

## RESEARCH ARTICLE

# MONECT PC Remote: Gaming Redefined and Shaping the Future of Gaming Experience with Virtual Remote Layouts

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## ABSTRACT

Since 2012, MONECT has pursued the conceptualization of a virtual remote controller, aiming to accommodate a diverse range of devices and peripherals within the realm of the virtual control landscape. Advancing to 2017–2019, we integrated this conceptualization into a remote desktop session with gaming controls, enhancing functionality across various game genres such as Racing, Frames Per Second (FPS), Role-Playing Game (RPG), and more. Each gaming category featured a tailored setup and a user-friendly layout, catering to different controller preferences. Further evolution occurred between 2019–2024, focusing on rapidly deployable features and advancements in both computing and gaming. Leveraging onboard sensors, the application aimed to provide an immersive gaming experience, utilizing sensors like the Accelerometer, G-Sensor, Gyroscope, Camera, and more. Each sensor played a distinct role in control; for instance, the Gyroscope sensor was activated in FPS mode, enabling precise aiming, while the G-Sensor facilitated steering movements in Race mode. The virtual remote sessions not only granted users the flexibility to use various controllers for specific gaming styles but also allowed simultaneous interaction among devices and peripherals. This real-time remote access, combined with the deployment research project's outcomes, marked a significant stride in providing users with the ultimate gaming experience with remote associativity control access.

**Keywords:** Artificial Intelligence (AI); Computer Vision; Virtual Keypad Controllers; Real-Time Remote Access; Real-Time Virtual Interactive Gameplay; Remote Access Control; Simultaneous Device Peripheral Interaction; User Customization

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# 1. Introduction

Before delving into the specifics, let's establish a foundation with key computing and processing concepts for better understanding. The concepts discussed underwent modifications and customizations to shape the final output for application development. To begin, Remote Desktop Connection (RDC) or Remote Desktop Protocol (RDP) is a proprietary protocol developed by Microsoft. It furnishes a Graphical User Interface (GUI) for users to connect to another computer over a network. For this connection to occur, both devices must grant access to each other. The user deploying the RDP client software initiates the connection, while the other user runs RDP server software. Microsoft officially terms its RDP client software as Remote Desktop Connection, previously known as "Terminal Services Client". However, the established protocol is unidirectional, allowing only one host session and lacking simultaneous interactions among connected devices. MONECT PC Remote introduced a groundbreaking idea for an application that facilitates simultaneous sessions on both hosts or associated devices. This concept gave rise to the PC Remote application. The solution involved creating a device-compatible application integrated into a network association from both the user and device perspectives<sup>[1-3]</sup>. This approach ensured compatibility across different operating systems (iOS, Android, Windows Phone) without rendering limitations. The application boasted various features and integrated functionalities<sup>[4-6]</sup>. Each user's calibration preferences were considered, tailoring the application to diverse needs without requiring additional hardware or assembly. The application leveraged the onboard integrated device peripherals of the smart devices, with its associated users installing the provided driver embedded within the application ([www.monect.com](http://www.monect.com)). The application, named MONECT PC Remote, can be downloaded from the Google Play Store. For clarity and optimal performance, the application's configuration layout was designed based on Android Version 4.0 (Ice Cream Sandwich), ensuring compatibility with nearly 98% of APK platforms. Higher device versions were welcomed for enhanced user experience. The installation process was straightforward: download, install, and configure with basic Wi-Fi connectivity within the same network. This research explores

the application's features, functionalities, and computing advancements in detail.

# 2. Methods and Experimental Designs Formulation for the Application Prototype

Let's begin by addressing the hardware functionality, which was intricately configured within smartphones. Although each smartphone possesses unique features and functionalities, the stability of embedded sensors has remained consistent.

From the inception of smartphones, sensors like the camera, proximity, gyroscope, accelerometer, light, ambient aura, motion, pedometer, rotation vector, orientation, touch, magnetometer, thermometer, microphone, and fingerprint have facilitated mobility and sensory experiences.

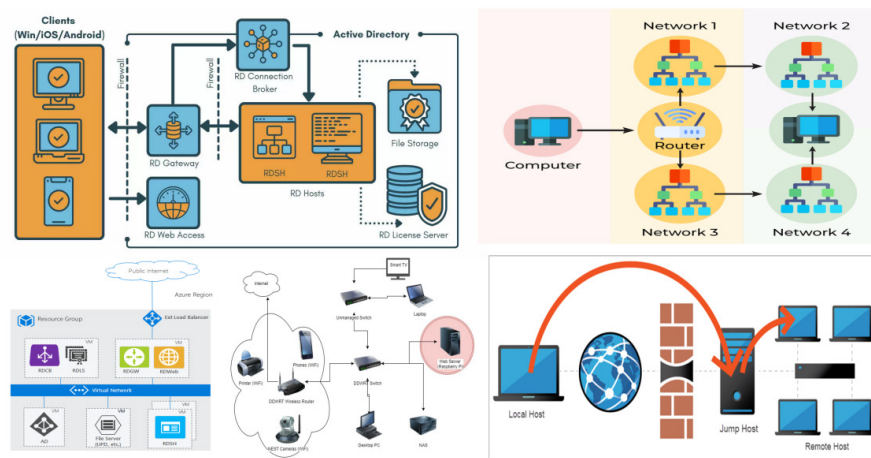
Over time, nearly 95% of smartphones incorporated the necessary sensors for the application, with the remaining aspects addressed through software implementation, encompassing design, coding, wireframing, and terminal command sequences.

To simplify functionality and enhance user experience, the application strategically employed virtual triggers and touch buttons for utility feature deployment. The development of the application unfolded across three phases, with each node connection confirmed through Internet Protocol (IP) within the internet network. While subnet masks and default gateways are integral for internet connections provided by Internet Service Providers (ISPs), it's crucial to note that the connection operates effectively only when users are within the same network. Breaking down the communication bridge within an internet connection, the TCP/IP protocol utilizes subnet masks to determine if a device is on the native subnet or a foreign network. Internet Protocol (IP) Access provides users with an IP address, connecting them to a beacon through an OpenVPN tunnel. The GRE protocol then configures the affiliation across the VPN tunnel. Bluetooth, a wireless technology for short-distance information exchange, and IEEE 802.11 protocols, governing WLANs and Wi-Fi, further contribute to the application's connectivity. Routers, serving as network interfaces, connect devices across various physical layer connections. The 802.11 protocol family, coupled with

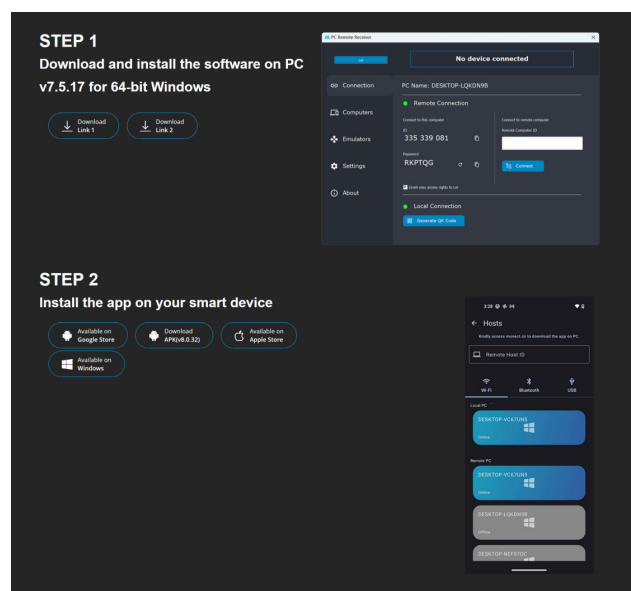
IEEE 802.2, seamlessly carries Internet Protocol traffic. Transmission Control Protocol (TCP) and other protocols handle data on the machine before bundling it into IP packets for transmission over the network. Routers, functioning as intermediaries, read destination IP addresses and route packets, accordingly, ensuring successful data transfer between devices.

The author, involved with MONECT since 2017, has witnessed significant changes in the application's development. In the years from 2019 to 2023, a research paper was published, showcasing specific development sets, including virtual remote sessions. The application continues to evolve, incorporating user recommendations and collaborative ideas. For application setup, users can visit ([www.monect.com](http://www.monect.com)), choose their preferred link for download,

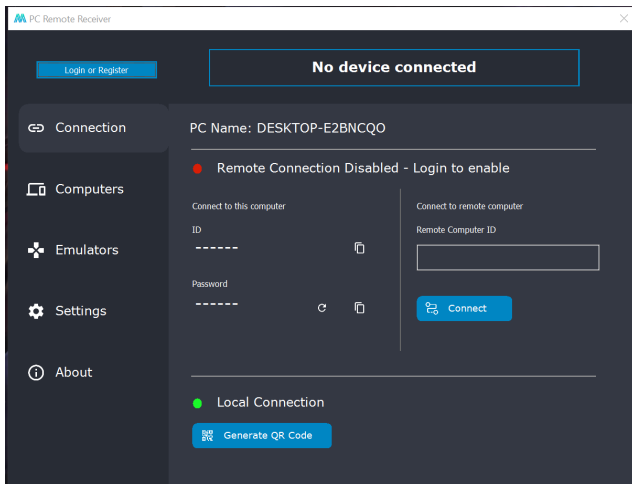
and follow the provided steps. Software upgrades have been tailored for 64-bit versions to optimize performance and enhance user control over the application's tools and features. In terms of software integration, the device driver is pivotal. Post-installation, the application downloads necessary drivers, and users must grant firewall access for successful connection establishment. Pop-ups guide users when drivers are detected, and connections are established. To better understand, the block diagram illustration is provided in **Figure 1** with its associated functionalities integration along with **Figure 2**, which gives the WebView of the application prototype, while **Figures 3** and **4** give the application system layout in PC (Desktop, Laptop, MacBook) and Smartphones respectively.



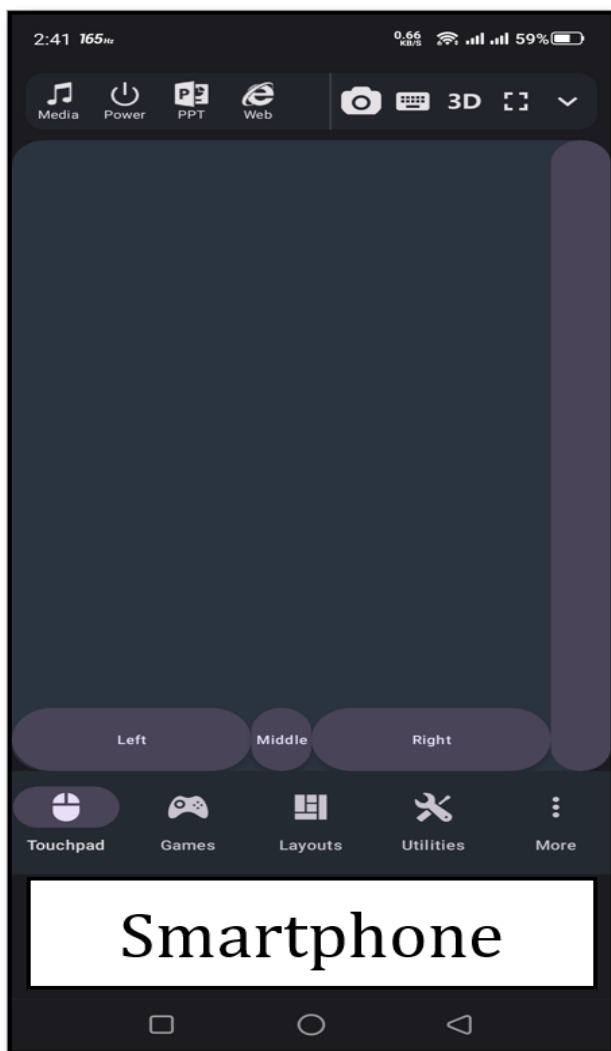
**Figure 1.** The block diagram for the prototype application.



**Figure 2.** The website view for the application with associated instructions.



**Figure 3.** The Application System layout on the PC (Remote Receiver).



**Figure 4.** The application system layout on the smartphone.

### 3. Experimentation and Designs with Results for the Virtual Layouts

In the gaming world, the gamepad stands as a crucial element for optimal performance and precision in rendered gameplay. Whether you're a competitive gamer, a novice, or just a casual player engaging in shooting, chasing, drifting, and precise target allocation, control is of utmost importance. The outcome, whether emerging victorious or scoring the final win, depends on the player's control ability and their associated device controller. The saying holds true: more frames mean more kills and increased frames lead to victory, emphasizing the significance of control efficiency, especially for competitive gamers who often decide victories in split-second shots. Gamepads, introduced in 1983 and released in 1985, were initially complex and challenging to manufacture. Technological advancements in recent years have exceeded gamer expectations, but despite these improvements, gaming setups and the control efficiency of associated peripheral devices remain a costly endeavor. Wiring implementation remains a critical factor, contributing to the overall cost of the setup. When it comes to gaming, the setup of gaming peripherals significantly influences achievement in terms of performance, efficiency, and control. Cost becomes a pivotal concern as it impacts the scaling factor of machinery and control for associated peripherals. Higher-performing machinery tends to come with a higher price tag, affecting the overall user experience in various aspects of real-time, interactive gameplay. The innovation of the smartphone concept and its control connectivity has transformed the gaming and computing landscape. Smartphones have become integral to daily activities, equipped with various sensors that enhance gaming experiences. This is where the application comes into play, offering advanced utility features with a variety of virtual joystick controllers/layouts. Each feature provides real-time simultaneous interactive sessions for various types of gameplays. To elevate the gaming experience, users can design their personal custom controllers/layouts, thanks to the user-friendly design and real-time updating capability of the application. As new games are released and gain popularity, layouts are updated to meet user demands, en-

ensuring a dynamic and collaborative gaming environment. The application's collaboration with FAMICOM, offering various fields of included games, adds to its appeal. Users can directly open and play these games, and if they have personal PC games installed, they can configure the layout from within the game settings. The application integrates itself automatically, and users can assign key buttons as per their preferences. What sets this approach apart is the ability for users to create custom layouts, allowing for alterations and modifications based on individual preferences. The application stands out due to its real-time interaction

gameplay and simultaneous interactive sessions for various rendered gameplay environments. For virtual joystick controllers, the process is similar to physical gamepads and joysticks, with users configuring key assignments for specific actions. The only difference lies in the virtual and remote nature of these controllers, operating in a real-time dynamic session for simultaneous interactions among associated devices. To provide an idea, **Figure 5** gives an overall visualization concerning the matter. The best and advanced feature of the remote desktop session for the application system is provided in **Figure 6**.

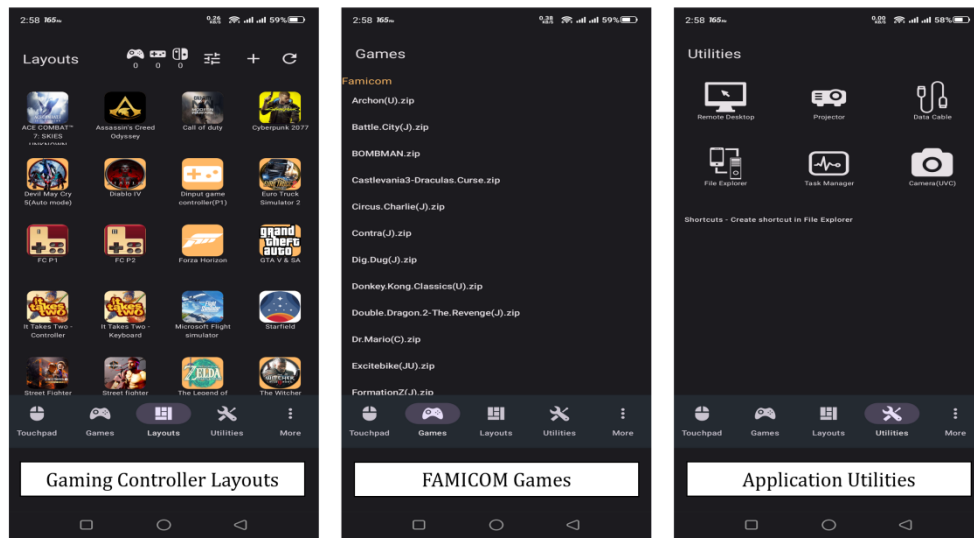


Figure 5. An overview of the gaming functionalities within the application system.

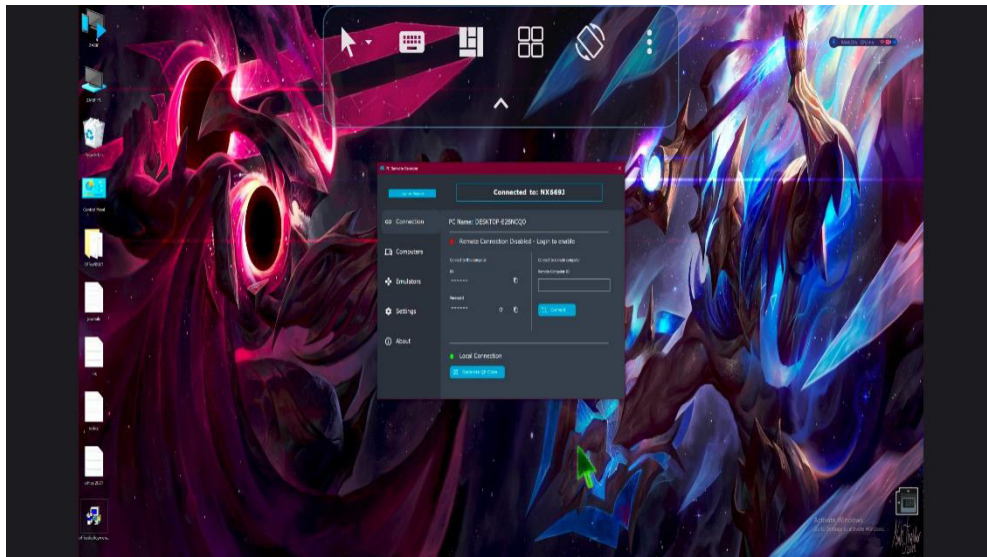


Figure 6. The remote desktop session feature of the application system.



## 4. The Advanced Feature for Remote Desktop Sessions

As a Windows user with its global prevalence, familiarity with Remote Desktop Connections (RDC) is widespread, considering Windows remains one of the oldest and widely used operating systems. While opinions on this may vary, the application introduces a new paradigm in remote sessions, surpassing the limitations of traditional Remote Desktop Connection (RDC) [1–11]. Unlike RDC, which permits only one session at a time from a specific host/guest mode, the app introduces virtual remote sessions, enabling simultaneous interactions and advanced graphical computation protocols for both device and user peripheral associativity [12–22]. The app's development solution addresses the limitation of single-host interaction and provides users with the ability to engage in simultaneous interactions from both the device and user standpoint. To fully grasp the scalability of this feature, users are encouraged to explore and experience the application themselves [23–33]. The designated user has control over access, allowing prioritization based on preferences. Optimal proficiency is a key goal, aiming for a hassle-free experience for users. The concept of remote sessions aims to deliver an exceptional experience in the realm of remote activity.

Beyond remote desktop sessions, the application prototype comes equipped with a wide range of utility tools and features. Remote access is crucial for developers during the design and development phases, facilitating interactions with various peripherals. The application extends this access to microphone and projection integration from the associated device, providing a significant level of remote control, especially beneficial for gamers with multiple peripheral usages [32–40]. While NFC is a potential solution, this application offers a tailored solution for users who stream content or engage in diverse peripheral activities. Users can exercise precise control over data and content present on both devices, enabling real-time interaction and execution. The app becomes particularly useful for tasks requiring relocation of information, data retrieval, problem-solving, brainstorming, and wireframing projects.

The Blackboard remote session functionality allows real-time editing and alteration, with options to save the process as screenshots or photos. Text editing and writing

permissions are accessible from smartphone interfaces, offering a solution for remote document modifications. The integration of Remote Desktop Protocol (RDP) allows users to access Windows OS simultaneously on Android devices. A customizable taskbar facilitates control aspects, catering to variations in display screen sizes across different smartphones. Users can adapt the display according to their preferences for a clear and personalized experience. This feature holds significant value not only in terms of computing and device association but also extends its utility to gaming rendering and video cinematography, as visually illustrated within **Figure 7**.



**Figure 7.** A visual illustration for real-time interactive gameplay sessions.

## 5. Additional Experimental Results with Findings for Features and Functionalities

The features and functionalities described were initially introduced in the timeline of 2017–2019 and subsequently updated within the timeline for 2019–2024. The author initially designed and developed these features as a prototype, and over time, each functionality underwent improvements for enhanced performance and usability.

The author published this research work in 2019 under the IEEE platform. Subsequently, an additional feature

was introduced by the author for real-time desktop remote sessions, which is currently present in the latest version of the application. This feature allows for full real-time interaction on both devices at any given working point. To illustrate, if a user is listening to music on their PC, opening the remote desktop session on their smartphone will display and process the concurrent dynamics, including audio, in real-time. This simultaneous interaction extends to videos as well.

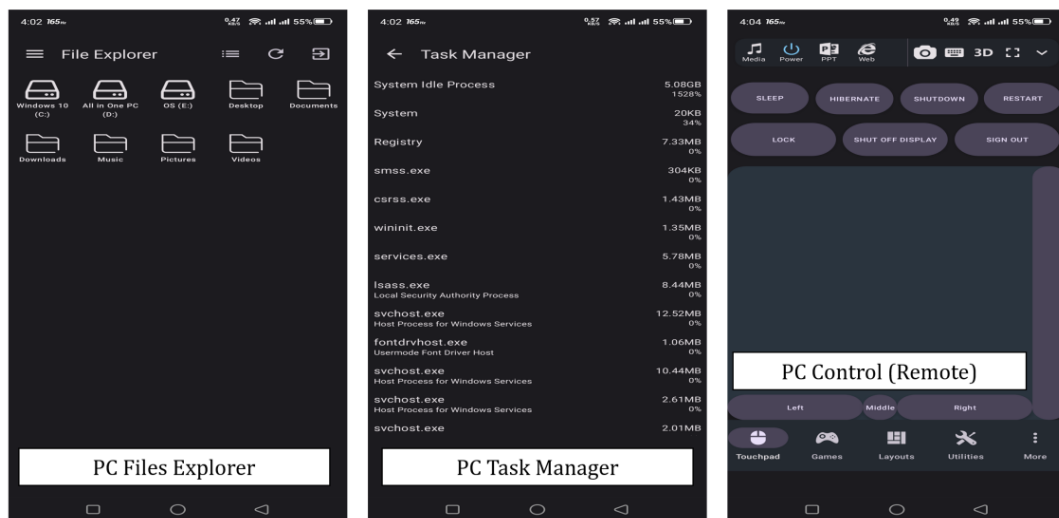
This feature operates seamlessly, avoiding lag and working concurrently for any given time during any state of the process. Users have the flexibility to end the session at any time and, upon reopening, will observe the current dynamics on the PC. Moreover, users can control the Desktop PC environment using the smartphone's touch sensor. This feature provides simultaneous real-time interaction with concurrent dynamics on dual devices, making it a unique and rarely found functionality among today's device peripherals.

In addition to the real-time desktop remote session, the application offers virtual remote control for keyboard, PowerPoint presentations, multimedia functions, webpage search with Uniform Resource Locator (URL) loader, and Operating System (OS) power control (e.g., shutdown, restart, lock, sleep, hibernate, sign out), along with mouse

selection protocols for both left and right controls. Over the years, user feedback and design considerations led to multiple testing and trial phases, resulting in the deployment of the final design features within the application. Concerning the perspective **Figure 8** provides an illustration to the matter.

For PowerPoint presentations, the app introduces a new dimension of productivity and material demonstration within slides. The utility's usage provides a unique experience of functionality and its impact from a remote access perspective. To cater to older generation computers and devices, the integration of Quick Response (QR) codes was included (only for older versions). A QR code generator facilitated immediate interaction and connection. To better understand the matter, **Figure 8** provides an overview visual representation concerning the features involved.

Considering the usage timeline and growth of the application, it has surpassed a gigantic figure of downloads as of the 2021–2024-year timeline, marking a significant milestone. The application offers both a free version and a premium (VIP) version for paid users. Features and functionalities have evolved based on user demand and future device requirements. The application continues to provide regular updates and new features, available to all users through the webpage and Google Play Store.



**Figure 8.** An overview of additional features within the application system.

## 6. Future Designs and Development Directions

As technology continues to evolve, incorporating advancements in AI, Machine Learning, and Deep Learning, the landscape of device peripherals undergoes significant transformations. This application prototype, in alignment with this trend, aspires to continually enhance and elevate its performance and efficiency. The ever-evolving nature of technology allows for the exploration and potential implementation of computer vision, image processing, and video encoding advancements, particularly in the context of streaming—an experimental feature already present in the application.

Beyond its gaming-centric functionalities, this application serves a diverse user base, including technical professionals engaged in work, project design, and development. The integration of AI holds the promise of enhancing the overall gaming experience, introducing novel rendering techniques. Numerous ideas are under consideration for future deployment, and as they materialize, users can anticipate a richer and more dynamic application environment in the years to come.

## 7. Discussions

MONECT, from its inception in 2012 to its present state in 2025, has undergone a revolutionary transformation, positioning itself as a trailblazing application in the domain of virtual remote control. The journey begins with the conceptualization of a gaming-centric platform, paving the way for a dynamic fusion of gaming, computing, and remote access features.

In the realm of gaming, MONECT introduces a paradigm shift, offering users an unprecedented level of control through virtual remote sessions. By harnessing the capabilities of smartphone sensors, the application caters to diverse gaming genres, redefining the gaming experience. The integration of gamepads, tracing their evolution since 1983, underscores MONECT's commitment to staying at the forefront of gaming control efficiency. The discussion recognizes the transformative impact of smartphones on gaming and computing, heralding a new era of comprehensive device control.

Beyond gaming, MONECT's influence extends to hardware functionality. By utilizing smartphone sensors, the application eliminates the need for additional hardware, ensuring compatibility across various platforms. The user-friendly interface and simplified installation process contribute to the broad appeal of the application.

MONECT's transformative impact extends to remote desktop functionality, transcending the limitations of traditional Remote Desktop Connections (RDC). The application introduces simultaneous interactions between devices, offering real-time desktop remote sessions that provide live views of concurrent dynamics. Utility tools and features, such as PowerPoint control, multimedia management, web-page search, and OS power control, position MONECT as a versatile solution catering to various user needs. With MONECT's demanding popularity, which underscores its impact, offering both free and premium versions, the application's commitment to continuous improvement, user-friendly design, and adaptability to emerging technologies solidifies its position as a transformative force in the computing and gaming domain.

## 8. Conclusions

In essence, the pivotal distinction that emerged lies in the users' newfound ability to operate the application and, if necessary, tailor their customized layouts for direct usage. This marked a significant departure, as the application offered users the unique opportunity to not only operate but also modify layouts based on their preferences. In the realm of remote access, the degree of functionality provided by the application is notably rare, especially considering the vast array of apps available globally. Furthermore, the application has ushered in a transformative era in computing, particularly in terms of gaming and performance rendering, by introducing a novel dimension to virtual remote access control. Beyond its significance for gamers, the app holds considerable value for professionals and researchers alike, offering a fresh perspective on minimizing hardware complexity and reducing costs associated with it.

In the contemporary landscape of computing, it stands as a versatile controller encompassing all device peripherals, providing a comprehensive solution for users across diverse domains. This application thus contributes



to the modernization of computing practices, streamlining accessibility and control for a broad spectrum of users in today's technological era.

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This work received no external funding.

## Institutional Review Board Statement

Not Applicable.

## Informed Consent Statement

Not Applicable.

## Data Availability Statement

The various original data sources, some of which are not all publicly available, contain various types of private information. The available platform provided data sources that support the findings and information of the research investigations and are referenced where appropriate.

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## Conflicts of Interest

The author declares no conflict of interest.

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