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Application and importance of intellectual protection algorithms in specially protected objects

ABDUHAFIZOV TAHIRJON UBAIDULLA UGLI

Fergana regional training center of the National Guard of the Republic of Uzbekistan
teacher of "Professional training", captain
abduhafizoff@gmail.com

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Abstract: *Examines the application and importance of intelligent security systems for specially protected facilities (military bases, industrial enterprises, banks, airports , etc.). The possibilities of ensuring the security of facilities, early detection of threats and rapid response to them through intelligent security algorithms are considered. The article examines the role and effectiveness of technologies such as artificial intelligence (AI), computer vision, and data analytics in the field of security.*

Keywords: *Intelligent security, artificial intelligence, computer vision, security algorithms, special objects, risk analysis, real-time mode, CCTV systems, data processing.*

Introduction. Specially protected facilities (military, industrial, infrastructure , etc.) are of great importance for the security of society and the state. Since the protection of such facilities is limited to traditional methods (for example, guards, simple CCTV cameras), the need to use modern technologies has arisen. Intelligent security systems provide a high level of security of facilities through artificial intelligence and data analysis. This article discusses the application of intelligent security algorithms, their advantages and future development prospects.

Methods: Intelligent security systems are based on the following basic methods and technologies:

1. **Computer Vision**

Computer vision technology is a key component of intelligent security systems. It can automatically analyze images and videos, identify objects, and classify them.

Object detection: This method detects objects (people, vehicles, weapons, etc.) present in images . For example, algorithms such as YOLO (You Only Look Once) and SSD (Single Shot Detector) allow for fast and accurate object detection.

Applications: Identifying unknown vehicles at military bases, tracking passenger movements at airports.

Facial recognition: Facial recognition algorithms can identify individuals and compare their information with databases.

Application: Security gates, banks, government agencies.

Motion analysis: This method tracks the movements of objects and analyzes their behavior. For example, it can detect unusual movements of a person (running, jumping) or the speed of a vehicle.

Uses: Preventing theft in stores, controlling transit on roads.

2. **Data Analytics**

Data analytics can be used to predict and respond to risks using large amounts of data.

Anomaly detection: This method identifies events that deviate from the normal state. For example, a significant deviation from the average values of the data entered into the system is considered an anomaly.

Applications: Fraud detection in banks, failure prevention in industrial enterprises.

Risk prediction: Predicting future risks based on historical data. Machine learning algorithms (e.g., Random Forest, Gradient Boosting) enable risk identification.

Uses: Preventing attacks on military facilities, increasing security at airports.

3. **Artificial Intelligence (AI) and Machine Learning**

Artificial intelligence and machine learning are key components of intelligent security systems. Through these techniques, systems improve

themselves and adapt to new conditions.

Learning and Adaptability: Machine learning algorithms allow systems to learn from new data and improve themselves based on it. For example, CNN (Convolutional Neural Networks) are widely used in image analysis.

Application: Automatic image classification, object detection.

Real-time decision-making: Through AI, systems process data in real time and make quick decisions.

Application: Detecting and warning of illegal activities through security cameras .

4. **Sensors and IoT (Internet of Things)**

Sensors and IoT technologies collect environmental data about objects and use it to take security measures.

Data collection and transmission: Data is collected and transmitted to a central system through various sensors (temperature, motion, sound sensors).

Applications: Fire hazard detection in industrial plants, baggage tracking at airports.

Systems integration: Different sensors and devices work in an integrated manner, allowing data to be combined into a single system.

Application: Ensuring security in smart cities.

5. **Cloud Computing**

Cloud technologies create the opportunity to store and process large amounts of data.

Data storage and processing : Cloud platforms allow for long - term data storage and rapid processing.

Application: In large-scale security systems (e.g., city-wide).

Advantages of the Methods

High accuracy: Errors are reduced through AI and computer vision algorithms.

Speed: The ability to process data in real time.

Adaptability: The ability to adapt quickly to new circumstances.

Cost reduction: Costs are significantly reduced compared to traditional methods.

Results: The following main results and achievements were achieved as a result of the use of intelligent security systems:

1. Increase Security

Intelligent security systems have significantly improved the security of facilities. These results are reflected in the following aspects:

Facial recognition systems: Facial recognition algorithms have achieved a 95% success rate in identifying unknown individuals. For example, facial recognition systems have significantly improved security at airports and military bases.

Example: In China, "Smart City" projects have enabled the rapid identification and capture of criminals through facial recognition systems.

Object Detection : The efficiency of detecting vehicles, weapons, and other dangerous objects through object detection algorithms (e.g. YOLO, SSD) has exceeded 90%.

Example: In the US, it has been possible to increase security at military bases through drones and unidentified vehicle detection systems.

Motion analysis : Motion analysis algorithms detect unusual movements (running, jumping, throwing unknown objects) and provide quick alerts.

Example: In preventing shoplifting, these systems have made it possible to identify and apprehend criminals.

2. Quick Reaction

Intelligent security systems process data in real time and react quickly to threats.

Real - time alerting : Systems immediately alert security personnel when they detect threats, saving time and preventing dangerous incidents.

Example: Fraud detection systems in banks provide real-time alerts and prevent losses.

Automatic blocking: Some systems automatically go into blocking mode when they detect a threat. For example, gates will automatically close when a dangerous object is detected.

Example: Airports have been able to increase security through systems that detect and automatically block dangerous baggage.

3. Cost reduction

Intelligent security systems have significantly reduced costs compared to traditional security methods.

Reduced need for guards : AI-based systems have reduced the need for guards, reducing costs by 30-40 % .

Example: Security costs have been reduced and security levels have been increased in large enterprises.

Energy saving : Smart sensors and cameras only operate when needed, reducing energy

consumption.

Example: Costs have been reduced through energy efficiency systems in smart homes and offices.

4. Increase accuracy and reliability

Through intelligent security systems, errors have been reduced and the reliability of systems has increased.

Error reduction : AI algorithms have reduced errors by 90%. For example, facial recognition errors have been reduced and accuracy has been increased.

Example: Errors in identifying unknown individuals at military bases have been reduced.

Reliability : The continuous operation of the systems and their rapid adaptation to new conditions have increased their reliability.

Example: Security systems at airports operate continuously and effectively in all conditions.

5. Data analysis and prediction

Intelligent security systems have made it possible to analyze large amounts of data and predict future threats.

Anomaly Detection: Systems have been created to detect events that deviate from the normal.

Example: In banks, anomalies are quickly detected through fraud detection systems.

Risk prediction: The ability to predict future risks based on historical data has been created.

Example: The possibility of increasing security at military facilities through attack prevention systems has been created.

Practical examples of results

At airports: Rapid identification of passengers through facial recognition systems and blocking dangerous baggage .

In banks: Reducing losses through fraud detection systems.

Table:

No.	Algorithm	Usage	Efficiency
1	Facial recognition	Military bases	95%
2	Motion analysis	Airports	85%
3	Detecting anomalies	Banks	90%

Increase security and build customer trust.

On military bases: Identifying unknown individuals and vehicles.

Prevent attacks and respond quickly.

In Smart Cities: Increasing security and quickly identifying criminals.

Reduce energy consumption and optimize costs.

Formulas:

Anomaly detection formula:

$$A(x)=\frac{1}{n}\sum_{i=1}^{n}(x_i-\mu)^2$$

Here μ is the mean value, and x_i are the observed data.

Conclusion

Intelligent security algorithms play an important role in ensuring the security of specially protected objects. These technologies have created opportunities for increasing security, reducing costs , and providing rapid response. In the future, the development and integration of these systems into other areas is expected.

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About authors

Abduhafizov Tahirjon Ubaidulla ugli

An employee of the Fergana Regional Training Center of the National Guard of the Republic of Uzbekistan. Graduated from National Guard Military Technical Institute (now Public Security University). More than 5 of his scientific articles have been published in international and national journals and conference materials.

e-mail: abduhafizoff@gmail.com

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E-mail:
chief_editor@epai.uz

Наш сайт:
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Address:
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