Research on the Construction of an Intelligent Agent for Precise Matching and Dispatch of "Police Cases, Personnel, and Equipment"

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***Abstract*—Under the strategic backdrop of "Digital China" and "Smart Policing," the traditional policing dispatch model, which relies on manual experience, faces challenges such as information lag, protracted decision-making, and uneven resource allocation when coping with complex and dynamic social security risks. To address this, this paper proposes a construction scheme for a "Police Case–Personnel–Equipment" precise matching and dispatch intelligent agent based on the DeepSeek large language model [1]. Centered around a "Perception–Decision–Execution" core architecture, this intelligent agent integrates multi-source heterogeneous policing data and leverages knowledge graph and semantic understanding technologies to achieve in-depth analysis of police cases and intelligent resource allocation. The system employs a collaborative "Cloud Brain + Edge Terminal" mechanism, balancing global coordination with real-time on-scene response. Research demonstrates that the proposed model holds significant advantages in information fusion, knowledge representation, and semantic reasoning, offering public security organs a replicable and scalable intelligent decision-making framework, thereby promoting the evolution of police dispatch towards a more scientific, precise, and proactive paradigm.**

***Keywords*—police intelligence agent, DeepSeek, knowledge graph, precise dispatch**

I. Introduction

Driven by emerging technologies such as artificial intelligence and big data, the construction of "Smart Policing" is advancing rapidly. However, the intelligence level of police command and dispatch remains a significant bottleneck, lagging behind and constraining overall operational efficacy [2]. The traditional manual dispatch model faces three major challenges: fragmented information, experience-dependent decision-making, and weak feedback mechanisms [3, 4]. These issues often lead to suboptimal resource allocation and delayed responses, particularly when handling complex police incidents. To address these limitations, developing an intelligent agent system capable of integrating multi-source information, performing semantic reasoning, and enabling dynamic decision-making has become an imperative trend. This research aims to introduce the DeepSeek large language model into the policing domain by constructing a dispatch intelligent agent endowed with environmental perception, knowledge reasoning, and autonomous decision-making capabilities. Through deep semantic understanding and intelligent matching of police cases, personnel, and equipment, the proposed system facilitates a systematic shift from "manual dispatch" to "intelligent decision-making," thereby substantially enhancing the speed and precision of police responses. This study not only holds innovative value in promoting policing dispatch technology from informatization to intellectualization but also improves the overall operational efficiency of public security systems through optimized police resource allocation. Furthermore, it provides crucial technical support for building an intelligent, proactive new model of social governance, ultimately driving police work toward greater scientific rigor and precision.

Domestic and international research on intelligent policing exhibits distinct phased characteristics. Studies outside China commenced earlier, primarily concentrating on data-driven predictive policing. For instance, the United States' "Smart Policing Initiative (SPI)" optimizes police force deployment through crime hotspot analysis, while the UK's "Met Command and Control System" utilizes AI technology to automatically identify incident types and push relevant response plans. However, these systems still predominantly rely on manual decision-making within their dispatch logic, focusing on "data presentation and prediction," and lack the capability for dynamic optimization and coordinated dispatch of multiple elements such as police cases, personnel, and equipment. Since China initiated the promotion of "Intelligence-Command-Action Integration" in 2018 [3], Police Brain projects in provinces like Zhejiang and Guangdong have achieved real-time data connectivity and visualization. Nevertheless, their decision-making capabilities largely remain at the level of process automation, falling short of achieving genuine intelligent matching and dynamic dispatch [4]. In recent years, emerging technologies represented by large language models have provided a novel pathway for policing intellectualization [1, 5]. Models like DeepSeek, leveraging their strengths in language understanding, knowledge reasoning, and task planning, can process complex contexts and implicit semantics. Possessing capabilities for cross-task transfer and self-correction, they offer a new technical paradigm for constructing intelligent agent systems with cognitive understanding and resource dispatch capabilities, holding the potential to propel the construction of Smart Policing towards a leap from "data-driven" to "cognition-driven."

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II. General Framework of the Intelligent Agent for Precise Matching and Dispatch

A. "Perception–Decision–Execution" Digital Neural Hub Architecture

The police intelligent agent proposed in this paper adopts a three-layer digital neural hub architecture inspired by cognitive neuroscience, forming a complete "perception-decision-execution" intelligent closed-loop system. At the perception layer, the system comprehensively utilizes natural language processing, computer vision image recognition, and multi-source sensor fusion algorithms to comprehensively collect and deeply structure multi-source heterogeneous information from different channels, including police case text descriptions, real-time scene images, officer GPS location information, and equipment IoT status data. This layer not only completes the extraction and cleaning of basic data but also constructs unified police case semantic vector representations, multi-dimensional officer capability profiles, and dynamic equipment attribute encoding through semantic encoding technology, achieving the transformation from raw information to machine-understandable and computable knowledge units, laying a solid data foundation for subsequent intelligent decision-making. The decision layer, as the intelligent core of the entire system, relies on the powerful deep semantic understanding and contextual reasoning capabilities of the DeepSeek large model [1, 5], combined with prior knowledge such as officer capabilities, equipment characteristics, and police case patterns stored in the professional policing knowledge graph, to perform abstract modeling and situational analysis of the received structured police case information. On this basis, the system uses multi-objective optimization algorithms to comprehensively consider multiple constraints such as response timeliness, resource suitability, and task load balance, generating optimal matching schemes between officers and equipment, thereby achieving a qualitative leap from underlying data processing to high-level knowledge reasoning and significantly enhancing the scientificity and precision of police resource dispatch.

The execution layer is responsible for translating the matching schemes output by the decision layer into actionable operational commands. Through software interfaces integrated into police smart terminals, vehicle-mounted devices, and front-line law enforcement units, it enables efficient task distribution and execution advancement. This layer not only handles command transmission but also establishes a comprehensive execution status monitoring and multi-dimensional data feedback mechanism, collecting real-time information on task progress, on-scene situational changes, and actual resource usage, thereby forming a continuous evaluation of decision effectiveness. This feedback data is systematically channeled back to the perception and decision layers to drive iterative optimization of model parameters and dynamic updates of the knowledge graph, subsequently supporting the entire system in developing a continuously evolving adaptive capability. The three-layer structure is tightly coupled through a top-down decision control flow and a bottom-up status feedback flow, forming a closed-loop regulatory network analogous to a biological nervous system. This architecture enables the police intelligent agent to continuously accumulate experience, correct deviations, and optimize strategies during actual operation, thus possessing dynamic evolutionary characteristics of "self-learning, self-correction, and self-optimization." It can effectively adapt to the complex, volatile, and highly uncertain operational demands of the modern policing environment, demonstrating strong system robustness and scenario generalization capabilities.

B. "Cloud Brain + Edge Terminal" Collaborative Technology Stack

To achieve an effective balance between system computational complexity and real-time responsiveness in policing, this paper constructs a distributed intelligent architecture based on "Cloud Brain + Edge Terminal" collaboration. This architecture establishes clear functional and hierarchical divisions at both logical and physical levels: the "Cloud Brain," serving as the global decision-making hub, is deployed in police cloud data centers with powerful computing resources. It centrally undertakes deep inference tasks of large-scale pre-trained models, fusion computation of massive multi-source policing information, and macro-level coordination and optimized dispatch of cross-regional police resources, thereby forming the decision core and intelligent engine for the overall police situation. The collaborating "Edge Terminals" are widely deployed at the practical front lines, specifically distributed across officers' mobile law enforcement terminals, police vehicle-mounted information units, and various on-site perception devices. Their core functions include performing high-frequency real-time data collection from the local environment, lightweight preprocessing and feature extraction of critical information, and receiving and executing dispatch commands from the Cloud Brain. This ensures that the dispatch process maintains extremely high response speed and system robustness in rapidly changing law enforcement scenarios [6].

The two are interconnected via a high-reliability, low-latency police private communication network and strategically deployed edge computing nodes, forming a tightly linked and highly synergistic organic whole. Under this collaborative operational paradigm, the Cloud Brain is responsible for generating optimized decision schemes based on a global perspective and deep analysis, which are then distributed to the various Edge Terminal nodes. Upon receiving commands, the Edge Terminal nodes do not execute them rigidly. Instead, by leveraging their built-in edge computing capabilities and combining precise perception and judgment of the local micro-environment, they can perform dynamic parameter adjustments and action path optimization within authorized boundaries, ultimately forming a collaborative mechanism where "centralized decision-making and edge autonomous optimization" complement each other [6]. This architectural design not only profoundly embodies the core concepts of collaborative computing and capability distribution in distributed intelligent systems but also, by enhancing the autonomy of the edge side, ensures the system's continuous operation and degraded handling capability under extreme conditions such

as network interruption or poor signal coverage, significantly improving the survivability and reliability of critical policing applications. From the perspective of top-level system design, this solution accurately adheres to the construction principle of "distributed intelligence, forward-deployed perception, and centralized decision-making," essentially building the digital neural hub for the Smart Policing system. It fully connects the entire chain intelligent processing path from the data perception source to the control execution endpoint, thereby enabling the entire police dispatch system to preliminarily possess advanced intelligent characteristics such as self-state awareness, autonomous analysis and decision-making, and continuous evolutionary optimization [7].

III. Key Technology Implementation of the Intelligent Agent

A. Construction of the Police Intelligence Knowledge System

This paper employs a knowledge graph as the framework to construct a police intelligence knowledge system composed of three core entities: police officers, equipment, and police cases. The Officer Capability Knowledge Base structurally models officer profiles, training records, and task performance data, forming a four-dimensional profile system of "skill–experience–performance–status" to provide a quantitative basis for task matching. The Equipment Resource Knowledge Base utilizes IoT technology to monitor equipment location, status, and availability in real-time, achieving full lifecycle management of equipment through a state machine model [7]. The Police Case Semantic Knowledge Base leverages the language understanding capability of the DeepSeek model to transform historical police case data into a semantic vector space and builds a hierarchical event type system based on ontology. These three knowledge bases are integrated into a unified knowledge graph via an RDF framework, where node relationships record not only static attributes but also dynamically track the interaction processes among "officers–cases–equipment." Through semantic querying and graph neural network algorithms, the system enables complex relational reasoning, providing a solid cognitive foundation for precise matching and dispatch.

B. Large Model-based Matching and Decision-Making Mechanism

The matching and decision-making mechanism constructed in this study is centered on the DeepSeek large model [1], utilizing its multi-layer Transformer architecture to convert police case text into high-dimensional semantic vectors, enabling deep semantic understanding and task feature extraction. Its decision process includes: the semantic understanding stage accurately identifies complex semantics such as case type, location, time, and threat level; the resource screening stage rapidly locates qualified sets of officers and equipment based on the knowledge graph; the matching optimization stage employs the multi-objective optimization function $F=w_1A+w_2B+w_3C$ (where A represents response time, B represents matching degree, and C represents task load) to compute the comprehensively optimal solution; the self-learning stage continuously updates model parameters and semantic distributions through execution feedback data. Compared with traditional rule-based systems, this mechanism demonstrates three main advantages: powerful natural language understanding capability for accurately parsing ambiguous and implicit information; high multi-factor coupling capacity for simultaneously considering task nature, officer status, equipment performance, and spatial distribution; and significant evolutionary capability for continuously optimizing decision quality through ongoing self-learning. This mechanism achieves organic integration of symbolic logic and statistical learning, possessing both interpretability and adaptability, marking a critical transition in police decision-making from "knowledge-driven" to "cognition-driven."

IV. Conclusions and Prospects

Focusing on the intelligent demands of police dispatch, this paper proposes a precise matching and dispatch intelligent agent system for "police cases–personnel–equipment" based on the DeepSeek large model. Theoretically, it constructs a three-layer "Perception–Decision–Execution" architectural model and designs a distributed "Cloud Brain + Edge Terminal" collaborative mechanism, systematically demonstrating the deep integration of knowledge graphs and semantic reasoning in policing scenarios. Conceptually, this research breaks through the limitations of "information silos and manual dispatch" inherent in traditional policing systems, achieving a transition from an experience-oriented approach to intelligent decision-making. Methodologically, it establishes a new paradigm for police dispatch based on semantic understanding and knowledge fusion, providing a systematic solution for the deep application of artificial intelligence in the field of public security. The research results not only construct a complete theoretical framework for intelligent dispatch but also, through multi-source data fusion, dynamic resource matching, and a closed-loop learning mechanism, significantly enhance dispatch response speed, resource allocation accuracy, and system self-adaptability. This provides important theoretical support and a technical pathway for advancing the reform of the "intelligence-command-operation integration" mechanism and the construction of Smart Policing.

This study proposes an intelligent agent architecture that aligns with the characteristics of the police system, achieving organic unification of information flow, knowledge flow, and decision flow. Secondly, it constructs a theoretical framework integrating police knowledge graphs with the DeepSeek model, enabling deep integration of semantic understanding capabilities and resource dispatch tasks. Thirdly, it realizes structured expression and computable modeling of police data, providing a standardized technical pathway for the construction of Smart Policing. However, this research still has certain limitations: system performance is strongly correlated with data quality, and real-world data biases may affect matching outcomes; the interpretability of the decision-making process and its legal traceability need to be further strengthened [8]; the ethical norms and security mechanisms of the intelligent agent also require further improvement at the institutional

level [9]. These limitations indicate directions for subsequent research, necessitating enhancements in transparency, reliability, and compliance while maintaining the system's intelligence, to promote the safe and effective application of this technology in actual policing scenarios.

The intelligent agent system constructed in this study demonstrates significant practical value and broad application prospects. At the practical level, the system can be widely deployed in various scenarios including urban daily police dispatch, emergency command and response, and security for major events, with its modular design ensuring replicability and scalability. Theoretically, this research provides a new paradigm for the deep integration of artificial intelligence in public management and social governance, promoting the conceptual evolution from "algorithmic governance" to "intelligent governance." Looking forward, with the continuous maturation of dedicated large-scale models for public security and edge intelligence technologies, the intelligent agent will further enhance its capabilities in semantic self-learning, cross-departmental collaboration, and complex task reasoning. Ultimately, it will establish an intelligent police dispatch ecosystem integrating perception, cognition, decision-making, and execution, providing solid technical support and development pathways for building a higher-level social governance system characterized by safety, intelligence, and efficiency.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Yuekai Ma conceived and designed the study, conducted the theoretical framework analysis, and drafted the initial manuscript; Yuehua Zhu contributed to the revision and refinement of the manuscript; Shuifeng Zhang supervised the overall research, conducted project investigation, acquired funding, and reviewed, edited, and finalized the manuscript; Qi Liu and Bo Li participated in framework design, and collection of research materials; Junquan Zhou and Enhao Yu assisted in literature collection, organization, and data curation; all authors participated in manuscript writing, editing, and the revision of reference formatting; all authors had approved the final version.

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