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Information Management System in Trading

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ABSTRACT: Automated trading systems have been proved to be very helpful to traders and investors. The idea of developing such a money making system is very old and the work on the same ground has started in late 90's. Being a fond of the capabilities of Artificial Intelligence, in Computer Science, we thought we could bring the finance domain and AI fields together to construct a very effective tool which will make the common man's life in the field of stock trading much easier by assisting him in his investment in the share market also giving profitable returns. To bring the system into reality, we've gone through lot of research papers under the domain of automated trading systems. This paper is an attempt to segregate the respective research papers under two fundamental criteria – Functional domain and Technical domain.

Trade execution, market analysis, trade strategies, candlesticks, market indicators, discernment, Risk management etcetera are some of the terms we learnt from functional literature reviews whereas, Algorithmic trading, Artificial Neural Networks, Fuzzy logic, classification and clustering, etc. were the terms related to technical domain. At the ending section of this paper, the influence of usage of HPC technology in the field of stock market prediction has been discussed.

KEYWORDS: Information Management, Trading Systems, Data Analytics, Market Intelligence, Decision Support System, Financial Technology, Real-time Data Processing

I. INTRODUCTION

Automated Trading is one of the very popular areas in the world of stock market. Since the work to build such type of intelligent systems within its domain has started way long back, it has retained its interest in human mind for further development due to its economic cause and support it provides to its respective users. A constructive system that provides guidance to its users by capturing real time data from the stock market environment to form profitable financial decisions by building user's portfolio and analyzing trends, which have a primary importance. Our hypothetical system includes decision making expertise, which mainly contains buying, selling or holding the stock dataset/value at that instantaneous time. It works on highly relative environment. To overcome the limitations of the current systems, we propose better solutions that consider the latest trends like Chart analysis, Fuzzy logic, Decision Support System, Data Mining and Social Media Trends. We are incorporating experience building capabilities within the system that enables the hypothetical system to calculate results based on machine learning, which helps the system to learn and generate new knowledge through the historical data, thus limiting losses and raising the chances of gain. Though Automated Trading Systems have proved their importance to the traders and investors, most of the existing systems implemented with statistical or neural network approaches are incapable of giving accurate advice because they cannot capture the off-market information for which most of it is non-numeric. In this we tried to cover every aspect of stock market from input to final decision that is output. ^[1]

II. SYSTEM MODEL AND ASSUMPTIONS

The proposed system is an **Information Management System (IMS)** tailored for **electronic trading platforms** to ensure efficient, secure, and real-time management of trading operations. This system model is designed to meet the demands of modern financial environments, where speed, accuracy, and data security are paramount. It integrates various components to support the full lifecycle of trading transactions, from data acquisition and processing to secure storage and regulatory compliance.

Trading Participants

The system is designed to accommodate a variety of stakeholders, including brokers, investors, analysts, and regulatory bodies. These participants interact with the system through a secure, web-based interface, enabling access to trading data, reports, and analytics based on their roles and permissions.

Data Sources

The IMS consolidates data from multiple sources including **live market feeds**, **historical trading records**, and **user-generated inputs**. These data streams are processed in real time to support immediate decision-making, trend analysis, and audit trail creation.

System Architecture

The system adopts a **client-server architecture** with deployment on a **cloud infrastructure**. This ensures scalability to handle high transaction volumes, redundancy for failover protection, and high availability across global trading hours. Load balancing and elastic computing resources are assumed to maintain consistent system performance under peak demand.

Database Management

A **centralized relational database system** (such as MySQL or PostgreSQL) is employed to manage structured data including transaction logs, user profiles, asset records, and trading history. The database supports indexing and optimized query performance for fast access and reporting.

Security Framework

Security is a core assumption in the system model. It incorporates **multi-factor authentication (MFA)** for users, **role-based access control (RBAC)**, and **end-to-end data encryption** (both in transit and at rest). Regular audits and vulnerability assessments are assumed to mitigate cybersecurity risks.

Regulatory Compliance

The IMS is built with compliance in mind, adhering to financial regulations such as **Know Your Customer (KYC)** and **Anti-Money Laundering (AML)** guidelines. These ensure that only verified users can access the system and that all transactions are traceable for legal auditing.

Data Integrity and Reliability

The database operations conform to **ACID (Atomicity, Consistency, Isolation, Durability)** principles, ensuring that data remains accurate, reliable, and consistent even during concurrent transactions or system failures.

Real-Time Monitoring and Alerts

A comprehensive **dashboard interface** provides administrators and users with insights into system status, user activities, and trading trends. **Real-time alerts** notify of unusual activity, price fluctuations, or system anomalies, enabling rapid response and reducing operational risk.

III. EFFICIENT COMMUNICATION

Efficient communication is a fundamental pillar of any robust Information Management System (IMS) in electronic trading. In such a high-speed and data-intensive environment, the ability to transmit, process, and respond to information in real time is critical for maintaining market competitiveness, transparency, and trust.

Internal Communication Architecture

The IMS is designed to facilitate fast and reliable communication between all internal components—including trading engines, databases, analytics modules, and user interfaces. A message-oriented middleware (such as RabbitMQ or Kafka) is assumed to ensure asynchronous, low-latency communication between services, thereby avoiding system bottlenecks during high transaction volumes.

User Interaction and Interface Communication

Traders, brokers, and analysts interact with the system through responsive, real-time dashboards and trading terminals. The system uses RESTful APIs and WebSocket protocols to ensure that data on trades, market movements, and alerts is transmitted instantly with minimal lag. This real-time feedback loop enhances user responsiveness and supports timely decision-making.

Inter-System Communication

The IMS integrates with external platforms such as stock exchanges, market data providers, banks, and regulatory bodies. Communication with these external entities is secured using standard financial communication protocols like FIX (Financial Information Exchange) and HTTPS with TLS encryption. This ensures seamless data flow, while preserving confidentiality, authenticity, and data integrity.

Communication Redundancy and Failover

To maintain communication even during unexpected failures or high-load scenarios, the system incorporates redundant communication channels and automatic failover mechanisms. Load balancers and backup nodes are used to ensure that communication continuity is preserved across critical services, preventing data loss and downtime.

Data Synchronization and Consistency

The IMS implements synchronization mechanisms to keep data consistent across all modules and users. This includes real-time replication of databases, event-driven updates, and distributed caching systems to minimize delays in information propagation.

Security in Communication

Given the sensitivity of financial information, all communication within and outside the system is fully encrypted using industry-standard algorithms (e.g., AES-256, SSL/TLS). Audit trails and access logs are maintained to monitor communication flows and detect anomalies.

Notification Systems

Efficient communication also extends to notification services. The system supports custom alerts through email, SMS, and in-app notifications for key events such as trade confirmations, threshold breaches, or system errors. These alerts ensure that users remain informed and can act swiftly in volatile market conditions.

IV. SECURITY

Security is a cornerstone of any **Information Management System (IMS)** designed for electronic trading. In a domain where massive financial transactions occur in real time and sensitive user data is exchanged constantly, implementing a comprehensive security framework is not just important—it is essential. The proposed IMS integrates a multilayered security architecture to ensure the **confidentiality, integrity, and availability** of data and services.

1. User Authentication and Access Control

To prevent unauthorized access, the system uses **multi-factor authentication (MFA)** mechanisms that combine passwords with OTPs (One-Time Passwords) or biometric verification. **Role-Based Access Control (RBAC)** is enforced to ensure that users can only access functionalities and data relevant to their roles—be it investor, broker, analyst, or admin. User sessions are monitored with timeouts and device registration protocols to minimize session hijacking risks.

2. Data Encryption

All data, whether at rest or in transit, is encrypted using advanced cryptographic algorithms. **AES-256** encryption secures stored data in databases, while **TLS (Transport Layer Security)** ensures secure communication between client applications and servers. End-to-end encryption protects transaction records, user credentials, and financial reports from potential interception or tampering.

3. Secure APIs and Integrations

All external and internal APIs are protected by **API gateways** with built-in **rate limiting**, **authentication tokens** (e.g., **OAuth 2.0**), and **input validation** to prevent injection attacks and abuse. Integration with stock exchanges, banks, and regulatory platforms is conducted over secure, authenticated channels using industry-standard protocols like **FIX** or **HTTPS with certificate pinning**.

4. Intrusion Detection and Monitoring

The system employs **Intrusion Detection Systems (IDS)** and **Security Information and Event Management (SIEM)** tools to monitor network traffic and log files for anomalies. Real-time alerts notify administrators of suspicious activities such as multiple failed login attempts, irregular transaction patterns, or unauthorized data access.

5. Data Backup and Disaster Recovery

Frequent automated backups are stored in **secure, geographically distributed data centers**, ensuring data recovery in case of failure or breach. The system includes a robust **disaster recovery plan (DRP)** that ensures minimal downtime and business continuity even in the event of cyberattacks or natural disasters.

6. Compliance and Legal Adherence

The IMS is designed to comply with major financial and data protection regulations such as **GDPR**, **PCI-DSS**, **SEBI norms**, and **SOC 2**. Regular audits and compliance checks are built into the system lifecycle, and audit logs are maintained to trace every action performed by users or system components.

7. Secure Development Practices

Security is considered from the earliest stages of development through **Secure Software Development Lifecycle (SSDLC)** practices. Code reviews, vulnerability scans, and penetration testing are regularly performed to ensure application security before deployment.

8. User Education and Awareness

As a final layer of defences, the system includes user awareness modules and alerts that warn against phishing attempts, suspicious login activity, and unsafe actions. Periodic training and updates help users remain vigilant against emerging threats.

V. RESULT AND DISCUSSION

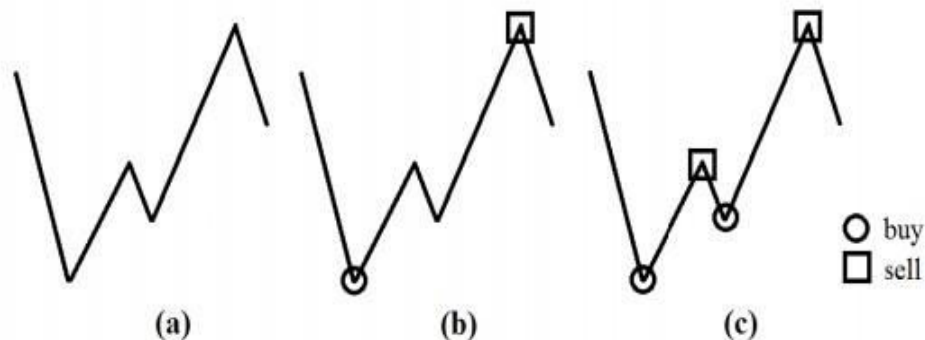


Fig. 1 Buying zones and selling zones

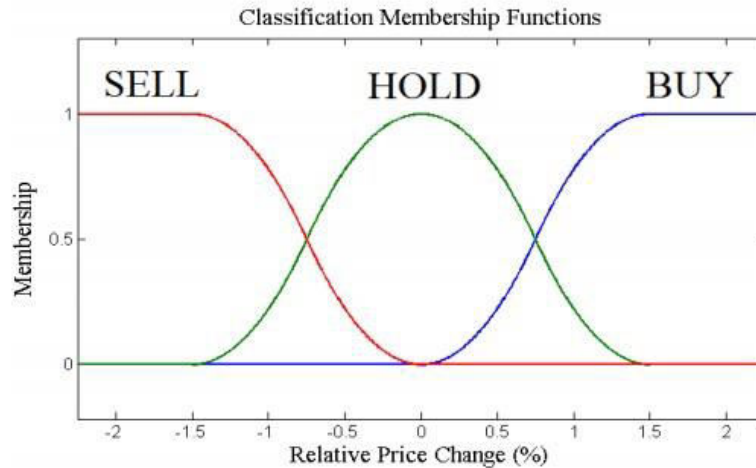


Fig. 2 Classification of trading actions

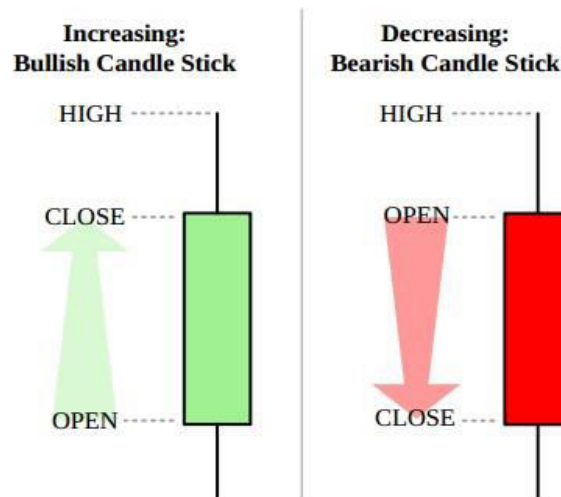


Fig .3 Representation of a candlestick

VI. CONCLUSION

Stock market is considered to be one of the popular sources of investment where you can get the returns in bucks in less time. However it is subjected to be titled under risky investment due to its highly fluctuating and unpredictable in nature. Common investors invest their money in stock market but at the same time they get so anxious with a thought of losing money. Automated Trading System is an attempt to make investor's life easier made by researchers working a way long back.

However, today's algorithmic trading systems lack in many aspects while serving their purpose. Now a day, a lot of sophistication and innovation has enriched the field of Computer Science, it has become possible to develop a system which can fulfill the market needs. We being researchers in Computer Science field, found a scope in the challenging field of Automated Trading System. To construct our idea and to figure out the where the current systems flawed, we had to have conduct a rigorous literature survey.

In this survey paper, at first we have mentioned basic building blocks of every automated trading system. Then we proposed our model with some improvements to give the system a personalized touch. In next sections, we discussed

about some functional terms related to the market. Later we focused about the aspects such as candlesticks, decision making process in the trading which are the core components of proposed system. Later, we have emphasized some indicators of stock market which have to be programmatically implemented as a part of inference engine. In the last section of this paper, we stated how the integration of HPC technology in Automated Trading System will leverage the performance at a peak thereby bringing accuracy and speed in the operations. We also mentioned basic attributes in our database that we have considered for our research.

This paper is an attempt to gather the basic and advanced techniques to stock price prediction that are invented so far. This paper also talks about the ins and outs of the automated trading world which will definitely help the enthusiasts working on the similar ground.

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