

From Eyes To Strategy: Implications Of Retina Scans For The Dynamics Of Insurgency Patterns

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Abstract

Not only have strategies and actors changed, but the transformation in contemporary conflict zones has also been driven by the introduction of advanced technologies that have changed the way surveillance and control are carried out. One important innovation in this regard is the use of biometric technology, specifically retinal scanning, which has been widely used in counterinsurgency operations in various conflict zones. This technology allows individuals to be accurately identified through their unique biometric characteristics, making it a vital tool for monitoring populations, blocking access to strategic areas, and tracking insurgents.

This study examines the strategic impact of the use of retinal scanning on insurgency patterns, including rebel movements, civil society support, and tactical changes in asymmetric conflicts. It illustrates how this technology is used to control the conflict field and as a political-military strategy through a study of literature and contemporary conflict cases.

The results of the study show that the pattern of insurgency is significantly affected by the use of retinal scanning. This technology reduces the freedom of movement of rebels because their identities are more easily traced, reduces civil society support, and encourages them to use new tactics that are more decentralized, hidden, and based on small networks. Therefore, retinal scanning serves not only as a technical tool but also as a strategic tool to change the dynamics of contemporary conflict.

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INTRODUCTION

Contemporary conflicts have undergone a drastic shift from conventional warfare to asymmetric warfare. These conflicts involve non-state actors and decentralized networks. In such situations, surveillance technology is crucial for security and counterinsurgency strategies. One advanced technology within the field of biometrics is retinal scanning. Retinal scanning is a technology that uses the unique patterns found on every person's retina to identify and verify a person's identity. The retina is a thin layer at the back of the eye that contains blood vessels. Every person in the world has a blood vessel pattern that is different from everyone else's; even identical twins have different blood vessel patterns. Therefore, retinal scanning is a highly secure form of identification (Aura, 2025).

Retinal scanning biometric technology has been widely used in Indonesia for example, in attendance systems at government agencies to improve discipline and foster a positive work culture within an organization (Nasution, 2022). However, the implementation of this technology has also raised concerns regarding the protection of personal data. Biometric data is permanent and cannot be altered in the event of a data breach (Fadhilla, 2025).

The use of retinal scanning in the context of counterinsurgency has the potential to alter the dynamics and patterns of insurgency by limiting the rebels' freedom of movement, reducing civilian support due to tighter surveillance, and encouraging a shift toward more decentralized and covert tactics.

Based on the above background, this study will address the following:

1. How does the use of retinal scans change the dynamics and patterns of insurgency?
2. What are the impacts of retinal scans on insurgency patterns in conflict zones?

This study employs a descriptive qualitative research approach using the case study method. It utilizes secondary data sources. The data were obtained through a literature review. The data sources consist of books and journals that have undergone a research process on topics similar to this study. The purpose of this paper is to analyze how retinal scanning technology influences the strategies and adaptations of insurgents in asymmetric conflicts.



LITERATURE REVIEW

A. The Concept of Patterns of Insurgency

A strong defense is a sign of a strong nation. According to Law of the Republic of Indonesia No. 3 of 2002 on National Defense, Article 1 stipulates that all efforts to defend the sovereignty of the state, the territorial integrity of the Unitary State of the Republic of Indonesia, and the safety of the entire nation from threats or disturbances to the sovereignty of the state and the nation are considered national defense (Ministry of Defense of the Republic of Indonesia, 2018) (Law No. 3 of 2002 on National Defense). One of the real threats to national integrity is insurgency. The term “insurgency” is used to describe a movement aimed at overthrowing the current government or an established government composed of officials who have been legally elected and possess legal authority (Hapsari, 2017).

Bard E. O'Neill defines insurgency in his book **Insurgency and Terrorism: From Revolution to Apocalypse** as: “An armed struggle waged by a group or movement seeking to overthrow the ruling government and replace it with a political system of their own choosing” (O'Neill, 2005). The four main strategies of insurgency are conspiracy, urban warfare, gradualism, and military-focus (O'Neill, 2005).

Conspiratorial strategies are employed without involving the masses, but rather by carrying out a rapid seizure of power at the elite level, such as a coup d'état. Urban warfare is typically waged through terrorism and sabotage in urban areas, exploiting the complexity of urban life as a source of shelter and logistics.

In his book, O'Neill divides insurgencies into eight main categories based on ideology and political objectives:

1. Anarchist insurgencies aim to abolish all forms of government and create a society without formal authority structures or hierarchies.
2. Egalitarian insurgencies are rooted in communist or radical socialist ideologies and seek to achieve comprehensive economic and social equality.
3. Traditionalist insurgencies seek to preserve or restore traditional social orders, such as feudal structures or conservative religious systems.
4. Pluralist insurgencies promote liberal democracy.
5. Secularist insurgencies seek to separate religion from the state and oppose systems of government centered on theocracy or the supremacy of a particular religion.



6. Reformist insurgencies seek to structurally reform political or economic systems without overthrowing the system as a whole.
7. Separatist insurgencies seek to secede from the parent state and form a new state based on cultural, geographic, or ethnic identity.
8. Preservationist insurgencies seek to maintain the existing political or economic system without overthrowing it.

Meanwhile, counterinsurgency expert David Kilcullen proposes an approach known as the “Three Pillars of Counterinsurgency” (Kilcullen, 2006).

1. Security: Protecting the public from the threat of insurgency.
2. Political: Establishing a legitimate government that addresses the needs of the people.
3. Economic: Providing economic services and opportunities to improve the well-being of the community.

Kilcullen emphasized that understanding the local context and building trust with the local community are crucial to successfully countering attacks.

Types of insurgency patterns:

1. Rural-Based Insurgency

As a base of operations, this model relies on hard-to-reach rural areas. Insurgent groups use the complex terrain to conceal their activities and gain support from the local population (O'Neill, 2005).

2. Urban Insurgency

Insurgent groups operate in urban areas, exploiting the social complexity and urban infrastructure to carry out sabotage, propaganda, and terrorist attacks (Kilcullen D., 2009).

3. Networked Insurgency

Insurgent groups consist of small, loosely connected cells, which allow for flexibility and rapid adaptation to changing conditions (Kilcullen, D., 2010).

4. Decentralized Insurgency

Insurgent groups lack a clear central command structure, allowing smaller groups to operate independently but toward a common goal.

The success or failure of an insurgency is greatly influenced by the following factors:

1. Environment: Remote areas, forests, or mountainous regions can provide strategic advantages to insurgent groups because they can hide and move freely.



2. Logistics: The ability to obtain and deliver resources such as weapons, food, and information is crucial to the sustainability of insurgent operations.
3. Community Support: Insurgent groups can gain protection, information, and recruits through the support or sympathy of the local community. Conversely, losing community support can significantly weaken their position.

B. The Development of Biometric Technology in Conflict

Biometric technology uses a person's unique physical or behavioral characteristics to identify and verify their identity. Biometrics typically uses biological data, such as voice, iris, face, and fingerprints. The system compares this data with information in a database to determine a person's identity. Biometric technology has advanced rapidly in the field of security and is widely used for identity authentication when granting access to restricted areas (Sardi, 2024).

Because everyone's retinal pattern is unique, criminal investigations require a sophisticated and accurate process. First, biometric data from the suspect's retina is collected using an infrared camera, which can identify the blood vessel patterns in their retina. Then, these patterns are analyzed using a computer algorithm that compares the retinal patterns with those in a pre-existing database to find a match. This method offers the advantage of a very high level of accuracy, as retinal patterns are nearly impossible to forge or significantly alter. Furthermore, retinal identification serves as a powerful tool for identifying criminals, particularly in cases where the perpetrator uses physical disguise. Additionally, this technology is highly secure because it relies solely on the eye, reducing the likelihood of errors or data manipulation (Sardi, 2024).

Although biometric technology has many advantages, the risk of errors and potential misuse is very high when it is used. Poor data quality such as low-quality images or less-than-ideal environmental conditions during data collection can lead to recognition errors in biometric data.

Biometric analysis may contain built-in biases, which can result in racial or gender discrimination against certain groups. Misuse of this technology such as the unauthorized use of biometric data or excessive surveillance can violate people's privacy. This raises legal and ethical issues, so governments and law enforcement agencies must exercise caution when using biometric technology to avoid violating human rights in their efforts to maintain public safety.

The primary functions of retinal scanning in security systems are as follows:

1. Identification and Verification: Ensuring that the person accessing a specific system or location is indeed authorized.



2. Prevention of Identity Fraud: Unique retinal patterns make it difficult for unauthorized parties to impersonate others.
3. Access Control: This is used to control access to facilities or sensitive information so that only authorized individuals can enter.

In the context of conflict, biometric technology, including retinal scanning, has been used by coalition forces to:

1. Build an Identity Database: Collect biometric data from local residents to help identify individuals involved in insurgent activities.
2. Access Control in Secure Zones: Scanning retinas to control who can enter specific areas, such as green zones or military bases.
3. Tracking and Surveillance: Monitoring the activities of individuals suspected of being involved in terrorist or insurgent activities.

This technology enhances the security and efficiency of military operations and aids in counterinsurgency efforts.

Biometric technology, particularly retinal scanning, is crucial for counterinsurgency strategies:

1. Rapid Identification: Enables security forces to quickly identify individuals involved in insurgencies.
2. Activity Tracking: Helps prevent terrorist attacks or activities by monitoring the movements and activities of suspected individuals.
3. Strict Access Control: Reduces the risk of infiltration by insurgents by ensuring that only verified individuals can access sensitive facilities or information.

To implement this technology, ethical and privacy considerations, as well as strict regulations, are necessary to prevent the misuse of biometric data.

C. Modern Counterinsurgency Theory

Information and intelligence are crucial in contemporary counterinsurgency strategies for identifying, mapping, and neutralizing insurgent networks. To identify threats, intelligence agencies gather data from various sources, including open and closed sources. They also monitor digital communications and social media activity. These methods enable early identification and rapid response to insurgent actions (Lettu Arh Nur Afiad Syamiajaya, 2024).

The Mystic Diamond model is employed, emphasizing the importance of integrating military, diplomatic, economic, and psychological operations in countering insurgencies. In



addressing the conflict in Papua, this model has been applied with a focus on gathering intelligence to locate and combat separatist networks (Lettu Arh Nur Afiad Syamiajaya, 2024).

Data-driven interventions involve the use of information technology and data analysis to develop successful strategies for preventing and managing insurgencies. The data collected is used for the following purposes (Nudan, 2025):

1. Early Detection: Identifying potential threats before they materialize.
2. Activity Monitoring: Studying the patterns and strategies of insurgent groups by observing their movements and communications.
3. Strategy Evaluation: Assessing the effectiveness of actions taken and using the data to adjust strategies.

This method also involves the use of advanced technology in intelligence and counterintelligence operations, such as the use of digital devices for surveillance and infiltration into insurgent cells.

RESEARCH METHODS

This study employs a qualitative-descriptive approach aimed at gaining an in-depth understanding of the phenomenon of biometric technology use—specifically retinal scanning—in the context of insurgency dynamics. This approach was chosen because it can comprehensively and contextually describe how a technology influences the strategies, movement patterns, and adaptations of insurgents in asymmetric conflicts. The methods used in this study are literature review and case studies. This study utilizes secondary data sources, specifically books and journals that have undergone research processes on topics similar to this study. This study examines how the use of retinal scanning alters the dynamics and patterns of insurgency and what impacts the use of retinal scanning has on insurgency patterns in conflict zones. The purpose of this paper is to analyze how retinal scanning technology influences the strategies and adaptations of insurgents in asymmetric conflicts.

RESULTS AND DISCUSSION

A. The Use of Retinal Scanning in Conflict Zones

In conflict zones, retinal scanning technology has become a key component of contemporary security approaches. Population databases are created using this technology to verify identities at checkpoints and track down individuals involved in insurgencies.



1. Population Database System

An accurate and forgery-resistant identity database can be created using retinal scanning technology. Each person's retinal blood vessel pattern is unique, making biometric identification reliable (Irianto, 2021). In terms of security, this database helps with:

- a. Rapid Identification: Enables law enforcement to quickly identify suspects.
- b. Infiltration Prevention: Prevents unauthorized individuals from entering sensitive areas.
- c. Activity Tracking: Records how a person moves around a conflict zone.

A study shows that the Euclidean Distance Metrics method for retinal identification can achieve a high level of accuracy, making it effective for security systems (Irianto, 2021).

2. Checkpoints and Biometric Verification Systems

Retinal scanning technology is used at checkpoints to verify identity in real time. This process includes (Indra, 2016):

- a. Retinal Scanning: The process of capturing an image of a person's retina.
- b. Data Matching: Comparing the image with the current database.
- c. Access Verification: Depending on the matching results, granting or denying access.

To improve the accuracy of retinal image recognition, techniques such as non-overlapping blocks and Euclidean distance have been used (Siboro, 2017).

3. Tracking rebels using retinal scans

Retinal scanning technology is used for (Irianto, 2021):

- a. Suspect Identification: Identifying individuals involved in insurgencies.
- b. Movement Tracking: Tracking the locations of suspected individuals and their movements.
- c. Evidence Collection: Accurate biometric data aids the legal process.

B. Changes in the Dynamics and Patterns of Insurgency

Changes in the dynamics and tactics of insurgency in Indonesia indicate that insurgent groups have undergone significant transformations in response to advances in security and counterinsurgency strategies. Insurgent groups typically avoid areas with extensive biometric surveillance, such as checkpoints equipped with fingerprint or retinal scanners. This drives them to move to more remote or less-monitored locations to avoid identification and arrest. Insurgent groups employ looser, decentralized organizational structures to evade pursuit by law enforcement. This method allows them to operate independently in small cells, so that the

identification or capture of a single cell does not immediately expose the entire network. Insurgent groups change the way they communicate by avoiding traceable logistics routes and public access points. They switch to more secure and harder-to-trace channels for communication, such as encrypted messaging apps or face-to-face meetings at secret locations.

CONCLUSION

In conflict zones, retinal scanning technology has become a critical component of contemporary security systems, particularly in the context of counterinsurgency. This technology serves not only as an identification tool but also as an active strategy for deterring, detecting, and monitoring the activities of insurgent groups. Biometric technology is highly effective in controlling access and gathering field intelligence by creating accurate population databases, verifying identities at checkpoints, and monitoring individuals involved in insurgencies. However, the success of this technology also has a direct impact on how the dynamics of insurgency are changing. Biometric surveillance drives terrorists to use more secure and untraceable communication methods, build decentralized organizations, and move to more hidden areas. Consequently, insurgency patterns are becoming increasingly flexible and more difficult to identify through conventional means.

In situations like this, retinal scanning technology can be used not only as a surveillance tool, but also as a strategic tool to combat insurgency. However, its success depends heavily on a contextual approach that respects individual rights and does not create new barriers within society. Therefore, the use of biometric technology must be accompanied by an ethical approach, transparent public engagement, and integration with sustainable national security policies.

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