作為一項任務的功能係統為有機體設定了一個目標（請求），通過在給定情況（主題領域）中有目的的行為的方法，使用從經驗中獲得的知識來滿足特定的需要，這些（請求）將滿足一定的標準——滿足需要［1，2］中更詳細地介紹了功能係統的信息模型，［3］中介紹了計算機建模。

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DOI 10.18699/sblai2023-10

Цифровая трансформация с применением ИИ и информационная безопасность

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В последние годы наблюдается активизация организаций в области цифровой трансформации, под которой часто понимаются интеграция существующих решений в области автоматизации, внедрение систем поддержки принятия решений и систем автоматического принятия решений уровня предприятия на основе средств ИИ и анализа больших данных, омниканальное взаимодействие с пользователями, в том числе через коммуникационные каналы, неподконтрольные предприятиям, такие как мобильная связь и домашний интернет, интеграция с ИТ системами контрагентов посредством API через публичные сети. В то же время это создает новые вызовы в области информационной безопасности и надежности информационных систем: увеличивается поверхность атаки информационных систем, повышается сложность ИТ систем за счет интеграции с ПО, разработанным третьими сторонами, в том числе ПО с открытым исходным кодом. Для предотвращения подобных рисков многие государства ужесточают требования в области ИБ.

Реализовать в ручном режиме эффективный контроль за исполнением регуляторных требований не представляется возможным: жизненный цикл ПО существенно отличается от жизненного цикла аппаратных решений. Циклы внесения изменений в ПО, в отличие от аппаратных решений, могут быть очень частыми – несколько раз в месяц, а то и в неделю.

Система тотального тестирования и контроля требований в области ИБ при столь частых изменениях по себестоимости реализации может быть сравнима, а то и превышать стоимость реализации самой информационной системы. Один из подходов к решению этих проблем заключается в применении методов модельно-ориентированного подхода (MBSE – Model Bases System Engineering), который изначально был разработан и применяется для реализации аппаратных систем. Особенность этого подхода заключается в реализации целевой системы на основе ее цифровой модели (цифровые двойники/тени).

Наша группа успешно занимается уже более 10 лет разработкой новых методов и технологических подходов на основе MBSE в области инженерии больших программных и информационных систем для индустрии телекоммуникаций, финансового и банковского секторов. В качестве научной основы мы выбрали наработки в области прикладной математической логики: семантическое программирование и исполнимые спецификации, логико-вероятностные методы и алгоритм Discovery, теорию нечетких моделей и семантические предметно-ориентированные языки (sDSL).

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Digital transformation using AI and information security

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In recent years, organizations have become more active in the field of digital transformation, which often means integration of existing automation solutions, implementation of decision support systems and enterprise-level automatic decision-making systems based on AI and big data analysis, omnichannel interaction with users, including through communication channels outside the control of enterprises, such as mobile communications and home Internet, and integration with IT systems of counterparties through APIs. At the same time, it creates new challenges to information security and the reliability of information systems: increasing the attack surface of information systems, increasing the complexity of IT systems due to integration with software developed by third parties, including open source software. To prevent such risks, many governments are tightening IS requirements.

The software lifecycle differs significantly from that of hardware solutions. Software change cycles, unlike hardware solutions, can be very frequent – several times a month or even a week.

The system of total testing and control of IS requirements with such frequent changes may be comparable to, or even exceed, the cost of implementing the information system itself. One approach to solving these problems is to apply methods of model-based system engineering (MBSE), which was originally developed and applied for realization of hardware systems. The

peculiarity of this approach is to implement the target system based on its digital model (digital twins/shadows).

Our group has been successfully developing new methods and technological approaches based on MBSE in the field of large software and information systems engineering for the telecommunications industry, financial and banking sectors for more than 10 years. As a scientific basis we have chosen the developments in the field of applied mathematical logic: semantic programming and executable specifications, logic-probabilistic methods and Discovery algorithm, fuzzy model theory and semantic domain specific languages (sDSL).

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AI数字化轉型與信息安全

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近年來，數字化轉型領域的組織愈演愈烈，這通常被理解為對自動化領域現有解決方案的整合，引入決策支持系統和基於企業級自動化決策系統。基於人工智能工具和大數據分析，與用戶進行全渠道交互，包括通過不受企業控制的通信渠道，如移動通信和家庭互聯網，

通過公共網絡通過API與交易方的IT系統集成。
同時，這在信息安全和信息系統可靠性領域帶來了新的挑戰：信息系統的攻擊面增加，IT 系統的複雜性由於與第三方開發的軟件集成而增加，包括。 開源軟件。
為了防止此類風險，許多國家正在收緊信息安全領域的要求。

在手動模式下無法對合規性要求進行有效控制：軟件的生命週期與硬件解決方案的生命週期存在顯著差異。 與硬件解決方案不同，軟件的更改週期可能非常頻繁 - 一個月幾次，甚至一周一次。

如此頻繁變化的信息安全領域的需求全面測試和控制系統的實施成本可以媲美，甚至超過實施信息系統本身的成本。 解決這些問題的一種方法是應用模型庫系統工程 (MBSE) 的方法，該方法最初是為實現硬件系統而開發和使用的。
這種方法的特殊性在於基於其數字模型（數字孿生/影子）實現目標系統。

在電信行業、金融和銀行業的工程大型軟件和信息系統領域，我們的團隊已經成功開發了基於 MBSE 的新方法和技術方法超過 10 年。
作為科學基礎，我們選擇了應用數理邏輯領域的發展：語義編程和可執行規範、概率方法和發現算法、模糊模型理論和語義領域特定語言（sDSL）。

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