Robot Opera: A Gesamtkunstwerk for the 21st Century

Wade Marynowsky(✉), Julian Knowles(✉), and Andrew Frost(✉)

Macquarie University, Sydney, Australia
{wade.marynowsky,julian.knowles,andrew.frost}@mq.edu.au

Robot Opera proposes an avant-garde spectacle of performative media that places robots centre stage as signifiers of high culture within a 21st century total art work of the future. This chapter addresses how framing robotic performance as a *Gesamtkunstwerk* (and its historical ambitions) contributes to the canon of Cultural Robotics. The notion of robotic performance agency is detailed through the history and theories surrounding representations of the robot in popular culture, representations of robots as performance agents and through the dramaturgical concepts explored in Marynowsky's previous robotic art works.

Artistic [wo]man can only fully content [her] himself by uniting every branch of Art into the common Artwork: in every segregation of his [her] artistic faculties [s]he is unfree, not fully that which [s]he has power to be; whereas in the common Artwork [s]he is free, and fully that which [s]he has power to be [1].

The term 'Gesamtkunstwerk' was coined in 1927 by German philosopher Karl Friedrich Eusebius Trahndorff to describe the concept of the 'total art work' - a work which synthesises all art forms into a single unified multidisciplinary work [2]. The term is most closely associated with the works of Richard Wagner (1813–1883), who sought to draw on the concept to guide his experiments in the opera form. In his text, 'The Artwork of the Future' (1849), Wagner calls for a synthesis of all artforms to produce the total art work of the future by pursuing musical drama (opera) as an integrating structure [1]. The concept of the total art work, drawing on multiple disciplinary practices, histories and conceptual reference points, is one which aligns very closely with the history of media art. One could say the Gesamtkunstwerk has found its natural home within the realms of contemporary media art. As a consequence, one can draw direct parallels between the Wagnerian approach to opera and the emerging conditions of mediatized and robotic performance agency and pose the question as to whether robotic opera may be seen as the logical playing out of the historical ambitions for the Gesamtkunstwerk within the opera tradition.

This chapter explores this proposition through the work Robot Opera (2015), a robotic opera for eight semi-autonomous robot performers. The work has been realised by Wade Marynowsky (robotic artist) in collaboration with Julian Knowles (music/sound) and Branch Nebula, Mirabelle Wouters and Lee Wilson (lighting, dramaturgy). Informed by the underlying fields of creative robotics, mediatized performance, music, and interactive media art, the project merges artist driven algorithmic/choreographic concepts with audience driven agency within a large scale performance interaction space 42 × 25 m. The project brings together core areas of investigation within these

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disciplines by establishing a performative context to explore the concept of robotic performance agency.

In order to understand how robots might operate as performers within an operatic performance context it is necessary to understand the histories and theories of robots through their representations in popular culture as well as their representations as performance agents.

1 Representations of Robots in Popular Culture

The origins of the robot in Western popular culture can be traced to the early 19th century. Stableford and Langford cite early clockwork dummies and other mechanised puppets as key influences for the mechanical beings that appear in E.T.A Hoffmann's stories *Automata* (1814) [3] and *The Sandman* (1817) [4], characters such as the 'Talking Turk' and 'Olympia' that "present a […] verisimilitudinous image, and play a sinister role, their wondrous artifice being seen as something blasphemous and diabolically inspired" [5]. The inherently ambiguous nature of the literary and, later, the cinematic robot has proven to be as durable as the figure of the robot itself, a mixture of technological wonder and uncanny dread, an often ill-defined amalgam of the mechanical being (the robot), artificial intelligence (the computer), the human-machine hybrid (the cyborg) or human simulacra (the android).

The nature of these robots and robot-like beings depend on the requirements of the stories in which they appear. Robots such as 'Robby' in Fred M. Wilcox's *Forbidden Planet* (1956) [6] or his Soviet counterpart 'John' in Pavel Klushantsev's *Planeta Bur* (1962) [7] dutifully follow Isaac Asimov's *Three Laws of Robotics* (1941) [8] sacrificing themselves to save humans. This kind of neutral 'goodness' is contrasted by robots such as the android Gunslinger in Michael Crichton's *Westworld* (1973) [9] or the genocidal Cylons in *Battlestar Galactica* [10], just two examples of a widely held conception of the robot as inhuman machine where the first law of robotics is blatantly broken: "a robot may not injure a human being or, through inaction, allow a human being to come to harm" [11].

So where does this ambivalent-neither friend nor foe-view of the robot derive? Robert M. Geraci traces the historical origins of robots beyond the early decades of the 19th century to the ancient Greek Myths of "Pygmalion and Daedalus to the Jewish Golem and the homunculi of Renaissance alchemy" [12] For Geraci, "The Western goal of building a functional humanoid also received, no doubt, some of its impetus from religion" [12]. From homunculi to singularity theories (Neuman, Kurzweil) the creation of robots and artificial intelligence (AI) may be considered an act of the divine, but at the same time, a mortal sin from a theological perspective. Once the creation of a humanoid by humans is achieved, then the end of the world is nigh. Western audiences have been easily swayed by the fears of technology found in Karel Capek's *R.U.R, Rossum's Universal Robots* (1921) the origin of the modern robot story and the source of the word 'robot' itself "…derived from the Czech *robota* (statute labour)" [5]. As performance theorist Steve Dixon states, Capek's play "concerns the

supplanting of humans by robots and has been discussed as a warning against Frankensteinian scientific hubris" [13].

The legacy of the 'Golden Age' of science fiction magazine publishing - roughly from the early 1930s to the mid 1960s - and its overlap into cinematic science fiction from the early 1950s onwards - produced a vast cultural trove of images of the robot that have proven remarkably durable. The 'mechanical man' image of the robot was in part established by artists such as Frank R. Paul, Robert Fuqua, Ed Emshwiller and Virgil Finlay producing illustrations for magazines such as *Astounding*, *Amazing* and the *Magazine of Fantasy and Science Fictio*n that provided the basis for the design of cinematic robots such as the aforementioned 'Robby' and 'John' or the silver and sleek 'Gort' seen in Robert Wise's *The Day The Earth Stood Still* (1951) [14]. The non-humanoid robot is, by comparison, a rare sight in cinematic visions of mechanical intelligence, either human-made or alien: the alien machine of *Kronos* [15] is a gigantic black cube with cylindrical legs that rampages around the Earth in search of energy, a strange anticipation of minimalist sculpture of the 1960s and the alien artifact in Stanley Kubrick's *2001: A Space Odyssey* (1968) [16], yet it is an outlier in conceptions of the 'look' of the robot in science fiction cinema.

More recent science fiction films such as *I, Robot* [17] - an adaptation of Asimov's *Robot* stories - present the robot as artificially intelligent machine with a speculative design based on the first generation frosted-plastic iMac, and an equally familiar homicidal mission thanks to some sinister covert reprograming. If Proyas's film posits the robot as a logical extension of contemporary consumer electronics then Alex Garland's *Ex Machina* (2015) [18] is an example of the popular conception of a robot that is indistinguishable from a human, if only when judged by outward appearances. Attempts to create robots in real life have often met with the same problems that filmmakers have encountered attempting to exactly simulate humans onscreen by means of computer animation - the 'uncanny valley' [19] (discussed in The Uncanny below).

Representations of Robots as Performance Agents. Jean Tinguely's 'Painting machines or Metamatic sculptures' (1959) are autonomous machines that paint pictures. The agency displayed in these works parodies the human thought processes needed to produce an abstract expressionist painting. Tinguely's work suggests that once the original concept is conceived by a human, then a machine can take over in the process of fabrication - but at what stage can a machine be perceived to produce original thought? Or at least to be able to *perform* convincing agency? This section explores the notion of robotic performance agency through the disciplines of the visual arts, music and theatre. The robotic agency, aesthetic principles and the context in which the robot is presented can help us understand the liminality of the performative robot, where and when it becomes an acceptable representation and or generator of 'living' culture.

The cybernetic sculptures of Edward Ihnatowicz such as his *Sound Activated Mobile* (SAM) (1968) and *The Senster* (1970) can be understood as distant robot relatives, precursors to contemporary robotic artworks, for example the works of Bill Vorn and Louis Phillipe Demers. *The Senster* was a large, steel, two legged zoomorphic creature that had a moving arm with multiple degrees of freedom. The arm's movements reacted to people's voices (via microphones) and to their movements (via radar), "the rest of the

structure would follow them in stages if the sound persisted. Sudden movements or loud noises would make it shy away" [20]. One of the first kinetic sculptures to be computer controlled *The Senster* was commissioned by electronics company Phillips and exhibited in The Evoluon, a remarkable flying saucer shaped building in Eindhoven, The Netherlands. *The Senster* has informed the main directions of robotic art, through the way it responded to its audience, with its animal-like behaviour and machine aesthetic.

Ihnatowicz's legacy and machine aesthetic can be seen in the works of Vorn and Demers, for example Vorn's *Hysterical machine*s (2006) that can be read as zoomorphic mechanical spiders that hang from the ceiling. The machines have a spherical body and eight moving arms made from aluminium tubing and electronics. They have a "sensing system, a motor control system and a control system that functions as an autonomous nervous system (entirely reactive)… the perceived emergent behaviours of these machines engender a multiplicity of interpretations based on a single dynamic pattern of events" [21]. The robotic performance agency in both of these works (the natural fluidity of *The Senster's* arm movement and twitching arms in Vorn's *Hysterical machine*s) generates a similar response, a temporary zone for reciprocity between the artificial and the human, known as the field of Human-Robot Interaction (HRI). Put simply, robots may react to human presence and humans project their internal desires onto the simulacra. Through the use of stark lighting and an eerie soundtrack, Vorn dramaturgically sets the scene for the audience, in order to highlight our desire to anthropomorphize his articulated metal structures, his aim being to induce empathy for his robotic creations.

Similarly, prominent electronica musician Tom Jenkinson (aka Squarepusher) felt empathy for the musical androids he collaborated with, Z-machines: "the robots [are] sad because they are just treated by the public as entertainment machines… their other qualities are neglected…this sadness comes out in the music they play…strangely [this] becomes one of the reasons why the public likes them, because they seem to be able to evoke strong emotions in their audience" [22] Z-machines consists of "March, a 78-fingered guitarist; Ashura, a drummer with 22 arms; and Cosmo, a keyboardist who triggers notes with lasers" [22]. The performance agency of the Z-machines can be understood as extending music beyond that which is physically possible for human players. By creating super-human compositions that are played faultlessly and easily reproduced evokes strong emotions in humans, as we feel threatened by being replaced by machines. In this example, it may be understood that the Z-machines androids are creators of *culture* as they play as humans do in the social formation of a musical ensemble.

In contrast to the slick techno-fetishtic finish of the Japanese Z-machines is the steam-punk aesthetic of the Berlin based Compressorhead. The android music ensemble features three band members built to human scale: 'Fingers', the guitarist; 'Stickboy', the drummer; 'Bones', the bassist and 'Junior', the hi-hat humper [23]. The group perform cover versions of well known repertoire from the heavy metal canon, such as Motorhead's *The Ace of Spades* and Joan Jetts' *I love rock and roll*. Compressorhead have been touring Europe and Australia since 2012, performing their one hour gig to large crowds normally expected at rock concerts, for example, the Big Day Out, Sydney, 2013. The robotic performance agency experienced when being entertained by

Compressorhead is convincing because they can actually play the well-known songs they are programmed to play, at the same time they make dance-like gestures, head-banging and swaying side to side. Compressorhead are successful representation of cultural robots existing in the rock and roll context they were created for. At this stage Z-machines and Compressorhead are simply midi control devices that actuate pre-written musical scores. Until the bands write their own material through machine learning algorithms they are not considered to be 'creators' of culture.

Using new media dramaturgical concepts in combination with the traditions of the stage roboticist Hiroshi Ishiguro and playwright/director Oriza Hirata have created several theatre works using Ishiguro's robots. I, Worker (2008) with Wakamaru, a humanoid robot, *In the Heart of a Forest* (2010), featuring Wakamaru), *Goodbye* (2010), with Geminoid F, a female android, and *Three Sisters*, *Android Version* (2012), with Wakamaru and Geminoid F. Wakamaru is programmed to move and talk when performing its role, while its operator controls the timing of the robot's actions remotely. Geminoid F is also controlled tele-remotely by a female actor who operates it. The robotic performance agency experienced through the robotic characters invites an empathetic response, similar to that of real actors on stage.

2 Dramaturgical Concepts in Marynowsky's Previous Robotic Work

The difference in the above examples of robots as performance agents and Marynowsky's investigations is that, in Marynowsky's work the audience is invited to directly engage and interact with the robots, within a gallery space. This breakdown of the fourth wall (an invisible barrier between the performer and the audience) is a key concept in the western avant-garde traditions of performance art. For example, Alan Kaprow's 'Happenings' in which, the audience participation in the performance directly affected its outcome. Thus, Marynowsky's works draws connections between nineteen sixty's conceptual and performance art and art in the age of robotic performance agency.

The scale and the agency in Marynowsky's robotic work can often be threatening, with large robots travelling towards the audience, they must make their own decisions as to either move out of the way or hope the robot stops before colliding with them. This intimidating experience draws on the work of La Fura Das Bas, a Spanish performance art group who took the notion of 'Happenings' and performance art to the next level, by controlling their audience in often threatening ways. In doing so, they blurred the line between the performer and the audience. As academic Maria Delgado states, "One does not watch a performance of La Fura. One participates" [24].

Robot Opera also extends upon the dramaturgical concepts explored by Marynowsky over the past two decades emerging from the context of the visual arts. These dramaturgical concepts include: The Uncanny; The Camp; The Robot as High Culture and are framed within different models of audience Reciprocity.

3 The Uncanny

The uncanny is a key concept in western humanities as well as in android science. Psychoanalyst Ernst Jentsch states that a very good instance of the uncanny casts "doubts [as to] whether an apparently animate being is really alive or conversely, whether a lifeless object might not be in fact animate" [25]. He lists waxwork figures, ingeniously constructed dolls and automata to have the potential to invoke an uncanny impression. Further to this, cultural theorist Terry Castle argues that the eighteenth century invention of the automaton was also the invention of the uncanny [26]. Sigmund Freud sought to further Jentsch's definition, proposing that 'the uncanny' is "what is frightening – what arouses dread and horror; equally too, the word is not always used in a clearly definable sense" [27]. Freud thus proposes that the uncanny has a role in eliciting emotional reactions from humans. The uncanny can be understood as an eerie, mysterious and weird feeling that extends beyond what is normal or expected, often-suggesting superhuman or supernatural powers or qualities.

The uncanny continues to be an enduring concept in visual arts. In the 1920's, the surrealists' love of the automaton was subconsciously explored through repressed desire. Hal Foster [28] understands Freud's investigation of the uncanny as the core conceptual undercurrent in the Surrealist movement in his book *Compulsive Beauty*. While Bruce Grenville relates the uncanny to notions of the cyborg in popular culture and aesthetics, he argues that Marcel Duchamp's *Nude Descending a Staircase* (1912) is a representation of the uncanny human-machine in motion, considered at its time "not only a threat to popular aesthetics but also a threat to the popular public perception of the human body and its physical limits" [29].

The artist Mike Kelley was "struck by Jentsch's list and how much it corresponded to a recent sculptural trend - popularly referred to in art circles as mannequin art" [30], and began collecting images of this type of work, later forming the major exhibition, *The Uncanny*, at Tate Liverpool in 2004. The exhibition consisted of life-sized figurative sculptures from throughout the ages, all with a disturbing edge: Hans Bellmer's *Doll* (1936), the Andy Warhol robot (1981), Disney's animated audio-animatronic figure of Abraham Lincoln (1964), mannequin stand-ins for the influential electronic band Kraftwerk (1978), as well as medical models and images of Jacques de Vaucanson's automata, such as his defecating robot duck (1739). For many artists, the uncanny continues to be a desired effect, for example, the works of Ron Mucek, Damien Hirst, Paul McCarthy, Tony Oursler and Patricia Piccinini, to name a few. Whilst the uncanny can be found across a range of visual art forms it finds its most potent expression in the field of robotics.

Robotics scientist Masahiro Mori proposed the 'uncanny valley' hypothesis [19] as the relationship between human likeness and perceived familiarity: "familiarity increases with human likeness until a point is reached at which subtle differences in appearance and behaviour create an unnerving effect" [31]. Following in Mori's footsteps, Karl. F MacDorman theorised that the android in the 'uncanny valley' elicits an eerie sensation because it is acting as a "reminder of mortality" [31]. For Mori, movement amplifies this effect and he "cautioned robot designers not to make the second peak their goal – that is, total human likeness – but rather the first peak of humanoid appearance to avoid the risk of falling into the valley" [31]. If we accept Mori's hypothesis the

'uncanny valley' can only ever be overcome when a truly humanoid robot (indistinguishable from a human) is produced, until which time we can only speculate through both an artistically and scientifically driven liminality.

In Marynowsky's prior works, the uncanny is embraced as an overall aesthetic - a device to invite the viewers into conceiving of the robots as beings that exist in their own right. Once the unnerving part of uncanny experience is overcome the human-robot experience can be opened up to various other more rewarding interpretations and experiences.

Wade Marynowsky, *The Discreet Charm Of The Bourgeoisie Robot,* 2008.

4 The Camp

A number of Marynowsky's prior works have investigated notions of 'camp' in respect of robotic identity. The robots are charged with an affectation that challenges gender based stereotypes of his android characters. The notion of camp is explored via the use of robots 'in drag', using the symbols of transvestism to confuse gender roles assigned by humans to robots. Susan Sontag states that camp is "the consistently aesthetic experience of the world. It incarnates a victory of 'style' over 'content', 'aesthetics' over 'morality', of irony over tragedy" [32] and its key proponents are "an improvised self-elected class, mainly homosexuals, who constitute themselves as aristocrats of taste" [32]. Sontag identifies the theatricalisation of experience, the exaggeration of mannerisms and the deployment of irony as key components of camp. The notion of camp is

this strongly tied to human experience and behavioural codes. As such, camp is a powerful device to inflect the robot with human qualities.

In *The Discreet Charm Of The Bourgeoisie Robot* (2008) for the length of the three week exhibition, the artist acted in a carefully choreographed drama as *Boris, The Bourgeoisie Robot*. A bricolage of 1950's science fiction (web camera under a domed head) and Victorian dress (body), the robot avatar waited for an audience to enter the gallery and then conversed with them in a polite and pleasant manner. The voice (filtered through a vocoder) was pure computer coldness inflected with the accent of an upper class English toff. The conversations covered champagne, caviar and were quickly re-directed to topics about itself, setting the scene for an interaction with a narcissistic entity. As curator Bec Dean states, "exquisitely dressed in a French maid's black satin and lace with a bustle-like protrusion at his back, Boris's embodied and mobile voice represented the notion of a self-contained and self-preserving intelligence" [33]. The fact that Boris's voice is male and he wears a dress introduces a notion of camp, as does his adoption of a theatricalised English toff persona.

The Hosts: A Masquerade of Improvising Automatons (The Hosts) (2009) features five larger than life sized robot characters. The robots wear sumptuous embroidered ball gowns and have individual masquerade guises: a clown in black and white harlequin print; a princess in a pink-ribboned bodice; a military officer with stars and stripes and a cowboy-hatted cowboy. Gliding gracefully, they 'dance' a completely automated, sensor-based choreography. Lights dimming to a dull glow, they pause periodically, and commence spinning in unison like robotic whirling dervishes. The main association people made while walking freely among the work, was that the robots reminded them of 'Daleks' of the BBC series *Dr.Who*, or 'Daleks in Drag' [34].

These works highlight the camp robot concept theorised by Dixon who states "robotic movement mimics and exaggerates but never achieves the human, just as camp movement mimics and exaggerates but never achieves womanhood" [13]. This statement suggests that camp is an essential factor in understanding anthropomorphic as well as zoomorphic robot performance agency.

Wade Marynowsky, *The Hosts: A Masquerade of Improvising Automatons*, 2009.

5 The Robot as High Culture

The notion of the camp robot is also linked to the idea of high culture but with an ironic twist "the experiences of camp are based on the great discovery that the sensibility of high culture has no monopoly upon refinement…the whole point of camp is to dethrone the serious, camp is playful" [32]. The camp not only enables imparting human qualities to robots, but it assists them to become credible agents within a high culture context. Once placed in the context of the art gallery robots immediately become accepted as fine art. This, concept was introduced by Marcel Duchamp when he placed a Urinal in the gallery and signed it R. Mutt (1917) or when Andy Warhol painted his Campbell's soup cans (1962). Importantly the avant-garde tradition of the visual arts involves re-writing what has gone before, re-defining what art is. This dissonance attempts to break down elite systems of class and hierarchy, namely that of bourgeoisie society. This is exemplified in Marynowsky's work *The Discreet Charm Of The Bourgeoisie Robot* (2008), which ironically suggests that high art is for robots.

The literary fiction devised by ETA Hoffman in the early 19th century popularised the darker side of the automaton. However most people never actually physically experienced an autonomous performance, as automata existed mainly for the courts of royal society and eventually those who could spare a week's wage. 18th Century automata were hand-built custom-made marvels created by clock-makers and mechanics, with Jacquet Droz of Switzerland and Jacques de Vaucanson of France being two of most-cited automata makers of the time. Vaucanson "achieved most notoriety as a producer

of a high-society spectacle…[with] his magnificent creations…praised by kings and applauded by scientists" [35]. Presenting to the Académie of Sciences in Paris, 1738, Vaucanson "set the standard for mechanical androids" [36] with his flute player, a drum player and a digesting duck. The life sized, life-like and musical qualities of his automatons gained "the attention of influential people such as Voltaire, Frederick the Great and the general minister to Louis XV" [36]. Fortunately the works of Droz and Vaucanson are still functioning and are regularly on display in Musée d'art et d'histoire in Neuctel, Switzerland and the Conservatorie national des arts et métiers in Paris, preserved through the conservation of culture, the automatons remain representations of the periods intelligentsia.

An important point to this argument (to accept the robot or more definitively, the automaton as a signifier high culture), is detailed in the book *Androids in the Enlightenment: Mechanics, Artisans, and Cultures of the Self* in which, Associate Professor Adelheid Voskuhl proposes, that automata were harbingers of the burgeoning industrial age, an age where the automaton transformed into the popular notion and understanding of the robot. A robot in this context is a product of mass-production, dispersed to the masses as popular culture, whereas automatons are one-of-a-kind artist's creations, preserving the aura of the art object.

In the author's experience, the automaton has re-emerged as a credible participant in high culture, expanding the status of Cultural Robotics through representation in major international contemporary art biennales (biennales being the cultural signifiers of international contemporaneity for the hosting nation). For example Marynowsky's work *The Hosts* featured in Beyond Mediations, Mediations Bienniale, The International Biennale of Contemporary Art, Poland, in 2010. The work's placement into the circular ballroom in the clock tower of the Imperial castle (Zamek) strategically situated the work in the traditions of European antiquity. This suited the project aptly as the work drew its inspiration from the traditions of 18th Century European automata and their fashion. In 2014, Marynowsky's *The Acconci Robot* featured in thingWorld: International Triennial of New Media Art, National Art Museum of China. By hosting the exhibition Chinese nationals are declaring how forward thinking and innovative they are by accepting new media art into their National Art Museum.

The tradition of displaying robots as representations of high or intelligent culture to display technological ingenuity is foregrounded in the meeting of the President of the United States Barack Obama and Honda's Asimo in Japan, 2013. After initial greetings and a display of dexterity (with Asimo jumping up and down on one leg), Obama and Asimo kicked a soccer ball back and forth. The experience left Obama with an uncanny feeling, stating, "I have to say that the robots were a little scary, they were too lifelike, they were amazing" he said [37].

6 Reciprocity

If the goal of android science is to advance human-robot relationships and to find adequate design concepts to support meaningful interactions, then artists are able to subvert, pervert and critique these notions through experimentation, within the direct, open ended context of the art gallery. A range of Marynowsky's prior works have explored different models for Human Robot Interaction. Notions of *reciprocal* exchange are explored in *The Discreet Charm Of The Bourgeoisie Robot* (2008), and *non-reciprocal* exchange in *The Hosts* (2009). Whilst *The Acconci Robot* (2012), subverts audience expectations of the direct engagement and reciprocal exchange by creating a robotic character that only responds when the audience is most *disengaged* from it.

Audience responses have provided insights into the way in which robotic agency was read in the context of an artwork. *The Hosts* demonstrated that audiences experiencing robots in the context of the gallery are desperate for reciprocal exchange. They seek feedback from robots in human-like ways, as might be expected from literary or cinematic science fiction genres. They wave their hands at the robots 'heads' and mimic the robots' movement. The main psychological response to *The Hosts* was that the robots responded to humans personally, when in fact they are autonomous. They simply avoid any obstacles in their path whilst wandering, with obstacles triggering pre-programmed sound and light samples.

As a viewer of the work, Melody Willis recalled, "They all turned and gathered around me. I felt psychically powerful, like a child with extrasensory perception (ESP), but then they started spinning madly and I realised I was meddling with forces I could never understand" [38]. In Willis's account, she expresses that she "could never understand" because the robots she thinks she is controlling with her mind, are in fact acting autonomously, ignoring her. The lack of reciprocal exchange between robots and humans causes uncertainty as to what the robot is thinking. As social robotics researcher Pericle Salvini explains: "the lack of presence causes uncertainty, especially when a physical entity gives the impression that there is more behind it, that there is indeed something behind the mask" [39].

In *The Discreet Charm Of The Bourgeoisie Robot* Marynowsky attempted to convince viewers of the robot's intelligence through tele-operation, by remotely controlling the movement and voice of the robot. The elaborately costumed robot avatar waits for an audience member to enter the gallery and converses with them in a camp and narcissistic manner adopting a model of direct reciprocity with the audience. The reciprocal exchange caused an ambiguous response amongst audience members. There was no uncertainty as to whether the robot was alive or not, but how intelligent was it and how could it be so intelligent? The Human Robot Interaction in the work became a game of interrogation between the robot and humans, a drag form of the Turing Test [40]. Dan McKinlay states in his review, "the conversation invokes and inverts that old new-media parody, the *ELIZA* [41] psychoanalysis program" [42].

Wade Marynowsky, *The Acconci Robot*, 2012, photo by Mark Ashkanasy, RMIT Gallery.

Marynowsky's work *The Acconci Robot* is an interactive robotic character that follows the viewer when they are not looking at it. Appearing as a shipping crate of minimal design, the robot is mute and motionless as a viewer approaches. But when the audience member turns away, and starts to leave, the robot begins to follow. If the audience member turns to look back at the robot, it stops in its tracks. The work draws inspiration from the 1969 performance work, 'Following piece' by Vito Acconci [43]. Acconci's early work was developed from an interest in the human body and its relationship to public space. In 'Following Piece', Acconci would select unsuspecting people in the street and follow them until they disappeared into a private place. Acconci carried out this performance every day for a month, documenting each encounter and sending it to a different member of the arts community. Acconci's investigations of the body in public space are re-contextualised in the work within the gallery context, re-examining public interaction through Human Robot Interaction. The work explores the concept of an anti-reciprocity through recognition of the human as the subject of surveillance, through the act of following. Leading the viewer to question notions of robotic agency, an important aspect of the increasingly computer mediated times we live in, for example Unmanned Aerial Vehicles (UAVs) and drones.

7 Robot Opera and the Exploration of a Robotic Performance Practice

Building on the dramaturgical concepts in Marynowsky's previous works: The Uncanny; The Camp; The Robot as High Culture and audience Reciprocity, *Robot Opera* moves beyond gallery based installation contexts and deploys robots as performance agents in an operatic context. In Western culture, opera is seen as a strong symbol of class and is framed as the pinnacle of high culture and is a heavily stylised performance form with a range of identifiable performance conventions. This makes opera a fertile site to investigate the potential for robots to be seen as performance agents and whether there is the potential to conceptualise a 'performance practice' that extends beyond their more traditional role as automated devices executing recorded sequences.

It is notable that opera as a form has remained fairly stable and somewhat resistant to radical transformation. As Salter asserts "Despite the interest in expanding the musical language of opera through the new compositional languages arising from serialism and postmodernism [including minimalism], many of these attempts still retained the dramatic stagecraft and orchestral vocabularies of traditional opera" [44]. Opera has therefore not tended to be a site for radical transformation. Furthermore more, radical engagements with the form of opera form have tended to come from outside the classical music field. Nam June Paik sign posted opera in his work *Robot Opera* from 1964. Paik had developed a robot, named K-456 (named after a Mozart piano concerto), in the early 1960s that become the focus for a range of subsequent art works and happenings. K-456 was anthropomorphic in appearance, was radio controlled, played audiotaped speeches by John F. Kennedy and defecated beans. K-264 had its first public performance in 1964 in Paik's own *Robot Opera* with Paik and Charlotte Moorman. Despite what the title of the work may suggest, Paik's piece had more to do with the avant garde Happenings of the period and did not expressly reference or draw upon opera as a form.

Perhaps the most important precedent work to *Robot Opera* is Tod Machover's *Death and the Powers* (2010) [45] developed via the MIT Media Lab. This large scale work involves computer controlled set elements and autonomous robots alongside human performers. Machover achieves a very high degree of sophistication in respect of the dramaturgical treatment of robotic performers. Furthermore unlike Paik, Machover's work directly addresses the opera tradition and has proven to be perceived as a work within that canon. A range of performances have been staged by large mainstream opera companies and the work can be seen to have entered the operatic repertoire. The key difference in respect of the *Robot Opera* project is that *Death and the Powers* relies on human performers as singers/actors and the robotic elements are supplementary to a human cohort of performers. The work does not solely rely on the performative agency of the robot performers or rest upon an entirely robotic dramaturgical setting. The work therefore provides insights into mixed cohort (robot/human) performance and the realm of the robot-only operatic performance remains unexplored. *Robot Opera* seeks to explore this mode of performance and develop a notion of robotic performance practice.

Robot Opera features eight larger than life sized rectangle monolithic shaped robots on powered wheels, employing the machine aesthetic (of Ihnatowicz's The Senster) the robots are equipped with Kinect v2 cameras that allow the robots to respond to humans

by translating their proximity and facial expression into responsively programmed sound and light, on the robots. The robots are individual agents operating on a wireless network and operate according to algorithmic principles, with various choreographed behaviours executed from the robot performance cohort, alongside sensing systems that allow the robot to be responsive to audience behaviours and interventions. The robots are not explicitly humanoid in appearance, but incorporate anthropomorphic design principles - for example, Kinect cameras for eyes, loudspeakers for mouths, and sensor systems to detect others. The work thus achieves a sense of the uncanny and the ambiguity of liveness without resorting to explicit humanoid representation.

Unlike much installation work, performance work most often deploys specific time-based structuring principles. It is 'vectorised' in the temporal domain, in that, performance works are perceived as having a beginning, middle, and an end. Notions of development exist and there is often a dramaturgical shape, or at the least, a sense of a set schema in respect of the performance structure and content. *Robot Opera* seeks to explore the idea of the robot as an active agent with the performance context, moving beyond a programmed machine executing digital sequences towards a semi-autonomous state, where the robots are seen to execute context specific decisions based on Human-Robot Interaction. This robotic performance agency can be distinguished from the fields of interactive or algorithmic art more broadly, in that it is explicitly situated within a performance context and so invites the audience to consider the robots as performance agents within a performative and dramaturgical system making 'performance decisions'.

Wade Marynowsky, *Robot Opera,* 2015, Photo: Heidrun Lohr, Carriageworks Sydney.

Within *Robot Opera* such a schema exists in the form of software based control sequences and behaviour commands that are plotted against a timeline. The performance model therefore incorporates the idea of a script of choreography, but allows for the audience responses and features of the performance space to modulate and inflect the pre-determined script/choreography. In so doing the robotic cohort starts to model a human cohort working to a script or choreography but having the freedom to inflect the performances based on audience and site conditions. The sense of the anthropomorphic extends beyond the physical attributes of the robotic form to the behaviour in

performance. On a conceptual level, this constructs a set of relations in robotic performance that map onto a human performance paradigm. In human performance, the schema is mediated to varying degrees by the performance context - that is, the limitations and possibilities of the venue/site and the audience real-time responses, be those subtle or unsubtle. These elements have a structuring effect on performance and this connects deeply to the fundamental concept of what a performance is.

By modeling the robotic performance system on human performance paradigm then the robots can be experienced as performers in their own right and not be seen to be sequencers or machines, executing patterns that pay little regard to their context. The project therefore suggests that the notion of robotic performance agency can be identified from the arising technical approach and the performance context. It is proposed that this form of agency is specific to performance-based robotics because it invites the audience to consider the robots as performance agents within a performative and dramaturgical system making 'performance decisions'. *Robot Opera,* then, is a work that opens up the possibility of a new robotic performance practice, expanding the field of Cultural Robotics. Placing robots centre stage as signifiers of high culture within a 21st century total art work of the future.

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