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INTELLECTUAL PROPERTY RIGHTS IN THE CONTEXT OF AUGMENTED REALITY TECHNOLOGIES: LEGAL CHALLENGES AND EMERGING SOLUTIONS

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ABSTRACT:

Technologies like augmented reality (AR) are quickly changing sectors like healthcare, education, entertainment, manufacturing, and retail. The intellectual property (IP) regime, however, faces difficult obstacles as a result of this quick expansion since it finds it difficult to adjust to AR's hybrid character, which involves superimposing digital information on top of real-world surroundings. In AR environments, ownership, infringement, and enforcement present challenges for traditional IP frameworks such as copyright, trademark, patent, and design rights. For example, user-generated AR content creates issues around authorship and licensing, while digital overlays may unintentionally violate real-world trademarks or copyrighted works. Because of overlapping claims and interoperability standards, patent law is especially unclear when it comes to protecting AR hardware, software algorithms, and user interfaces. Additionally, problems with IP rights enforcement in AR settings include

. Patent law also faces ambiguity in protecting AR hardware, software algorithms, and user interfaces due to overlapping claims and interoperability standards. Moreover, enforcement of IP rights in AR spaces is complicated by issues of jurisdiction, digital anonymity, and the ephemeral nature of AR interactions. [764]

A display of a real-world environment with one or more layers of text, data, symbols, images, or other graphical display elements added to it is called augmented reality (AR). Online games are always linked to augmented reality technologies. Beyond online gaming, augmented reality (AR) has permeated every facet of society's technology-related interactions. AR and other virtual technologies are essential for cutting expenses in marketing and retail. AR is also utilized in the fields of medicine, education, and criminal prevention. In order to save lives in remote locations impacted by natural catastrophes, AR is growing more frequently utilized for humanitarian purposes.

Considered a new technology, the commercialisation of AR may bring incredible business opportunities as well as potential legal risks. In the context of Intellectual Property (IP), AR systems and services can embody a variety of forms of IP. Meanwhile, the operation of AR systems in virtual spaces is raising concerns about how to deal with data breaches and privacy issues.

Augmented reality (AR) is a relatively new technology that enables the blending of virtual elements with the real world in various proportions, achieving a level of immersion that no virtual reality equipment can provide. Recent advances in computer and vision technology enable AR systems to go beyond indoor applications (e.g., surgery and inspection of hazardous environments) to support

[764] Gervais, D. J. (2019). Exploring the Interfaces Between Big Data and Intellectual Property Law. *Journal of Intellectual Property, Information Technology and Electronic Commerce Law (JIPITEC)*, 10(2), 101–113.

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complex analysis, decision-making, and governance processes. [765]Augmented Reality is a combination of a real and a computer-generated or virtual world. It is achieved by augmenting computer-generated images in the real world. It has many applications in the real world. AR is used in various fields, including medical, education, manufacturing, robotics, and entertainment. Augmented reality comes under the field of mixed reality. It can be considered as an inverse reflection of Virtual Reality. They both have certain similarities and differences.[766]

Keywords: Augmented Reality, Intellectual Property Rights, Copyright, Trademark, Patent Law, Digital Content, Legal Challenges, Emerging Solutions.

[765] Sisi Zlatanova Professor at UNSB Built Environment https://www.academia.edu/download/50447644/Augmented_Reality_Technology20161120-9929-1shp9s9.pdf

[766] Riya Aggarwal, Abhishek Singhal https://ieeexplore.ieee.org/abstract/document/8776989

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Introduction

The technology known as augmented reality creates a more engaging and interactive experience for the user by fusing digital content with the physical world. In contrast to virtual reality (VR), which completely submerges the user in a computer-generated environment, augmented reality (AR) superimposes virtual items, data, or images on top of the user's perception of the actual world. A tracking system, a rendering engine, and a display device are the three main parts of the AR concept.

As the viewing platform for the augmented content, the display device can be a smartphone, tablet, specialized AR glasses, or headgear.

The tracking system uses sensors, cameras, and computer vision algorithms to determine the user's position and orientation in the real world, enabling the accurate placement and alignment of virtual elements within the user's field of view. The rendering engine is responsible for generating and rendering the digital content, ensuring that it seamlessly integrates with the real-world environment. One of the most common applications of AR is in mobile apps, where the device's camera and sensors are used to overlay digital information or interactive elements onto the real-world view seen through the camera. This technology has been widely adopted in various industries, including gaming, retail, education, and marketing.

The rapid evolution of augmented reality (AR) technologies has transformed how users interact with digital information by overlaying virtual content onto the physical environment. Initially popularised in gaming and entertainment, AR has now expanded into diverse industries, including healthcare, education, real estate, retail, and manufacturing. [767]As AR integrates the virtual and real worlds, it raises unique questions regarding intellectual property rights (IPR), a legal framework designed to protect creative works, inventions, and brand identities. Unlike traditional digital platforms, AR creates dynamic, context-sensitive experiences that may involve real-world trademarks, copyrighted content, and user-generated data, all within shared virtual spaces.[768] The legal challenges associated with AR stem from the complex overlap of physical and digital domains. For instance, when virtual advertisements are superimposed on real-world locations, issues may arise concerning trademark dilution, copyright infringement, and unfair competition (Gervais, 2019). Similarly, the integration of user-generated content and real-time data collection raises concerns regarding ownership, licensing, and enforcement of IP rights. Existing IP frameworks, primarily developed for traditional media, often struggle to address the hybrid nature of AR experiences.[769]AR has rapidly ascended as a formidable instrument within the media landscape, revolutionising the manner in which users engage with digital content. This innovative technology overlays virtual elements onto the real world, creating an immersive and interactive experience that blurs the lines between physical and digital realms. The objective of this study is to meticulously analyse the multifaceted impact of AR on media production, distribution, and consumption, while placing a concentrated lens on the legal dimensions that accompany its adoption. The advent of AR in media production has introduced novel ways of storytelling and content creation. Filmmakers, journalists, and advertisers are now equipped with tools to craft experiences that allow audiences to step into the narrative, fostering a deeper connection with the content. However, this new form of media production is not without its legal

[767] Billinghurst, M., Clark, A., & Lee, G. (2015). A survey of augmented reality. *Foundations and Trends in Human–Computer Interaction, 8*(2–3), 73–272. https://doi.org/10.1561/1100000049

[768] Perzanowski, A., & Schultz, J. (2016). *The end of ownership: Personal property in the digital economy*. MIT Press.

[769] McKenna, M. (2020). IP in the age of augmented reality. *Journal of Intellectual Property Law & Practice, 15*(7), 525–534. https://doi.org/10.1093/jiplp/jpaa092

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intricacies. Intellectual property rights become a complex issue when digital assets intersect with the real world. Determining ownership and securing the necessary rights for virtual elements superimposed onto physical locations necessitates a thorough understanding of copyright laws and their application in an AR context. Distribution channels for AR content also face legal scrutiny. As AR applications become more prevalent, the methods by which this content reaches consumers must be evaluated for compliance with privacy and data protection laws. The collection and use of location data, biometric information, and user interactions within AR environments raise significant concerns. Media companies must navigate these issues, ensuring that user consent is obtained and that data is handled in accordance with stringent regulations. In AR, the real world serves as a backdrop, blending digital elements into it, typically using a smartphone. By overlaying digital content onto real-life scenarios, it enriches the user experience and creates an interactive environment.[770]

AR is a "augmented" perspective of the world in which computer-generated things are placed on top of the real-world view. When L. Frank Baum originally proposed the concept of an electrical display that depicted a person's personality as embodied in a character that the wearer viewed on people's foreheads in 1901, AR was born. A near-eye heads-up display, the first commercially available embedded computer sport biometric system with a speedometer and performance computer integrated into the goggles, was patented in 1986 by Pete Purdy and Kirk Beach. The phrase "augmented reality" was first used in 1990 and is credited to Tom Caudell.

In 2000, Hirokazu Kato created and released a software called AR Toolkit. Through this software, one could capture real-world actions and combine them with interactions of virtual objects. Soon after, mainstream technologies and applications such as Google Glass, Microsoft HoloLens, Pokémon Go, Google's AR Core, and Apple's ARKit have emerged, finally bringing AR to the masses.[771]Augmented reality (AR) is technology that provides an enhanced, composite version of the real-life, physical world through the use and superimposition of digital audio-visual elements.AR blends the physical world that we live in with virtual reality experiences.

It utilises digital information to augment what we already mentally process in the physical world, and immerses the user in an environment where it is often difficult to differentiate between the physical and the virtual. Some examples of AR that we encounter daily include sponsor logos that appear on sporting fields during sports broadcasts, games like Pokémon Go, where virtual avatars of the eponymous monsters appear superimposed in physical reality and react to the user when viewed through AR applications or devices, and social media filters where images are superimposed over the head of the user.[772]

Research Problem: -

Current IP laws were made for physical inventions or digital works, but not for hybrid technologies like AR.

Hypothesis: -

Current IP frameworks are inadequate to protect innovations and creative works in AR Technologies.

Concept of Augmented Reality: -

Augmented reality is made up of the word "augment," which means to make something great by adding something to it. Essentially, augmented reality is a method that allows us to alter our real world by adding digital elements to it. This is done by superimposing a digital image on the person's current view, thus

[770] Intellectual Property Concerns In Augmented Reality https://ttconsultants.com/intellectual-property-concerns-in-augmented-realityar/

[771] Augmented, Virtual and Mixed Reality – A Reflective Future https://www.nishithdesai.com/Content/document/pdf/ResearchPapers/Augmented_Virtual_and_Mixed_Reality.pdf

[772] The Rise of Augmented Reality and its Novel Challengeshttps://law.nus.edu.sg/trail/rise-of-augmented-reality/

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enhancing the experience of reality. [773]Augmented reality (AR) is the integration of digital information into the user's environment in real-time. Unlike virtual reality (VR), which creates a totally artificial environment, AR users experience a real-world environment with generated perceptual information overlaid on top of it. Augmented reality has a variety of uses, from assisting in the decision-making process to entertainment. AR is used to change natural environments in some way, either visually or to provide additional information to users. The primary benefit of AR is that it seamlessly blends digital and three-dimensional (3D) components with an individual's perception of the real world.[774]AR delivers visual elements, sound, and other sensory information to users through devices such as smartphones, glasses, or headsets. This information is overlaid onto the device to create an interwoven and immersive experience where digital information alters the user's perception of the physical world. The overlaid information can be added to an environment or mask part of the natural environment. Augmented reality (AR) refers to the real-time integration of digital information into a user's environment. AR technology overlays content onto the real world, enriching a user's perception of reality rather than replacing it. AR devices are equipped with cameras, sensors, and displays. This can include smartphones and tablets that create mobile AR experiences, as well as 'wearables' such as smart glasses and headsets. These devices capture the physical world and then integrate digital content (for example, 3D models, images, or videos) into the scene, blending digital and virtual worlds.[775] Augmented reality (AR) is a technology that overlays a real-world environment with a computer-generated one, enhancing the user's experience and shifting their perspective. It can be used in a wide range of applications, from gaming and design to shopping and education. It is a form of mixed reality, combining the real world with digital elements, as opposed to virtual reality (VR), which is entirely digital. [776]Augmented reality (AR) either makes visual changes to a real environment or enhances that environment by adding new information. It can be used for various purposes, including gaming, product visualisation, marketing campaigns, architecture and home design, education, and industrial manufacturing. The virtual object appears on the screen in the real environment, alongside the device's camera input. This way, the users can interact with both the physical world and the virtual object, enriching the experience with data.

Difference between Augmented Reality and Virtual Reality: -

We all know about Virtual Reality. Virtual reality creates a virtual environment and immerses the user in it, whereas augmented reality overlays virtual components onto the user's real-world view. Virtual reality immerses a person in a virtual place created by a computer, whereas augmented reality overlays digital elements into the real world. To experience virtual reality, the person needs to wear a special VR headset that is connected to a computer, such as the Oculus Rift, or a gaming console, like PlayStation VR. However, some devices, such as Google Cardboard, are compatible with smartphones. To experience this, insert a smartphone, wear a headset, and immerse yourself in virtual reality. For augmented reality, you only need a modern smartphone, and then you can easily download an AR app, such as Google's "Just a Line", and try out this technology. There's also a different way to experience augmented reality, through special AR headsets, such as "Google Glass", where

[773] Basics of Augmented Reality https://www.geeksforgeeks.org/blogs/basics-augmented-reality/
[774] Alexander S. Gillis https://www.techtarget.com/whatis/definition/augmented-reality-AR#:~:text=Augmented%20reality%20(AR)%20is%20the,overlaid%20on%20top%20of%20it.
[775] Molly Hayes, Amanda Downie https://www.ibm.com/think/topics/augmented-reality#:~:text=Augmented%20reality%20(AR)%20refers%20to,with%20cameras%2C%20sensors%20and%20displays.
[776] Augmented Reality (AR)https://www.investopedia.com/terms/a/augmented-reality.asp#:~:text=Augmented%20reality%20(AR)%20is%20a%20technology%20that%20overlays%20a%20real,)%2C%20which%20is%20entirely%20digital.

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digital content is displayed on a tiny screen in front of a user's eye, or "Microsoft HoloLens", which displays the information in real world all you have to do is wear the headset and you can see the digital images. VR is the most widely known of these technologies. It is fully immersive, which tricks your senses into thinking you're in a different environment or world apart from the real world. Using a head-mounted display (HMD) or headset, you'll experience a computer-generated world of imagery and sounds in which you can manipulate objects and move around using haptic controllers while tethered to a console or PC. [777]Whereas virtual reality provides complete immersion in a digital environment, augmented reality overlays virtual information on the real world. The real world is enhanced (augmented) by digital details, such as animation, text, and images, in real-time, and users aren't isolated from the real world or what's happening in front of them. Many people got a taste for the potential of augmented reality when the mobile game Pokémon GO rose in popularity, prompting people to chase down digital animals and engage in battles in parks and public places.[778]

How does augmented reality work?

Augmented reality is facilitated through the deployment of camera-equipped hardware, such as smart glasses or heads-up displays. Mobile devices, such as iPads or iPhones, which are already equipped with technologies like GPS, accelerometers, and sensors, are particularly well-suited for augmented reality applications, making the technology more accessible to the average consumer. In recent years, several technology companies have released APIs such as Apple's ARKit and Google's ARCore, which facilitate the development of mobile AR applications for Android and iOS.[779]

Though the types of data and sensors a particular AR software might draw on vary, the basic steps of the AR process are:

1) Sensing and tracking:

An AR device receives a stream of video content from a user's field of vision, sensing the environment and tracking physical objects in view. This may include collecting data from accelerometers, gyroscopes, GPS, or lasers, alongside a video stream, to track the user's position and orientation.

2) Processing and recognition:

AR software scans and processes this environment—this might mean connecting to an object's digital twin, a 3-D copy of the object stored in the cloud. It might also mean using artificial intelligence to recognise the physical object. During this process, AR software processes the information it has received, identifying objects and environmental features that can be augmented. This might involve sensors on the physical object sending data to a digital twin, or combining tracking data with other information, such as a product's price or equipment lifecycle data.

3) Rendering and display:

Information streamed from the AR software is displayed on the AR device, superimposing computer-generated content onto the user's field of vision. Digital information is rendered in the correct perspective and orientation, appearing to the user as if the object is physically present. The user follows interaction instructions by sending commands through a touchscreen, using physical gestures, or speaking aloud. These commands are received by the software and sent to the superimposed digital object, allowing it to be manipulated by the user.

Uses of AR: -

Augmented reality (AR) is being applied in various industries, including manufacturing,

[777] https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented-reality.html

[778] Bernard Marr, Virtual Reality And Augmented Reality https://bernardmarr.com/what-is-the-difference-between-virtual-reality-and-augmented-reality/

[779] Molly Hayes, Amanda Downie https://www.ibm.com/think/topics/augmented-reality#:~:text=Augmented%20reality%20(AR)%20refers%20to,with%20cameras%2C%20sensors%20and%20displays.

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healthcare, and education. The growth of use goes hand in hand with the release of new AR Hardware. The applications range from entertainment (think AR filters with Snap Spectacles from Snapchat) to e-commerce (mostly mobile AR through your smartphone or tablet), or enterprise solutions (think HoloLens). Compared to virtual reality (VR), AR is a lot easier to adapt to and, in most cases, more comfortable to use because the user still sees the physical world around them.[780] Let's explore some real-life applications of this technology:

- Education:

Many schools, organisations, and education resource companies use AR to help students learn and understand better. Schools can apply AR in specific classes to help students understand subjects like astronomy and biology. Students can use the technology to bring photos of animals into the classroom and learn about their anatomy and functions. They can also display and explore images of solar systems to gain a better understanding of the locations of stars and planets. Textbook publishers can utilise AR to make learning more engaging and dynamic. Students can scan specific images in the textbook to make them animate or display additional information.[781]

- Healthcare:

Healthcare and medicine also benefit from AR glasses. Some AR glasses enable surgeons to project an X-ray or a CT scan image over a patient's body, allowing them to see the inside and perform more precise surgeries. Additionally, they can pull patients' records in real-time without interrupting the surgeries.AR glasses, such as Google Glass, help medical institutions provide AR-assisted healthcare. It helps improve healthcare-delivery accuracy and supports safer healthcare services by allowing health professionals to:

- Work hands-free
- Access training videos
- Use images or annotated instructions
- Run quality assurance checklists

These healthcare professionals can also:

1. Record and share voice communications
2. Connect with coworkers through live video streams
3. Collaborate and troubleshoot issues in real-time

Besides smart glasses, several AR apps, such as Medic AR and MEVIS Surgery, provide valuable AR-supported healthcare delivery content for their users.[782] AR can help medical students learn more about the human body by analysing 3D images of its anatomy and systems, similar to its use in the field of education. By scanning specific areas of a patient's body and reviewing pre-existing medical conditions on record, AR can help doctors perform their tasks more effectively.

- Navigation:

Many individuals and businesses use AR apps for navigation. While using their smartphones for navigation, individuals can see guidelines emerge over the road, which helps them understand where they are heading and how to get there. Some apps allow users to scan items and their immediate surroundings to learn more about locations and discover what is nearby. High-end automobiles may utilise AR technology on windshields, offering drivers a head-up display (HUD) that provides navigational information and vehicle statistics.[783]

- Communication:

AR technology is also making communication easier and more interactive. AR-enabled apps such as Snapchat or Instagram allow users to share AR-enhanced content. Such as filters,

[780] Augmented Reality in Different Industries, (May 6, 2022) https://www.circuitstream.com/blog/12-examples-of-augmented-reality-in-different-industries?adobeCleanFontAdded=true
[781] What Is Augmented Reality? (Definition And Applications)https://in.indeed.com/career-advice/career-development/augmented-reality
[782] Augmented Reality in Different Industries, (May 6, 2022) https://www.circuitstream.com/blog/12-examples-of-augmented-reality-in-different-industries?adobeCleanFontAdded=true
[783] What Is Augmented Reality? (Definition And Applications) https://in.indeed.com/career-advice/career-development/augmented-reality

stickers, or animations, making conversations more engaging and fun.[784]

- Entertainment:

AR has numerous potential applications in the entertainment industry. Some companies develop AR games, while others develop AR effects that people can add to videos or social media streams. Some companies combine navigation and entertainment by developing games that players can play while exploring and navigating their physical environment.AR adds a new dimension to entertainment by allowing viewers to become active participants in a show, as opposed to passively viewing it. Creating enticing worlds, immersing the audience in the plot, and offering additional information about what is happening on screen are just a few ways in which AR integration may help make a show more engaging for viewers.

- Navigation:

Many individuals and businesses use AR apps for navigation. While using their smartphones for navigation, individuals can see guidelines emerge over the road, which helps them understand where they are heading and how to get there. Some apps allow users to scan items and their immediate surroundings to learn more about locations and discover what is nearby. High-end automobiles may utilise AR technology on windshields, offering drivers a head-up display (HUD) that provides navigational information and vehicle statistics.[785]

- Logistics:

Timely and efficient delivery is crucial for sustaining businesses, and AR is transforming how logistics companies operate. Logistics workers use AR glasses in warehouse operations to access a digital packing list. It also shows them the best route to cut travel time. AR devices can also scan items to detect damage, pack cargoes in perfectly sized boxes, and maximise freight loading spaces.

- Advertising:

Some organisations rely on AR to enhance the product discovery reality experience. AR provides immersive experiences that emotionally connect brands and viewers. The ads are highly engaging, and consumers can interact with them in real-time, creating positive experiences that drive impressive conversion numbers.[786]

- Retail:

AR technology is used in retail to allow customers to try on clothing and accessories virtually. This technology allows customers to see how a particular product will look on them before making a purchase.

- Tourism:

AR technology is utilised in tourism to enhance the visitor experience. For example, the British Museum utilised AR technology to develop an app that enables visitors to explore the museum and view 3D images of artefacts.

- Shopping:

AR technology is used in retail to provide customers with a more personalised and interactive shopping experience. Customers can use AR apps to try on clothes virtually, see how furniture will look in their homes, or preview products before making a purchase. This technology makes shopping more convenient and enjoyable, and it also reduces the likelihood of making an incorrect purchase.

- Manufacturing:

AR technology is used in manufacturing to improve efficiency and accuracy. For example, workers can use AR glasses to see instructions on how to assemble a product. Also, to visualise how a product will look when completed.

- Art:

AR technology is used in art to create interactive and immersive experiences for

[784]Chanchal Aggarwal (Mar 20, 2023) https://www.shiksha.com/online-courses/articles/augmented-reality-examples-in-real-life/#:~:text=AR%20can%20be%20used%20in,immersive%20and%20realistic%20AR%20experiences.

[785] What Is Augmented Reality? (Definition And Applications) https://in.indeed.com/career-advice/career-development/augmented-reality

[786] Augmented Reality in Different Industries, (May 6, 2022) https://www.circuitstream.com/blog/12-examples-of-augmented-reality-in-different-industries?adobeCleanFontAdded=true

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viewers. For example, the artist Marina Abramovic used AR technology to create an exhibition. It allowed visitors to see virtual objects in real-life spaces.[787]

Essential components for AR to work: -

Essential components for Augmented Reality (AR) to work include hardware (sensors, cameras, processors, and displays) to capture, interpret, and present the real world with digital information, and software (computer vision, 3D rendering, and input handling) to process sensor data, generate digital content, and enable user interaction. These components work together to map the environment, integrate virtual objects into the user's view, and provide a seamless, interactive AR experience.

❖ **Hardware:** -

Sensors and Cameras:

Capture real-time data and a live feed of the user's physical surroundings, which can include accelerometers, gyroscopes, cameras, and GPS.[788]

Processors:

Interpret the data from sensors and cameras, perform computer vision tasks, and handle the complex processing needed to map the environment.

Displays:

Show the augmented experience, overlaying digital information onto the real world. These can be smartphones, tablets, head-mounted displays (HMDs), or AR glasses.

Input Devices:

Devices such as touchscreens, voice commands, or gestures enable users to interact with the AR system and its virtual content.

❖ **Software:** -

Computer Vision:

Software that uses algorithms to understand images and videos from the environment, detect objects, and track their positions and orientations in real-time.[789]

3D Rendering:

Technologies and libraries are used to create and display 3D digital models, ensuring they are correctly positioned and appear integrated with the real world.

Tracking:

Systems that monitor the user's position and movement, along with the context of the environment, to accurately place virtual elements.[790]

Application Software (SDKs):

Specific software development kits, such as ARKit (Apple) or AR Core (Google), provide frameworks for creating and launching AR applications on mobile devices.

Types of AR: -

1. Marker-based AR:

This type of AR, also known as recognition-based AR or image recognition, relies on the identification of markers/user-defined images to function. Marker-based AR requires a marker to activate an augmentation. Markers are distinct patterns that cameras can easily recognize and process, and are visually independent of the environment around them; they can be paper-based or physical objects that exist in the real world.

Maker-based AR works by scanning a marker, which triggers an augmented experience (whether an object, text, video, or animation) to appear on the device. It usually requires

[787] Chanchal Aggarwal (Mar 20, 2023) https://www.shiksha.com/online-courses/articles/augmented-reality-examples-in-real-life/#:~:text=AR%20can%20be%20used%20in,immersive%20and%20realistic%20AR%20experiences.

[788] Lucia Jasenovcova https://www.resco.net/blog/what-is-augmented-reality-and-how-does-ar-work/#:~:text=to%20be%20effective.-,Sensors,the%20user's%20neck%20or%20eyes.

[789] Anusha Sharma https://www.a3logics.com/blog/how-does-the-augmented-reality-framework-work-and-its-impact-on-businesses/#:~:text=engaging%20augmented%20experience.-,Key%20components%20of%20the%20Augmented%20Reality%20framework,for%20placing%20the%203D%20models.

[790] Architecture of Augmented Reality and its Components (06 Mar, 2023) https://www.geeksforgeeks.org/computer-graphics/architecture-of-augmented-reality-and-its-components/

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software in the form of an app, which enables users to scan markers from their device using its camera feed.[791]

Maker-less AR

The second primary type of AR is markerless augmented reality. As the name suggests, markerless AR involves no markers like images or QR codes. Instead, it positions the digital objects by examining the data obtained through the sensors. Instead of a dedicated fiducial marker, markerless AR relies on data provided by geographic location, cameras, sensors like accelerometers or compasses, or even the time of day to determine how to respond.[792] Marker-less AR offers the most control to the user as it allows the user to choose where they would like to place the content. It also allows real-life scale placement of the virtual augmented objects. These AR experiences are highly reliant on smartphone features such as sensors, camera, and processors. Markerless AR is divided into the following types:

Location-based AR

This type of markerless AR uses the real-time location and sensors of a smart device to place the virtual object in a physical space. Due to the availability of smartphone features that provide location detection, location-based AR ties augmentation to a specific place and works by reading data from a device's camera, GPS, digital compass, and accelerometer while predicting where the user is focusing as a trigger to pair dynamic location with points of interest to provide relevant data or information. Information and virtual objects are mapped to specific locations, then displayed when a user's device data matches the location. The reliability of marker-less AR on positional information gathered from a device's camera, GPS, digital compass, and accelerometer makes it more adaptable than marker-based AR, as it does not need an image or object cue to deploy.[793]

Projection-based AR

Projection-based AR involves projecting digital content onto physical surfaces or objects in the real world. This creates an augmented experience for the user without using a headset or any other device. It uses projectors to display virtual images, animations, prototypes, or information directly in the physical space. Some project-based AR also includes sensors, allowing users to interact with the projection. Projection AR, sometimes also referred to as spatial AR, is a method of delivering digital information within a stationary context. It focuses on rendering virtual objects within or on a user's physical space. It is one of the simplest forms of AR where light is projected onto a surface. The interaction occurs by touching the projected surface physically. Projection-based augmented reality uses equipment to project images into a preprogrammed space. As you experience the AR, you are free to walk around and explore the space, but the projected images remain in the designated area. [794]

Superimposition-based AR

Superimposition-based augmented reality replaces one aspect or element of the visual field with something else or overlays an enhanced image onto the object. For example, image filters on social media that replace your face or background with an enhanced image run on superimposition-based AR. The technology needs to categorize the objects in its field of vision to understand which image it needs to replace or improve.

Why is Augmented Reality Important?

The development of AR technology is poised to revolutionise industries ranging from retail to military, education, and tourism, transforming the way we interact with the digital world every

[791] https://digitalpromise.org/initiative/360-story-lab/360-production-guide/investigate/augmented-reality/getting-started-with-ar/types-of-ar/
[792] Augmented Reality: Types of AR https://www.coursera.org/articles/types-of-ar
[793] Types of AR https://digitalpromise.org/initiative/360-story-lab/360-production-guide/investigate/augmented-reality/getting-started-with-ar/types-of-ar/
[794] https://www.coursera.org/articles/types-of-ar

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day. Augmented reality has many uses in different fields, like archaeology and architecture. Visual arts, commerce, education, video games, and military training, etc. Some applications of AR are

1) AR is being used to aid research in archaeology. AR can be used to recreate different structures and overlay them in the real environment, allowing researchers to study them accurately.

2) AR applications in smartphones include Global Positioning System (GPS) to locate the person's location and the phone's built-in compass to find device orientation.

3) Augmented reality can be used in the field of tourism to enrich visitors' experience during visits, like the Eiffel Tower has an AR app that can show you how it looked throughout history when it was being built.

And the list goes on. That's why AR and VR companies raised more than $3 billion in funding in 2017; thus, in 2018, when AR goes mainstream, we can be sure that in the coming years, it will change the way we look at technology and improve the integration of technology in our daily lives.

Case Laws: -

1) *Super Cassettes Industries Ltd. v. Myspace Inc. (2011, Delhi High Court)*[795]

Facts: Super Cassettes Industries Ltd. (popularly known as T-Series) is one of India's biggest owners of music and film copyrights. Myspace (a U.S.-based social networking platform) allowed users to upload videos and music. Many users uploaded songs and videos owned by T-Series without permission. T-Series argued that Myspace was not just a passive platform but was earning money from advertisements shown along with the infringing content. They claimed this amounted to direct copyright infringement.

Court's Decision**:** The Delhi High Court held that Myspace could not escape liability just by saying users uploaded the infringing content. The court said if a platform is aware of infringement and still monetizes or promotes it, it cannot take safe-harbour protection. It was observed that intermediaries have a duty to act when notified about copyright violations. The case strengthened the position of copyright owners by making platforms more responsible.

Why this matters for AR: In Augmented Reality, platforms also allow user-generated content (like 3D objects, videos, or music). If users put copyrighted material into AR spaces (say, adding Bollywood songs to AR experiences), the AR company could also be held liable unless it takes down or controls infringing content quickly.

2) ***Tips Industries Ltd. v. Wynk Music Ltd. (2019, Bombay High Court)***[796]

Facts: Tips Industries Ltd. is a major Indian music company owning copyrights in thousands of songs. Wynk Music, owned by Bharti Airtel, was a music streaming app that allowed users to listen to songs and also download them for offline use. Wynk had earlier entered into a licensing agreement with Tips to stream its songs, but that agreement expired. After the expiry, Wynk continued to stream Tips' songs by relying on the statutory license under Section 31D of the Copyright Act, 1957, which allows broadcasting organizations to use works by paying a statutory royalty. Tips objected, arguing that online streaming apps are not "broadcasting organizations" under the law and Wynk had no right to keep streaming without their consent.

Court's Decision: The Court held that Wynk could not rely on Section 31D. It clarified that Section 31D applies to radio and television broadcasters, not to on-demand online streaming services. Therefore, Wynk was infringing Tips' copyright by streaming songs without a valid license. The court granted an injunction restraining Wynk from streaming Tips' songs without permission.

[795] https://indiankanoon.org/doc/216257/

[796] https://indiankanoon.org/doc/156695842/

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Why it matters for AR: Just like streaming platforms, AR apps often use music, films, or videos inside AR experiences (e.g., background music in AR games or AR shopping apps). This case shows that in India, AR platforms must obtain direct licenses from copyright owners—statutory exceptions for broadcasters will not protect them.

3) ***Christian Louboutin SAS v. Nakul Bajaj & Ors. (2018, Delhi High Court)***[797]

Facts: Christian Louboutin, the French luxury brand, is famous for its red-soled shoes, protected as a trademark. The defendant, Nakul Bajaj, operated an online platform called www.darveys.com, which sold luxury fashion goods, including Christian Louboutin products. Louboutin alleged that Darveys was selling counterfeit and unauthorised goods under its mark. Bajaj argued that Darveys was only an intermediary/online marketplace and not directly responsible for third-party sellers.

Court's Decision: The Court held that Darveys was not a passive intermediary. Darveys actively advertised products, gave guarantees of authenticity, and promoted luxury goods on its platform. Therefore, it was an active participant in the sale of goods, not just a neutral platform. The Court ruled that Darveys was liable for trademark infringement if counterfeit or unauthorised products were sold through its website.

It directed the platform to:

- Disclose complete details of its sellers.
- Obtain guarantees of authenticity from sellers.
- Remove infringing products once notified.

Why it matters for AR: Just like an online marketplace, an AR shopping app or AR try-on platform may show branded products. If such platforms use a brand's trademark without permission or promote counterfeit goods in AR (e.g., virtual red-soled shoes), they can be held directly liable for trademark infringement.

4) ***DM Entertainment Pvt. Ltd. v. Baby Gift House & Ors. (2010, Delhi High Court)***[798]

Facts: DM Entertainment Pvt. Ltd. was the management company of popular Punjabi singer Daler Mehndi. It owned exclusive rights to manage and exploit his personality, including his name, image, and likeness.

The defendants, Baby Gift House and others, were selling toys (dancing dolls) resembling Daler Mehndi. The dolls wore flashy costumes similar to his trademark style. They also sang songs that closely imitated Daler Mehndi's voice and mannerisms.

DM Entertainment claimed that: This amounted to unauthorized commercial exploitation of Daler Mehndi's personality. It violated publicity rights (the right of a person to control the commercial use of their identity). It also amounted to passing off, as the public would believe that the toys were endorsed or authorized by Daler Mehndi. The defendants argued that the toys were just a form of entertainment and not intended to deceive customers.

Court's Decision: The Court recognized that famous personalities have publicity rights, meaning their name, image, likeness, or persona cannot be commercially used without permission. It held that the defendants had unfairly exploited Daler Mehndi's image and popularity for commercial gain.

The Court ruled that: Such unauthorized use amounted to passing off and misappropriation of Daler Mehndi's personality. It also violated his right of publicity under Indian law.

An injunction was granted restraining the defendants from selling or manufacturing such dolls.

Why this matters for AR: In Augmented Reality (AR), celebrities' faces, voices, or digital avatars

[797] https://indiankanoon.org/doc/99622088/

[798] Manupatrahttp://student.manupatra.com/Academic/Studentmodules/Judgments/2022/June/MANU_DE_2043_2010.pdf

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may be used in games, filters, or virtual concerts. Just like the dolls, if an AR app uses a celebrity's image or persona without consent (for example, an AR filter that looks like Daler Mehndi or Shah Rukh Khan), it could violate publicity rights. This case shows that Indian courts will protect celebrities from unauthorized AR exploitation of their identity.

5) ***Telefonaktiebolaget LM Ericsson v. Intex Technologies (2015, Delhi High Court)***[799]

Facts: Ericsson, a Swedish telecom giant, owned several Standard Essential Patents (SEPs) related to GSM, EDGE, and 3G technologies. SEPs are patents that are essential for complying with industry standards (like mobile communication). Intex Technologies, an Indian handset manufacturer, was using Ericsson's patented technology in its mobile phones without taking a license.

Ericsson claimed that Intex was infringing its SEPs. It had offered licenses to Intex on FRAND terms (Fair, Reasonable and Non-Discriminatory), but Intex refused. Ericsson sought an injunction and damages.

Intex argued that Ericsson's royalty demands were excessive and unfair. Ericsson was abusing its dominant position under the Competition Act, 2002. The patents were not valid or enforceable in India.

Court's Decision: The Court upheld the validity of Ericsson's patents and found that Intex had infringed them. It ruled that Ericsson's offer of FRAND licensing was reasonable and Intex's refusal to accept amounted to infringement. The Court restrained Intex from manufacturing, selling, or importing devices that used Ericsson's patented technology without a license. It directed Intex to pay royalties to Ericsson on the sale of its mobile devices. On the competition law issue, the Court held that patent owners are entitled to enforce their rights even if they hold a dominant position, provided their terms are not abusive.

Why it matters for AR: AR devices (like smart glasses, AR-enabled smartphones, and headsets) rely on telecom standards (4G, 5G, Wi-Fi, etc.). Many of these are covered by SEPs. Just like Intex, AR companies in India may also face licensing disputes with SEP holders (Ericsson, Nokia, Qualcomm, etc.). This case shows that Indian courts will enforce SEP patents strictly and require AR device makers to obtain proper licenses under FRAND terms.

6) ***Koninklijke Philips Electronics NV v. Bhagirathi Electronics & Ors. (2017, Delhi High Court)***[800]

Facts: Philips, the Dutch electronics giant, held several patents related to DVD Video technology (essential for making DVD players). Bhagirathi Electronics and others were manufacturing and selling DVD players in India that used this patented technology without taking a license from Philips.

Philips argued that the defendants were infringing its Standard Essential Patents (SEPs) for DVD technology. Since the patents were essential to make DVD players, no manufacturer could avoid using them. The defendants had refused to obtain licenses on FRAND (Fair, Reasonable and Non-Discriminatory) terms.

The defendants contended that: The patents were invalid or not enforceable. They had not directly copied Philips' technology. Philips was demanding excessive royalties.

Court's Decision: The Court upheld the validity of Philips' patents and found that the defendants had indeed infringed them. It emphasized that SEPs must be respected by all manufacturers, since the technology is unavoidable.

The Court ordered the defendants to: Pay damages to Philips, Stop manufacturing and selling infringing DVD players.

The judgment reinforced the principle that SEP holders can seek both injunctions and damages in India.

[799] Indiakanoon https://indiankanoon.org/doc/74163100/

[800] Indiakanoon https://indiankanoon.org/doc/86509297/

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Why it matters for AR: Just like DVD players depended on patented technology, AR devices and software also rely on patented innovations (e.g., AR displays, motion sensors, tracking systems). If AR companies in India use such patented technologies without licenses, they may face lawsuits similar to this case. The case shows that Indian courts support patent enforcement strongly, especially when the technology is standard or essential for an industry.

Suggestions: -

1) Copyright (Copyright Act, 1957):

Who owns AR creations? – The law should clearly say whether rights belong to the developer of the AR app, the platform, or the user who customizes or creates the digital object.

2) Patents (Patents Act, 1970)

Patentability of AR technology – Indian law currently excludes "software per se" from patents (Section 3(k)). This should be relaxed for AR-related inventions where software works with hardware (like AR headsets, gesture-recognition tools).

3) Trademarks (Trade Marks Act, 1999)

Unauthorized use in AR – The Act should clearly state that projecting or displaying a brand/logo in AR without permission counts as infringement.

Brand misuse and dilution – AR can place a brand in negative or false contexts (for example, putting a competitor's logo in a damaging situation). Laws should add clear rules to stop such misuse.

Virtual branding – Add provisions for protecting trademarks in digital spaces like AR, VR, and the Metaverse.

4) Designs (Designs Act, 2000)

Protecting digital designs – At present, design law protects physical articles. It should be extended to cover virtual objects, AR interfaces, and 3D models.

Conclusion: -

Augmented Reality (AR) is reshaping industries ranging from gaming and retail to healthcare and education, but it also challenges the traditional framework of intellectual property law. In India, existing statutes such as the Copyright Act, 1957, Trade Marks Act, 1999, Patents Act, 1970, and Designs Act, 2000 provide some protection, but they were originally designed for physical and conventional digital works. As a result, several grey areas remain—such as ownership of AR-generated content, misuse of trademarks in virtual overlays, limited patentability of AR software, and the absence of protection for purely digital designs. While Indian courts and regulators can adapt existing laws to some extent, long-term solutions require targeted reforms. These include clarifying copyright ownership of AR creations, recognizing trademarks in virtual environments, expanding design protection to digital objects, and modernizing patent law to cover AR innovations. In addition, policy measures like a national AR/VR strategy, technological tools such as blockchain and watermarking for rights management, and industry self-regulation can strengthen protection and enforcement. Ultimately, the goal should be to balance innovation and protection: ensuring that creators, developers, and brands feel secure in their rights, while allowing the AR ecosystem to grow without excessive legal uncertainty. As AR moves closer to the Metaverse, India has an opportunity to position itself as a forward-looking jurisdiction by proactively updating its IP framework and aligning with global best practice