance to the pedestrian Mall at DCU (a). The visual background averaged from many frames, like a long photographic exposure (b). Movement or

maximum-change frames. The collected frames are composited (Figs. 25.5, 25.6, 25.7 and 25.8) to overlay all the details within a space, without strict reference to relative location, evoking the embodied mood or ambience (Peri Bader 2015) or "*residue of continuous experience*" (Berger and Mohr 2016). The images often evoke a strong recall of other senses I experienced in the same moment—the **Acoustics**, the echoes from hard surfaces, the calls of seabirds, the rain falling into my collar, or the smell of food frying in the cafeteria—and whether the marginal awareness conveyed safety, comfort and welcome, or threat, danger and rejection (Liebergesell et al. visual change isolated by subtracting the background from an individual frame (c). Crowd flow in a motion composite of equally spaced frames (d)

2021). These sensory composites sometimes unveil **Sensory zoning** and make explicit a strangeness which I felt, yet was unable to identify in the moment.

## 25.3.4 Recording Passing Events in Slit-Scan Photographs

Social attention to the bodily presence of others is a substantial part of the dynamic structure of the experience of public spaces (Bader and Peri Bader 2016), but may provoke anxiety, be unreadable to, or absent entirely from autistic Fig. 25.3 A motion composite exposing the network of paths entering the DCU pedestrian campus (a). The accumulated visual change over 16 min (b) identifies pedestrian desire lines, from the main entrance to the left, the car park exit immediately below the camera and pedestrian footpath entrance from the street to the right. Desire lines converge entering the Mall beside the Helix Theatre at the centre of the visual field, and diverge quiet rear entrances to faculty buildings on the left. The intensity of visual change is represented by a heatmap colour-scale from blue (inactive) to red (busy)



perception. I often feel that crowds are rushing in response to an alarm I cannot perceive. A slitscan image has the potential to count events, visualise sequences (Fig. 25.9) or portray a timetable of activity intensity and sensory stimuli (Fig. 25.10). Most people are not consciously aware or appreciative (Vermeersch 2013) of marginal effects that can transform the atmosphere (Peri Bader 2015) and utility of a place for autistic people.

#### 25.3.5 The Sense of Journey in Panoramic Slit-Scans

A slit-scan captured from a moving camera, while walking or in a vehicle, captures the sense of journey. The sensory impact of places distorts the linearity of time, distance and direction in our residual memories. The imperfections of real life distinguish a visual map of a journey from a geometrically accurate elevation of the same structures (Fig. 25.11).



**Fig. 25.4** The exhibition "*Meat and Potatoes*" at the Crawford Gallery with the sculpture "*Longevity/Apopostome*" by the artist Maria McKinney (2015, semen straws, glue, cable ties, 3D printed objects (PLA—polylactic acid), powder coated steel frame,  $126 \times 120 \times 40$  cm) in the centre of the frame (**a**), a heatmap displaying the paths by which visitors approach

and view the works (**b**) and a motion composite of the paths as visitors connect the "*Sire Series*" photographic prints on the two walls with the related sculptures in the centre (**c**). Of particular note is the impact artificial light flicker (**d**). With no threshold to filter out continuous, small changes (**d**), the heatmap emphasizes spotlights and their reflections



**Fig. 25.5** A "*less busy path*" identified by autistic students as a calming route between the high intensity movement of the Mall and rear access via a green public park. The highlight and lowlight details from a hand-held

video walking the entire path are composited into a residual image portraying a memory of the ambience and the sensory experiences



Fig. 25.6 The main lobby beyond the forbidding entrance to the crawford gallery, despite being the confluence of five sets of flow—the main staircase,

offices, studio space, café and exit-provides calm refuges, if the corners are not yet occupied



**Fig. 25.7** The "*Botanica*" exhibition in the long room of the Crawford Gallery contains precise, detailed images. A hard parquet floor, glass cabinets and high-contrast

lighting contribute to the reflective, acoustic sensory experience of visiting this space



**Fig. 25.8** The main gallery of the Crawford Gallery is divided by refuge walls into several calm spaces, with gentle exterior light from a ground floor window in a shaded street. The light accentuates the colours and

Fixed and moving slit-scans have the potential to expose **Spatial Sequences** and **Transitions**, whether designed, or the consequence of, sensory change.

#### 25.4 Discussion

These images reflect one autistic person's impressions of two contrasting locations. DCU is an autism friendly campus with quiet zones and

textures in "*Sire Series*" by Maria McKinney and "*How to Butterfly a Leg of Lamb*" by Mary A Kelly and Abigail O'Brien (1999, Photographic, video and sculptural installation)

low arousal entry transitions, connected by a network of paths enhanced by an EscapeScape of less busy paths. The Crawford Art Gallery is a safe refuge in a busy city centre, harboured within nested transitions through a forbidding exterior, security and heavy gallery doors. My images help me make visible the conflicting sensory and emotional demands of, and locate myself effectively within, these shared public spaces.



**Fig. 25.9** A slit-scan photograph of walkers and food delivery vehicles between the Crawford Gallery and a café opposite  $(\mathbf{a})$ . The traffic through at the entrance to the

Mall in DCU is countable, amounting to 55 pedestrians and one vehicle in 2 min



**Fig. 25.10** A slit-scan photograph of the movement outside the Crawford Art Gallery over an 8 h day reveals a quiet morning, mid-morning delivery vehicles, a busy

lunchtime, and evening rush. The movement of sunlight over a blue café façade suggests the dynamic sensory ambience **Fig. 25.11** A slit-scan journey by bicycle converts the 360° façade of the Crawford Art Gallery and Opera House into a linear journey punctuated by landmarks and apertures, with an embodied sense of the bicycle's balance on the sweeping curves at the four corners of the block



#### 25.5 Conclusion

"Cultivating strangeness" is a vital stage in any design process. Inclusive design can be promoted by becoming estranged from yourself and your own designs, sufficiently to see your creations from the perspectives of their diverse users. Artistic visualisations and other experiential displays are one entry to cultivating strangeness.

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