

The Oxford Handbook of Music and Digital Technologies

by Andrew Brown and Eduardo Reck Miranda

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Summary:

The Oxford Handbook of Music and Digital Technologies, edited by Andrew Brown and Eduardo Reck Miranda, is a comprehensive guide to the use of digital technologies in music. It covers topics such as sound synthesis, sampling, audio processing, computer-assisted composition and performance, interactive systems for musical expression, virtual instruments and controllers, networked music systems and applications for mobile devices. The book also examines the impact of digital technologies on the production process in popular music genres such as hip hop or EDM (electronic dance music).

The first part of the book provides an overview of current trends in digital technology research. It includes chapters on topics such as artificial intelligence techniques applied to musical analysis; machine learning approaches to sound synthesis; real-time audio processing algorithms; physical modelling techniques for simulating acoustic instruments; 3D audio rendering methods; gesture recognition systems for controlling electronic instruments; augmented reality interfaces for live performances; distributed networks for collaborative improvisation over long distances.

The second part focuses on specific applications that are enabled by digital technologies. These include algorithmic composition tools based on generative grammars or evolutionary computing paradigms; software platforms designed specifically for creating electroacoustic works or interactive installations with sensors and actuators connected to computers via MIDI protocols or OSC messages (Open Sound Control); virtual instrument libraries used in film scoring sessions or video game development projects.

Finally, the third part looks at how these new tools have been adopted by musicians from different backgrounds: classical composers who embrace algorithmic processes within their creative practice; DJs who mix samples from multiple sources using turntables controlled with laptops running specialized software programs like Ableton Live or Traktor Pro 2.; producers working with synthesizers inside recording studios equipped with high-end hardware samplers.

Overall this book offers a comprehensive overview of how digital technologies are transforming contemporary musical practices across all genres. It is essential reading not only for researchers interested in exploring new possibilities offered by these tools but also practitioners looking to expand their knowledge about them.</p></div>

Main ideas:

#1. *Digital Music Technologies: Digital music technologies have revolutionized the way music is composed, performed, and experienced. This chapter provides an overview of the various digital technologies that have been developed and how they have impacted the music industry.*

Digital music technologies have revolutionized the way music is composed, performed, and experienced. From digital audio workstations (DAWs) to virtual instruments and plugins, modern musicians now have access to a wide range of tools that allow them to create complex musical compositions with ease. Digital recording technology has also enabled producers and engineers to capture high-quality recordings in a fraction of the time it used to take. Additionally, streaming services such as Spotify and Apple Music have made it easier than ever for listeners around the world to access millions of songs at any given moment.

The impact of digital music technologies on the industry has been profound. Record labels are no longer limited by

physical media formats; instead they can distribute their content digitally through various online platforms. This has allowed artists from all over the world to reach larger audiences than ever before. Furthermore, advances in artificial intelligence (AI) are allowing computers to generate new pieces of music autonomously or even collaborate with human composers.

In addition, digital technologies have opened up new opportunities for live performances as well. Musicians can now use software such as Ableton Live or Max/MSP Jitter which allows them to manipulate sound in real-time during their shows using controllers like MIDI keyboards or drum pads.

Overall, digital music technologies have had an immense impact on how we experience and interact with music today – both as creators and consumers alike. As these technologies continue to evolve so too will our relationship with sound.

#2. *Music Notation Software: Music notation software has enabled composers to create complex musical scores with ease. This chapter examines the various software programs available and how they have changed the way music is composed and performed.*

Music notation software has revolutionized the way music is composed and performed. It allows composers to create complex musical scores with ease, eliminating the need for manual transcription of notes or tedious calculations. With a few clicks of a mouse, users can quickly generate intricate arrangements that would have taken hours to write out by hand. This technology has enabled musicians to explore new possibilities in composition and performance, allowing them to experiment with different sounds and textures without having to worry about transcribing their ideas into traditional notation.

The range of available software programs is vast, from basic programs designed for beginners all the way up to professional-level applications used by experienced composers. These programs offer features such as automatic transposition, playback options, MIDI integration, score sharing capabilities and more. They also provide tools for creating custom instruments or manipulating existing ones in order to achieve unique sonic results.

In addition to its creative potentials, music notation software also offers practical advantages over traditional methods of writing music. For example, it eliminates the need for paper copies of scores which can be expensive and time consuming; instead they are stored digitally on computers or other devices where they can be easily accessed at any time.

Overall then it is clear that music notation software has had an immense impact on how we compose and perform today's music. By providing powerful tools that enable us to quickly create complex musical works with ease it has opened up exciting new possibilities in both composition and performance.

#3. *Digital Audio Workstations: Digital audio workstations have enabled musicians to record, edit, and mix music with greater ease and accuracy. This chapter looks at the various features of digital audio workstations and how they have changed the way music is produced.*

Digital audio workstations (DAWs) are computer-based systems that allow musicians to record, edit, and mix music with greater ease and accuracy than ever before. DAWs provide a range of features such as multi-track recording, virtual instruments, effects processing, automation tools for mixing and mastering, MIDI sequencing capabilities, and more. These features enable producers to create complex musical arrangements quickly and easily without the need for expensive hardware or studio space.

The introduction of digital audio workstations has revolutionized the way music is produced. By providing powerful tools in an affordable package they have enabled anyone with access to a computer to produce professional sounding recordings from their own home studios. This has opened up new opportunities for independent artists who can now

produce high quality recordings on their own terms without having to rely on expensive studio time.

In addition to making it easier for musicians to record their own material at home, digital audio workstations also offer many advantages over traditional analog recording techniques. For example they allow producers to experiment with different sounds by using virtual instruments or manipulating samples in ways that would be impossible with analog equipment. They also make it possible for producers to automate certain processes such as mixing which can save them time when working on larger projects.

#4. *Digital Audio Effects: Digital audio effects have enabled musicians to create unique sounds and textures. This chapter examines the various types of digital audio effects and how they have been used to create new musical styles.*

Digital audio effects are a powerful tool for musicians to create unique sounds and textures. They allow the user to manipulate sound in ways that were not possible before digital technology was available. Digital audio effects can be used to alter the pitch, timbre, or volume of an instrument or voice; add reverb, delay, chorus, flanging and other special effects; and even generate entirely new sounds from scratch. These tools have enabled musicians to explore new sonic possibilities and create music that is truly their own.

The range of digital audio effects available today is vast. From simple EQ adjustments to complex multi-effects processors with hundreds of parameters, there is something for every musician's needs. Many modern DAWs (digital audio workstations) come with built-in effect plugins which make it easy for users to experiment with different settings without having to purchase additional hardware or software. Additionally, many third-party developers offer specialized plug-ins designed specifically for certain types of music production.

Digital audio effects have been used by artists across all genres of music since they first became available in the late 1980s. Electronic dance producers use them extensively as part of their signature sound while rock bands often rely on them heavily when creating guitar solos or vocal harmonies. Hip hop producers also employ digital audio effects such as auto tune and vocoders in order to achieve a distinct style.

In addition to being used creatively within musical compositions themselves, digital audio effects can also be employed during live performances using MIDI controllers or foot pedals connected directly into a computer running a DAW program like Ableton Live or Logic Pro X.

Overall, digital audio effects provide musicians with an incredible array of options when it comes time to craft their own unique soundscapes – whether they are producing tracks in the studio or performing live on stage.</P

#5. *Digital Synthesis: Digital synthesis has enabled musicians to create sounds that were previously impossible to create. This chapter looks at the various types of digital synthesis and how they have been used to create new musical styles.*

Digital synthesis is a type of sound production that uses digital technology to create sounds. It has enabled musicians to explore new sonic possibilities and create sounds that were previously impossible or difficult to produce. Digital synthesis can be divided into two main categories: subtractive and additive synthesis. Subtractive synthesis involves the use of filters, oscillators, and envelopes to shape an audio signal in order to achieve desired results. Additive synthesis involves combining multiple sine waves together in order to create complex waveforms with unique timbres.

In addition, there are several other types of digital synthesis such as frequency modulation (FM) and phase distortion (PD). FM is used for creating bell-like tones while PD is used for creating distorted sounds with sharp attack transients. Both techniques have been widely used by electronic music producers over the years, particularly in genres such as techno and trance music.

Digital synthesizers have also been used extensively in film scores, video game soundtracks, television shows, commercials, and more recently popular music styles like EDM (electronic dance music). The ability to quickly manipulate parameters within a synthesizer allows composers/producers/musicians greater control over their sound design than ever before.

#6. *Digital Sampling: Digital sampling has enabled musicians to create new sounds by combining existing sounds. This chapter examines the various types of digital sampling and how they have been used to create new musical styles.*

Digital sampling is a process of digitally capturing and storing sound recordings, which can then be used to create new sounds. It has revolutionized the way music is created, allowing musicians to combine existing sounds in creative ways. Digital sampling involves recording an audio signal into a digital format such as WAV or MP3 files, which are then stored on a computer or other digital device. The recorded audio can then be manipulated using software tools such as pitch-shifting, time-stretching and filtering. This allows for the creation of entirely new sounds by combining elements from different sources.

Digital sampling has been used in many genres of music including hip hop, electronic dance music (EDM), pop and rock. In hip hop production it is often used to sample drum breaks from classic funk records or vocal samples from old soul songs; while EDM producers use it to layer multiple synth lines together with effects processing. Pop and rock producers have also embraced digital sampling technology for creating unique textures within their productions.

The ability to manipulate existing recordings through digital sampling has enabled musicians to explore new sonic possibilities that would not have been possible before its invention. By combining elements from different sources they are able to create entirely new musical styles that draw upon both traditional and modern influences.

#7. *Digital Music Distribution: Digital music distribution has enabled musicians to distribute their music to a wider audience. This chapter looks at the various methods of digital music distribution and how they have changed the way music is consumed.*

Digital music distribution has revolutionized the way musicians share their music with the world. By utilizing digital platforms, artists can now reach a much larger audience than ever before. Digital music distribution allows for an artist to upload their songs and albums onto streaming services such as Spotify, Apple Music, and Tidal. These services allow users to access millions of songs from around the world at any time. Additionally, many digital distributors offer direct-to-fan sales options which enable fans to purchase individual tracks or entire albums directly from an artist's website.

The rise of digital music distribution has also changed how people consume music. Instead of buying physical copies of CDs or vinyl records, listeners are now able to stream their favorite songs on demand through various streaming services. This shift in consumption habits has allowed for more personalized listening experiences as well as increased exposure for independent artists who may not have had access to traditional forms of promotion.

Overall, digital music distribution has drastically altered the landscape of the industry by providing new opportunities for both established and emerging artists alike. It is clear that this form of technology will continue to shape how we experience and interact with our favorite tunes in years to come.

#8. *Music Streaming: Music streaming has enabled listeners to access music from a variety of sources. This chapter examines the various streaming services available and how they have changed the way music is consumed.*

Music streaming has revolutionized the way people access and consume music. It allows users to listen to a vast library of songs from any device with an internet connection, without having to purchase or download them. Streaming services such as Spotify, Apple Music, and Pandora offer millions of tracks for free or at a low cost subscription fee. This has

made it easier than ever before for listeners to discover new music and explore different genres.

The convenience of streaming services also means that listeners can create their own playlists tailored specifically to their tastes. They can easily share these playlists with friends or even publish them publicly on social media platforms like YouTube and SoundCloud. Additionally, many streaming services have integrated features such as personalized radio stations which allow users to find similar artists based on what they are already listening to.

Finally, streaming services have enabled musicians to reach wider audiences by making their music available online in ways that were not possible before. Artists now have more control over how they distribute their work and can use analytics tools provided by the streaming service providers in order to better understand who is listening and where.

#9. *Music Interfaces: Music interfaces have enabled musicians to interact with digital music in new ways. This chapter looks at the various types of music interfaces and how they have been used to create new musical styles.*

Music interfaces have revolutionized the way musicians interact with digital music. By providing a physical connection between the musician and their instrument, these interfaces allow for more expressive control over sound than ever before. From MIDI controllers to touch-sensitive pads, there are now many different types of music interfaces available on the market.

MIDI (Musical Instrument Digital Interface) is one of the most popular forms of music interface technology. It allows electronic instruments to communicate with each other by sending messages about note values, pitch bends, and other performance parameters. This has enabled musicians to create complex musical arrangements that would not be possible without this type of technology.

Touch-sensitive pads are another type of music interface that has become increasingly popular in recent years. These devices allow users to trigger samples or play notes simply by touching them on a surface such as a tablet or smartphone screen. This makes it easier for producers and DJs to manipulate sounds quickly and intuitively while performing live.

Finally, motion controllers such as Kinect can also be used as an interface for creating digital music. These devices use sensors to track body movements which can then be mapped onto various parameters within a software program such as Ableton Live or Logic Pro X. This enables performers to control their sound in real time using gestures rather than traditional buttons or knobs.

#10. *Music Visualization: Music visualization has enabled musicians to create visual representations of their music. This chapter examines the various types of music visualization and how they have been used to create new musical styles.*

Music visualization is a technique used by musicians to create visual representations of their music. It has been used in various forms since the early days of electronic music, and continues to be an important tool for creating new musical styles. Music visualization can take many forms, from simple waveforms or spectrograms that show the frequency content of a sound, to more complex animations that represent the structure and dynamics of a piece. Visualizations can also be used as part of live performances, allowing performers to interact with their audience in real time.

The use of music visualization has enabled musicians to explore different ways of expressing themselves musically. By combining visuals with audio elements, they are able to create unique experiences for listeners that would not otherwise be possible. For example, some artists have created interactive installations where viewers can manipulate visuals while listening to the accompanying soundtrack. Other artists have developed software tools which allow them to visualize their compositions in real-time during performance.

In addition, music visualization has become increasingly popular among DJs and producers who use it as part of their creative process when producing tracks or remixes. By using visualizations such as waveforms or spectrograms they are able to identify patterns within sounds which may help them craft better mixes or arrangements.

Finally, there is growing interest in using music visualization techniques for educational purposes such as teaching students about musical concepts like rhythm and harmony through interactive visualizations. This type of approach allows students to gain a deeper understanding by engaging with both auditory and visual elements simultaneously.

#11. *Music Education: Music education has been revolutionized by digital technologies. This chapter looks at the various ways digital technologies have been used to enhance music education.*

Digital technologies have had a profound impact on music education. From the use of computers to create and store musical scores, to the development of interactive software for teaching music theory and composition, digital technology has revolutionized how we learn about music. Digital tools such as sequencers, synthesizers, and samplers allow students to explore sound in ways that were not possible before. Furthermore, online resources provide access to vast amounts of information about different styles of music from around the world.

The internet also provides an invaluable platform for collaboration between teachers and students. Online forums enable teachers to share ideas with each other while providing feedback on student work. Social media platforms like YouTube can be used by both teachers and students alike to showcase their work or find inspiration from others' creations.

Finally, digital technologies are being used more frequently in live performance settings as well. Musicians are now able to incorporate pre-recorded sounds into their performances using laptops or tablets connected directly into their instruments or amplifiers.

#12. *Music Therapy: Music therapy has been enhanced by digital technologies. This chapter examines the various ways digital technologies have been used to enhance music therapy.*

Music therapy is a form of psychotherapy that uses music to improve the physical, mental, and emotional well-being of individuals. It has been used for centuries as a way to help people cope with stress, anxiety, depression, trauma, and other psychological issues. In recent years digital technologies have become increasingly important in music therapy. Digital technology can be used to create new musical experiences or modify existing ones; it can also provide access to vast libraries of recorded music from around the world.

Digital technologies are being used in many different ways within music therapy. For example, they can be used to record sessions so that therapists and clients can review them later on; they can also be used for sound synthesis and manipulation which allows therapists to create unique sounds tailored specifically for their clients' needs. Additionally, digital technologies allow therapists to use virtual instruments such as drum machines or synthesizers during sessions which may help engage clients more effectively than traditional acoustic instruments.

Furthermore, digital technology has enabled the development of interactive systems that allow both therapist and client(s) to interact with each other through musical improvisation or composition activities. These systems often include sensors that track movement or gestures made by participants which then trigger changes in the soundscape created by the system itself – this type of interaction encourages creative expression while providing an engaging experience for all involved.

Finally, digital technology has allowed researchers and practitioners alike access to large databases containing information about various aspects of music therapy such as research studies conducted on its efficacy or case studies detailing successful interventions using specific techniques. This data provides valuable insight into how best utilize music therapy when working with particular populations.

#13. *Music and the Internet: The internet has enabled musicians to reach a wider audience and to collaborate with other musicians. This chapter looks at the various ways the internet has been used to enhance music.*

The internet has revolutionized the way music is created, distributed and consumed. It has enabled musicians to reach a wider audience than ever before, as well as collaborate with other musicians from around the world. Through streaming services such as Spotify and Apple Music, listeners can access an almost limitless library of music at their fingertips. Social media platforms like YouTube have allowed artists to share their work with millions of people in an instant.

Digital technology has also made it easier for independent artists to produce and distribute their own music without relying on traditional record labels or radio stations. This means that more diverse voices are being heard than ever before, allowing new genres and styles of music to emerge. Digital tools such as software synthesizers, drum machines and sequencers have also opened up new possibilities for sound design.

Finally, digital technologies have enabled musicians to create interactive experiences for audiences through virtual reality (VR) concerts or augmented reality (AR) performances. These immersive experiences allow fans to feel closer to the artist than ever before by providing them with a unique perspective on the performance.

#14. *Music and Social Media: Social media has enabled musicians to interact with their fans and to promote their music. This chapter examines the various ways social media has been used to enhance music.*

Social media has revolutionized the way musicians interact with their fans and promote their music. Through platforms such as Twitter, Facebook, Instagram, YouTube and SoundCloud, artists can share updates about upcoming shows or releases, post videos of performances or rehearsals, and even engage in conversations with fans. This direct connection between artist and fan is unprecedented in the history of music promotion.

In addition to providing a platform for communication between artist and fan, social media also provides an opportunity for musicians to showcase their work. Music streaming services like Spotify allow users to listen to entire albums without having to purchase them outright; this allows listeners to sample new music before deciding whether they want to buy it. Similarly, video sharing sites like YouTube provide a platform for artists to upload live performances or official music videos that can be viewed by millions of people around the world.

Finally, social media has enabled musicians to collaborate more easily than ever before. Platforms such as Bandcamp allow independent artists from all over the world connect with each other online; this makes it easier for them find collaborators who are geographically distant but musically compatible.

#15. *Music and Mobile Devices: Mobile devices have enabled musicians to create and distribute music on the go. This chapter looks at the various ways mobile devices have been used to enhance music.*

Mobile devices have revolutionized the way music is created, distributed, and consumed. With the advent of smartphones and tablets, musicians can now create music on the go with a variety of apps that allow them to record audio or MIDI data directly into their device. This has enabled musicians to capture ideas quickly without having to lug around bulky recording equipment. Additionally, mobile devices provide access to a wide range of digital instruments and effects which can be used for sound design.

The portability of mobile devices also allows for easy distribution of music via streaming services such as Spotify or Apple Music. Musicians are able to upload their tracks directly from their device in order to make them available worldwide within minutes. Furthermore, social media platforms like Instagram and YouTube have become powerful tools for artists looking to promote themselves online.

Finally, mobile devices offer an array of features that enhance the listening experience for fans. For example, many streaming services allow users to customize playlists based on genre or mood; some even feature curated playlists tailored specifically towards individual listeners' tastes. Additionally, many apps enable users to interact with other fans

by sharing comments about songs they enjoy.

#16. *Music and Video Games: Video games have enabled musicians to create interactive music experiences. This chapter examines the various ways video games have been used to enhance music.*

Video games have become an increasingly popular platform for musicians to create interactive music experiences. By combining the audio and visual elements of video games, musicians can create immersive soundscapes that are tailored to the games narrative or environment. For example, composers may use a combination of synthesized sounds and live instruments to create dynamic musical scores that respond to player actions in real-time. This allows players to experience music as part of their gaming experience rather than simply listening passively.

In addition, some video games allow players to interact with the music directly by playing along with it or creating their own compositions within the game itself. This type of interaction has been used in rhythm-based games such as Rock Band and Guitar Hero where players must match notes on a controller in order to progress through levels. Other types of interactive music experiences include virtual instruments which allow users to play simulated versions of real-world instruments using controllers or motion sensors.

The integration of music into video games has also enabled new forms of collaboration between musicians and developers. Musicians can now work closely with developers during the development process in order to ensure that their compositions fit perfectly within the games aesthetic and gameplay mechanics. Furthermore, many modern video games feature licensed tracks from well-known artists which adds another layer of depth and authenticity.

#17. *Music and Virtual Reality: Virtual reality has enabled musicians to create immersive music experiences. This chapter looks at the various ways virtual reality has been used to enhance music.*

Virtual reality (VR) has opened up a range of possibilities for musicians to create immersive music experiences. VR technology allows users to interact with virtual environments, and this can be used in creative ways by musicians. For example, some artists have created interactive musical performances that allow the audience to explore different parts of the performance space while listening to the music. This type of experience is not possible without VR technology.

In addition, VR can also be used as an instrument itself. By using motion controllers or other input devices, musicians can control sound parameters such as pitch and volume in real-time. This opens up new possibilities for improvisation and experimentation with sound design. Furthermore, it enables performers to create unique sonic landscapes that are impossible outside of a virtual environment.

Finally, VR also provides opportunities for collaboration between musicians who may not otherwise have access to each other due to geographical distance or time constraints. Through shared virtual spaces, multiple performers can collaborate on compositions remotely from anywhere in the world.

#18. *Music and Artificial Intelligence: Artificial intelligence has enabled musicians to create music with greater complexity. This chapter examines the various ways artificial intelligence has been used to enhance music.*

Artificial intelligence (AI) has been used to create music for decades, but recent advances in AI technology have enabled musicians to explore new possibilities. AI can be used to generate musical ideas and patterns, analyze existing compositions, and even compose entire pieces of music. AI-generated music is often more complex than what a human composer could produce on their own.

One way that AI is being used in the creation of music is through generative algorithms. Generative algorithms are computer programs that use data from various sources such as audio recordings or MIDI files to generate new musical ideas or patterns. These generated patterns can then be manipulated by the musician into something unique and interesting. Generative algorithms also allow for experimentation with different sounds and textures without having to

manually program each note.

Another application of artificial intelligence in music production is analysis of existing compositions. By analyzing an existing piece of music, an AI system can identify its structure, harmonic content, melodic motifs, rhythmic elements, etc., allowing it to suggest changes or additions that would improve the composition. This type of analysis can help composers refine their work quickly and efficiently.

Finally, some researchers are exploring ways for computers to autonomously compose complete pieces of music using artificial intelligence techniques such as deep learning networks or evolutionary computing systems. While these approaches are still in their infancy compared with traditional methods like score writing software or algorithmic composition tools they offer exciting potential for creating entirely novel forms of musical expression.

#19. *Music and Robotics: Robotics has enabled musicians to create robotic instruments and performances. This chapter looks at the various ways robotics has been used to enhance music.*

Robotics has enabled musicians to create robotic instruments and performances that are not possible with traditional acoustic instruments. For example, robots can be programmed to play complex rhythms or melodies in a way that would be impossible for a human musician. Additionally, robotics can enable the creation of new sounds by combining different elements from various sources into one performance. This could include synthesized sounds, samples from other recordings, or even live instrumentation.

Robotic music also allows for greater control over musical parameters such as tempo and dynamics. By programming specific instructions into the robot's software, it is possible to precisely control how fast or slow certain sections of a piece should be played and how loud or soft they should sound. This level of precision is difficult to achieve with traditional acoustic instruments.

Finally, robotics can provide an opportunity for collaboration between humans and machines in creating music. By using sensors and controllers connected to computers running specialized software programs, musicians can interact directly with their robotic counterparts in real-time during performances. This type of interaction opens up exciting possibilities for improvisation and experimentation within the realm of digital music production.

#20. *Music and Augmented Reality: Augmented reality has enabled musicians to create interactive music experiences. This chapter examines the various ways augmented reality has been used to enhance music.*

Augmented reality (AR) has opened up a range of possibilities for musicians to create interactive music experiences. AR technology allows users to interact with digital content in the physical world, creating an immersive experience that can be used to enhance musical performances and compositions. For example, AR can be used to project visuals onto surfaces or objects during live performances, allowing performers to manipulate sound and visuals in real-time. Additionally, it can be used as part of a composition process by enabling composers to visualize their ideas before committing them into notation or recording.

In addition, augmented reality has been utilized in educational contexts such as teaching students about music theory and composition through interactive visualizations. By using AR technology, teachers are able to provide students with an engaging way of learning complex concepts while also providing them with tangible feedback on their progress. Furthermore, augmented reality applications have been developed specifically for use within the classroom setting which allow teachers and students alike to explore different aspects of music theory without having access to expensive equipment.

Finally, augmented reality is being explored as a tool for audience engagement at concerts and other events. Through the use of mobile devices equipped with AR capabilities audiences are able participate more actively in shows by interacting directly with elements projected onto stage sets or even manipulating sounds themselves from their seats.