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"MALVA ALCEA": ADVANCING UKRAINIAN NAVAL CAPABILITIES WITH REACT NATIVE TECHNOLOGY

М. Максимов, М. Кіріакіді, О. Тошев, О. Максимов. **"Malva Alcea": розвиток військово-морського потенціалу України за допомогою технології React Native.** У сфері військових операцій, що швидко розвивається, поява цифрових технологій відкрила безпрецедентні можливості та ефективність. «Цифровий адмірал "Malva Alcea"» є прикладом такого перетворення, представляючи мобільний додаток на базі React Native, розроблений для революціонізації розрахунків цілі ракет в українському флоті. Стаття розглядає критичну потребу в інноваціях у відповідь на традиційні, ручні методи розрахунків, які займають багато часу та схильні до помилок. Вона відстежує розробку додатка, виділяючи вибір React Native за його міжплатформні можливості та легкість інтеграції з навігаційними даними. Стаття надає повний огляд архітектури додатка, включаючи інтуїтивно зрозумілий інтерфейс користувача, надійну модель зберігання даних та інтеграцію складної математичної моделі для цілевказування ракет. За допомогою зворотного зв'язку користувачів та оперативного впровадження додаток продемонстрував значне скорочення часу розрахунків та покращення точності, тим самим підвищуючи оперативну ефективність та прийняття рішень у сценаріях морської оборони. Крім того, у статті розглядаються виклики, з якими зіткнулися під час розробки, такі як забезпечення безпеки даних та підтримання адаптивності системи для майбутніх розширень. Вона завершується окресленням майбутніх напрямків для додатка, включаючи потенційні інтеграції з більшими платформами обізнаності про ситуацію та розширення на інші операційні системи, підкреслюючи вирішальну роль цифрових інновацій у просуванні військових можливостей та стратегічних операцій.
Ключові слова: React Native, військово-морські оборонні операції, розрахунки цілей ракет, розробка мобільних додатків, користувацький досвід (UX), безпека даних та шифрування, управління станом Redux, шифроване зберігання, оперативна ефективність, інновації військових технологій

M. Maksymov, M. Kiriakidi, O. Toshev, O. Maksymov. **"Malva alcea": advancing Ukrainian naval capabilities with react native technology.** In the rapidly evolving domain of military operations, the advent of digital technologies has ushered in unprecedented capabilities and efficiencies. "The Digital Admiral "Malva Alcea" exemplifies this transformation, showcasing a React Native-based mobile application designed to revolutionize missile targeting calculations within the Ukrainian Navy. This paper delves into the critical need for innovation in the face of traditional, manual calculation methods that are both time-consuming and prone to human error. It charts the development journey of the application, highlighting the selection of React Native for its cross-platform capabilities and ease of integration with naval data systems. The paper provides a comprehensive overview of the application's architecture, including its intuitive user interface, robust storage model, and the integration of a sophisticated mathematical model for missile targeting. Through user feedback and operational deployment, the application has demonstrated a significant reduction in calculation times and an improvement in accuracy, thus enhancing operational efficiency and decision-making in naval defense scenarios. Furthermore, the paper addresses the challenges encountered during development, such as ensuring data security and maintaining system adaptability for future expansions. It concludes by outlining future directions for the application, including potential integrations with larger situational awareness platforms and expansions to other operating systems, underscoring the pivotal role of digital innovations in advancing military capabilities and strategic operations.
Keywords: React Native, Naval Defense Operations, Missile Targeting Calculations, Mobile Application Development, User Experience (UX), Data Security and Encryption, Redux State Management, Encrypted Storage, Operational Efficiency, Military Technology Innovation

1. Introduction

In the realm of modern warfare, the rapid and accurate calculation of missile targeting is paramount for the effective defense of naval assets. Traditionally, these critical calculations have been performed manually, a process fraught with the potential for human error and significant time delays [1]. This paper presents a transformative solution to this challenge: a mobile React Native application designed specifically for the Ukrainian Navy. This application not only streamlines the calculation process but also significantly reduces the likelihood of human error, thereby enhancing the operational capabilities and strategic decision-making of naval forces.

The purpose of this introduction is to set the stage for a comprehensive analysis of the development and deployment of this innovative application. We will delve into the historical context that necessitated this technological advancement, underscoring the limitations of previous manual methods and the pressing need for digital transformation within military operational planning. This paper aims

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to define and explore the objectives of the study, namely, the application's impact on enhancing efficiency, accuracy, and user-friendliness in missile targeting calculations.

Our investigation is situated within the broader discourse of military technology and innovation, offering insights into the specific challenges and solutions encountered during the application's development. We will outline the theoretical and practical methodologies employed in the creation of the application, including the choice of React Native as the development framework, the architectural design decisions, and the integration of complex mathematical models for missile targeting.

This introduction serves as a roadmap for the ensuing discussion, guiding the reader through the critical aspects of the application's development process, its operational impact, and the broader implications for future military technological advancements. By presenting a clear and compelling narrative, this paper aims to engage and inform the reader, encouraging a deeper exploration of how digital innovations can revolutionize naval defense strategies and operations.

2. Background

The precision of missile targeting calculations is a cornerstone of modern naval warfare, influencing both the effectiveness and efficiency of defensive and offensive operations [2]. Traditionally, these calculations were conducted manually, a method that, while reliable, posed significant challenges in terms of time consumption and potential for human error. This section explores the evolution of missile targeting calculations, the limitations of manual methods, and the emerging need for technological innovation in this critical area.

2.1 Limitations of Manual Calculations

The manual approach to missile targeting calculations presented several key limitations [3]:

– *Time-Consuming Process:* Each calculation taking upwards of 1.5 hours posed a significant operational delay, especially in time-sensitive military operations.

– *Risk of Human Error:* The involvement of human factors in complex calculations increased the likelihood of errors, which could lead to either overestimation or underestimation of missile requirements [4].

– *Dependency on Expertise*: The need for specialized knowledge limited the number of personnel capable of performing these calculations, creating a bottleneck in operational readiness.

– *Inefficiency and Resource Waste:* Overestimation of missile requirements could lead to unnecessary allocation of expensive resources, whereas underestimation could compromise mission success.

2.2 The Drive for Digital Transformation

The limitations of manual calculations and the critical nature of missile targeting in naval operations underscored the need for a digital transformation [5]. A solution that could automate the calculation process, minimize human error, and expedite decision-making was not just a technological advancement but a strategic necessity. The emerging consensus pointed towards the development of a mobile application that could harness the power of modern computing to deliver fast, accurate, and reliable missile targeting calculations [6].

This background sets the stage for the development of the React Native application [7], a digital tool designed to overcome the challenges of manual calculations and significantly enhance the operational capabilities of the Ukrainian Navy. The subsequent sections will delve into the design, development, and impact of this transformative technology.

3. The purpose and objectives of the study

3.1 Purpose of the Study

The principal aim of this research is to elucidate the transformative role of the "Malva Alcea" application, a React Native-based tool, in augmenting the precision, efficiency, and user experience of missile targeting calculations within the Ukrainian Navy. This study seeks to bridge the gap between traditional, manual calculation methods and the pressing need for digital innovation in military strategic operations, thereby enhancing decision-making processes and operational readiness in naval defense scenarios.

3.2 Objectives of the Study

1) *Innovative Solution Exploration*: To investigate the limitations inherent in traditional missile targeting calculations, including time consumption and susceptibility to human error, and to present "Malva Alcea" as an innovative digital solution.

2) *Development Process Analysis*: To detail the developmental stages of the "Malva Alcea" application, from conceptualization through to deployment, highlighting the strategic selection of React Native as the development framework, and the considerations in designing the user interface and experience.

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3) *Technical Feature Examination*: To provide an in-depth analysis of the application's architecture, focusing on its modular design, the integration of a sophisticated mathematical model for missile targeting, and the encryption mechanisms ensuring data security.

4) *User Experience and Feedback Assessment*: To evaluate the application's impact on operational efficiency and user satisfaction through analysis of feedback from diverse military personnel, thereby illustrating the practical benefits and challenges encountered.

5) *Operational Impact Quantification*: To quantify the improvements in missile targeting calculation speed and accuracy attributable to the "Malva Alcea" application, and to discuss its implications for the strategic and tactical decision-making capabilities of the Ukrainian Navy.

This study is positioned at the confluence of military operational needs and technological innovation, aiming to contribute significantly to the discourse on digital transformation in defense strategies. Through a comprehensive examination of the "Malva Alcea" application's development, deployment, and operational impact, this research aspires to underscore the critical role of technology in modernizing and enhancing military capabilities in the face of evolving global challenges.

4. Development process

The development of the mobile React Native application for the Ukrainian Navy represents a significant leap from traditional manual methods to a sophisticated digital solution for missile targeting calculations [8]. This section outlines the comprehensive process undertaken to bring this innovative application from concept to reality.

4.1 Conceptualization

The initial stage involved identifying the core challenges and limitations of existing manual calculation methods. Recognizing the need for a digital solution, the project team set out to conceptualize an application [9] that could automate complex calculations, reduce human error, and expedite decision-making processes in critical naval operations.

4.2 Selection of Technology

React Native was chosen as the development framework for its cross-platform capabilities [10], robust support, and ease of integration with existing naval data systems. This decision was driven by the need for a reliable, scalable, and easily maintainable solution that could be deployed across a range of devices used in naval operations [11].

4.3 Design and User Experience

The application's design focused on creating an intuitive user interface (UI) and a seamless user experience (UX) to accommodate users with varying levels of technical proficiency [12]. Leveraging lightweight Material UI principles ensured that the application was accessible and familiar to the end-users, while the integration of different measurement systems and minimal user input requirements [13] addressed the diverse needs of naval operations.

4.4 Architectural Development

The application's architecture was meticulously planned to encompass several key components: a user-friendly interface, a Redux-based storage model for in-app information management, an encrypted storage solution for sensitive data [8], and a modular math model module for easy updates and scalability [14].

4.5 Integration and Testing

Critical to the development process was the integration of encrypted constants and the mathematical model module, ensuring that the application could securely and accurately perform the required calculations. Rigorous testing phases, including user feedback sessions [15], were conducted to refine the application's functionality and usability, ensuring reliability under various operational scenarios [16].

5. Technical architecture

The technical architecture of the mobile React Native application for the Ukrainian Navy is a testament to modern software engineering principles, designed to meet the rigorous demands of military operational planning and execution. This section provides an in-depth look at the application's architecture, highlighting its modular design, integration of secure data handling practices, and the adoption of user-centered design principles.

5.1 Application Structure

The application is structured around several core components (Fig. 1), each serving a distinct function within the broader system:

– *User Interface (UI) and Mathematical Consideration for Error Minimization*: Developed with an emphasis on simplicity and ease of use, the UI leverages lightweight material design principles to ensure accessibility and familiarity for users of diverse technical backgrounds. This design choice not only facilitates rapid adoption but also guarantees the application's responsiveness and reliability across a wide array of devices, including low-end hardware frequently encountered in challenging operational environments.

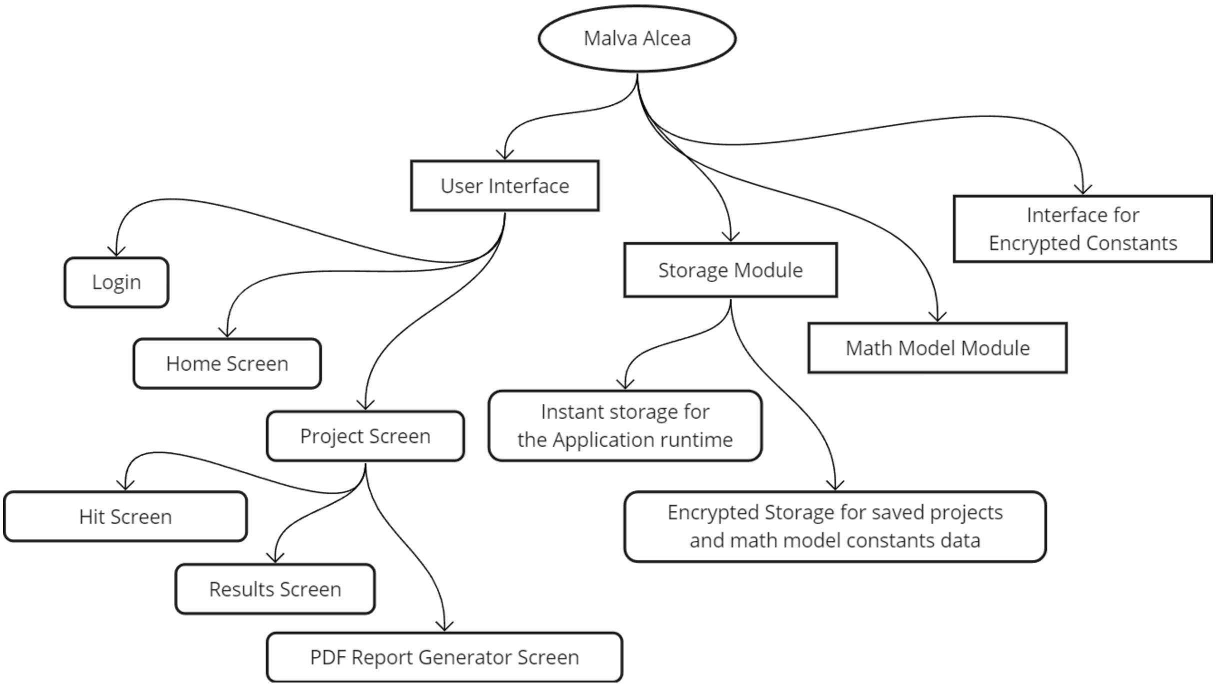

Fig. 1. Application structure (compiled by the authors)

To further refine the UI's effectiveness, especially when user is under the stress, we introduced a mathematical model to minimize the probability of input errors. The model considers the quadratic relationship between the probability of correct input, the number of input fields, and the user's current state–from relaxed and concentrated (0) to highly stressed (100), potentially leading to more human errors.

The probability P of correct input is modeled as a function of the number of input fields **N** and the user's state **S**, with the equation:

$$P = aN^2 + b(NS) + c\ .$$

Where: aN^2 –represents the base effect of the number of input fields on the probability of correct input, assuming a quadratic relationship. This suggests that as the number of fields increases, the complexity and the likelihood of errors increase quadratically.

$b(NS)$ **–** models the interaction between the number of input fields and the user's state, indicating that stress levels can alter the impact of the number of fields on error probability.

c **–** is the baseline probability of correct input, adjusted for factors not directly related to the number of input fields and the user's state.

This mathematical approach underlines our commitment to creating a UI that not only prioritizes user-friendliness and accessibility but also actively mitigates the risk of input errors through intelligent design and user understanding. This ensures that the application remains a reliable tool, especially in high-stakes environments where every input counts.

– *Storage Module*: The application employs a robust Storage Module (Fig. 2), integrating a Redux-based state management system with an EncryptedStorage module to optimize data handling and security. This dual-component framework is pivotal in maintaining operational data integrity and user confidentiality.

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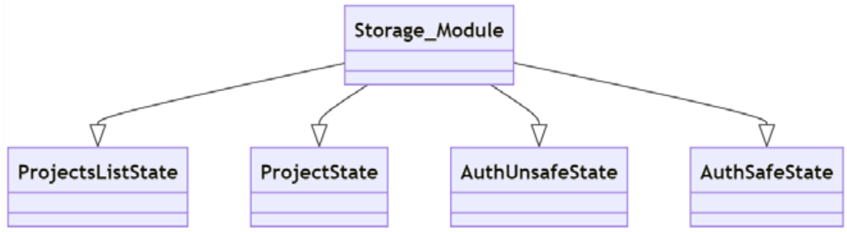

Fig. 2. Storage Module top hierarchy storage (compiled by the authors)

– *State Management with Redux*: The application's state, represented by *S*, is managed through a Redux framework, where *S=f(R, A)*. Here, *R* denotes the *rootReducer* combining various data slices like project and *authSafe*, and *A* represents actions dispatched to manipulate the application's state. This setup (Fig. 3) ensures a predictable state evolution and facilitates the efficient management of in-app data such as calculations and user sessions.

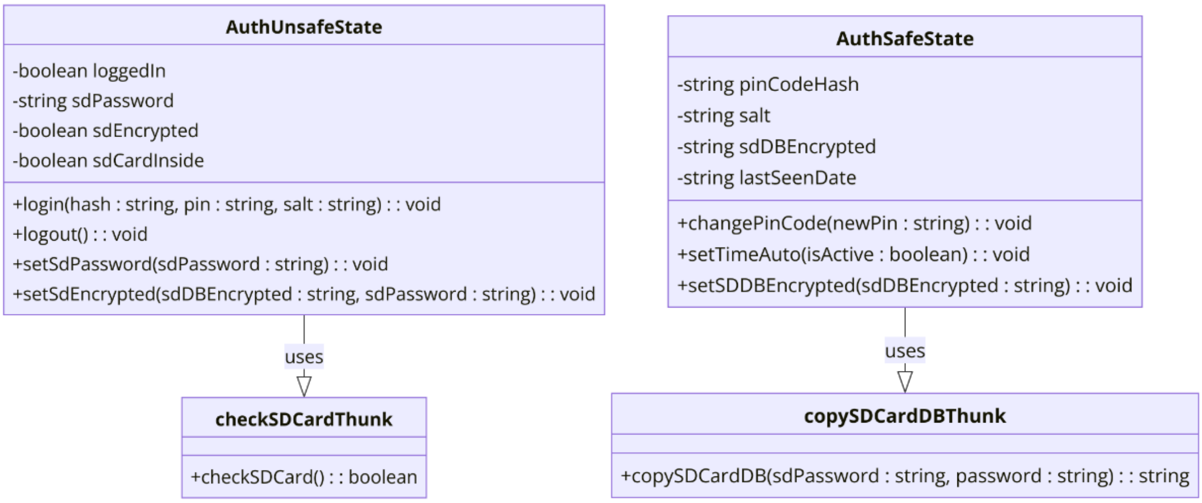

Fig. 3. Left – Auth based storage. Right – Encrypted storage (compiled by the authors)

– *Encrypted Storage for Data Security*: Sensitive data is secured using EncryptedStorage, denoted by *E*(*D*), where *D* represents the data to be encrypted. The encryption process is governed by *E*(*D*)=*Enc*(*K*,*D*), with *K* being the encryption key derived from user credentials and application constants. This mechanism ensures that all critical data, including saved projects and constants, is encrypted at rest, enhancing data confidentiality and protection against unauthorized access.

– *Optimized Data Handling*: The application's data slices (Fig. 4), such as *projectsListSlice* and *projectSlice*, facilitate targeted data operations, enabling efficient and secure data manipulation. The actions within these slices, such as adding or removing projects, are mathematically represented by $S'=S\pm\Delta D$, where *S'* is the new state, *S* the initial state, and ΔD the change in data due to the action.

– *Mathematical Model Module and Probabilistic Impact Assessment*: The core of missile targeting calculations within the "Malva Alcea" application is encapsulated in a Mathematical Model Module, which employs a sophisticated probabilistic graphical model (PGM) framework. This module intricately models the dependencies and interactions between various parameters, including warship types, positions, missile types, and environmental conditions, as outlined in the *HitState* datatype and its dependencies.

The PGM is structured with vertices representing the random variables of the model, such as the number and type of warships (*Warship*), launchers (*Launcher*), and fighter jets (*FighterJet*), alongside the engagement conditions like distance, visibility, and electronic warfare effects. Directed edges in the graph signify the conditional dependencies between these variables, offering a comprehensive representation of the operational scenario.

Utilizing the principles of conditional probability, the model computes the joint probability distribution over these variables to estimate the expected outcomes of an engagement. The expected value of destroyed or damaged ships, both core and security vessels, is derived through the factorization of

this distribution, taking into account the compounded effects of each input parameter and their interrelations:
Where: *E(Damage)* – represents the expected value of damage or destruction inflicted on enemy warships;

f(...) – denotes the conditional probability function encapsulating the complex interplay of factors like ship type, launcher capabilities, and fighter jet support, conditioned on the prevailing environmental and engagement parameters;

N – is the total number of engagements or hits considered in the scenario.

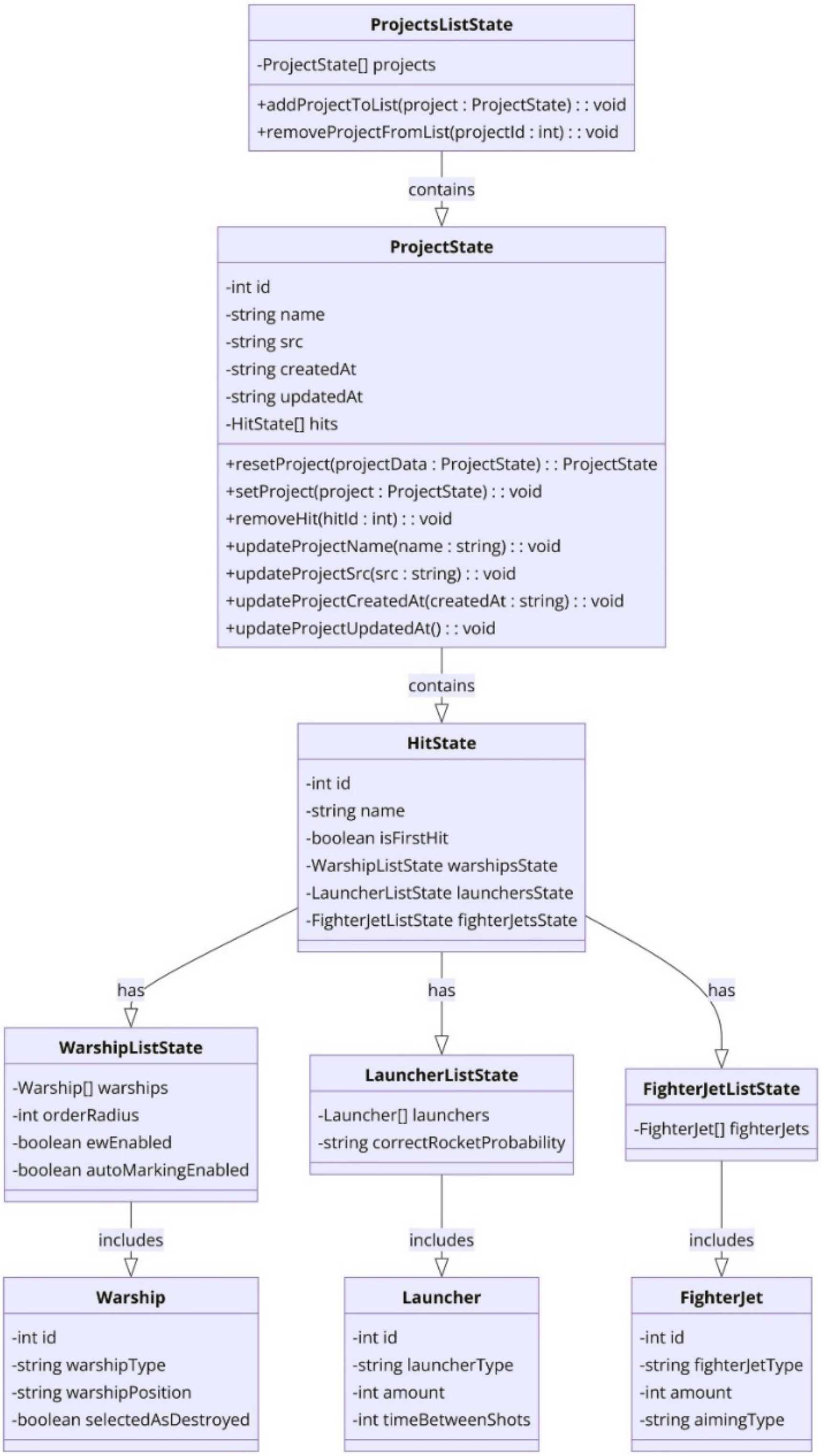

Fig. 4. Projects storage and processing structure (compiled by the authors)

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$$E(\text{Damage}) = \sum_{i=1}^{N} f(\text{ship}_i, \text{launcher}_i, \text{fighterJet}_i \mid \text{EP} .$$

This modular approach ensures that the mathematical logic underlying missile targeting calculations is both robust and adaptable. It allows for seamless updates or replacements of the model to accommodate new data, insights, or operational requirements without impacting the application's broader functionality. Thus, the Mathematical Model Module stands as a testament to the application's commitment to precision, adaptability, and the nuanced understanding of modern naval engagements.

– *Middleware Integration*: Bridging the gap between the mathematical models and the encrypted data storage is a custom middleware layer. This component ensures secure and efficient access to the necessary constants and parameters, feeding them into the mathematical module as required for each calculation.

5.2 Modular Design and Scalability

Adopting a modular design philosophy has facilitated the separation of concerns within the application, allowing for independent development, testing, and updating of individual components. This approach not only enhances the maintainability of the system but also enables scalability, as new features or improvements can be integrated with minimal impact on existing functionality or even some modules can be reused in future integrations.

5.3 Security and Performance Considerations

Security is paramount in the application's architecture, with encrypted storage and secure data handling practices implemented to protect sensitive information. Performance considerations have also been a priority, with optimizations ensuring that calculations are completed swiftly and efficiently, even on less capable devices, to support timely decision-making in operational scenarios.

6. User experience, feedback and operational impact

The deployment of the React Native application for missile targeting calculations within the Ukrainian Navy marked a significant shift from traditional manual methods to a technologically advanced approach. This section delves into the user experience and feedback gathered during various phases of implementation, and evaluates the operational impact of the application on naval defense strategies.

6.1 User Experience and Feedback

The application was designed with a focus on intuitive user interfaces (UI) and seamless user experiences (UX), catering to officers with varying levels of technical proficiency. Utilizing a lightweight material UI ensured the application was accessible and familiar, significantly reducing the learning curve for new users. Feedback sessions conducted at each development milestone played a crucial role in refining the application's features and usability. Officers from diverse ranks and backgrounds provided insights that led to iterative enhancements, ensuring the application met the end-users' needs effectively.

Key improvements made from user feedback included the optimization of measurement system integrations, allowing users to input data in various units without needing conversions. This feature was particularly appreciated for its inclusivity of different naval operation standards and its contribution to minimizing input errors.

6.2 Development Outcomes and Technical Specifications

The "Malva Alcea" application has undergone rigorous development phases, resulting in a highly optimized tool tailored for naval defense operations. The application's responsiveness and reliability have been thoroughly tested across various scenarios, ensuring its effectiveness even in the most demanding conditions.

For optimal performance, the application has been designed to run efficiently on a wide range of Android devices, with the following minimum specifications:

– Operating System: Android Version 9.0 or higher;

– Processor: Quad-Core 2.0 GHz or higher;

– RAM: 4 GB or more;

– Storage: At least 200 MB of free space;

– Screen Resolution: 1280×720 pixels.

These specifications ensure that "Malva Alcea" remains accessible to users with varying hardware capabilities, from high-end to lower-tier devices, without compromising on performance or user experience..

6.3 Operational Impact

The illustration of the development of the Ukrainian Armed Forces' naval potential using React Native information technology is demonstrated through the use of the developed Malva Alcea application. The results of the missile strike decision-making against enemy surface targets for various tactical situations are presented, summarized by solving 9 typical tasks shown in Table 1. Tasks 1–6 belong to the first type, which allow obtaining results of missile strike effectiveness calculations with determined forces (units). Tasks 7–9 belong to the second type, which allow obtaining calculation results for a specified unit of forces when destroying enemy surface forces with a given effectiveness.

Table 1

Time spent on every task by each respondent for (compiled by the authors)

Alcea Respondent	Task 1			Task 2			Task 3			Task 4			Task 5			Task 6			Task 7			Task 8			Task 9		
	manually	software	errors	manually	software	errors	manually	software	errors	manually	software	errors	manually	software	errors	manually	software	errors	manually	software	errors	manually	software	errors	manually	software	Errors
1	0.497	0.050		0.128	0.045		0.268	0.017	+	0.145	0.017		0.184	0.011		0.078	0.011		0.251	0.017	+1	0.151	0.011		0.140	0.011	
2	0.832	0.061		0.324	0.028		0.318	0.022		0.335	0.017	+	0.330	0.011		0.318	0.011		0.318	0.017	+2	0.235	0.017		0.173	0.011	+1
3	0.888	0.078	+	0.330	0.034	+	0.330	0.022	+	0.318	0.017		0.307	0.011		0.296	0.011		0.330	0.011	+1	0.263	0.011	+1	0.162	0.011	+1
4	1.000	0.073	+	0.419	0.022		0.341	0.028		0.296	0.017	+	0.302	0.017		0.268	0.017		0.307	0.011	+1	0.240	0.011	–1	0.184	0.011	+1
5	0.888	0.067	+	0.330	0.039		0.318	0.028		0.307	0.017		0.313	0.017	+	0.318	0.011	+	0.302	0.017	-1	0.229	0.017		0.196	0.017	+1
6	0.911	0.089	+	0.453	0.034		0.274	0.034		0.302	0.011		0.296	0.011	+	0.296	0.011		0.313	0.017	+2	0.218	0.017	+1	0.184	0.017	–1
7	0.899	0.084	+	0.430	0.045		0.324	0.017	+	0.313	0.017	+	0.324	0.017		0.307	0.011	+	0.307	0.011	+1	0.223	0.011	+1	0.212	0.017	+1
8	0.665	0.061		0.324	0.039	+	0.257	0.022	+	0.296	0.017		0.296	0.017	+	0.302	0.017		0.302	0.017	+2	0.229	0.017		0.229	0.011	
9	0.598	0.073	+	0.341	0.034		0.274	0.022		0.268	0.011		0.307	0.011		0.313	0.011	+	0.313	0.017	–1	0.218	0.011	+1	0.173	0.017	+1

As a result of the Malva Alcea application testing, Table 1 summarizes 9 types of users of different training levels who participated in the calculation experiment for missile strike preparation. Users 1 and 2 are proficient in the calculation methods for planning operations (combat actions) with the use of cruise missiles and can perform calculations independently using this methodology. Users 3 and 4 are familiar with the calculation methods included in the methodology but had not performed calculations independently before. Users 5 to 9 had various levels of training but were acquainted with the calculation methods before the experiment and conducted the calculations under the guidance of a specialist.

During the first stage of the experiment, task calculations were carried out according to a defined methodology but using a calculator, with the execution time shown in Table 1. In the second stage of the experiment, all users were introduced to the Malva Alcea software, and it was proposed to perform the calculations of the same tasks under the condition that users would input the initial data through the application interface. The systematized results of the numerical experiment are presented in Table 2

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Table 2

Comparison of all and average time spent on solving tasks (compiled by the authors)

Respondent	1	2	3	4	5	6	7	8	9
Time for solving all tasks (1 is max time)	0.562	0.935	0.880	0.921	0.972	0.989	1	0.884	0.855
Average time for solving one task (1 is max time)	0.569	0.938	0.876	0.923	0.984	1	1	0.892	0.861
Time for solving all tasks with the software (1 is max time)	0.829	0.853	0.902	0.902	1	1	1	0.951	0.902
Average time for solving one task with the software (1 is max time)	0.8	0.8	0.8	0.8	1	1	1	0.8	0.8

Additionally, it was determined that due to the complex calculation method involved in preparing missile strike data, many errors were made by all respondents. In obtaining solutions for the first variant of tasks, 21 mistakes were made, accounting for 39% of the total number of tasks. In the calculations for the second variant of tasks, 21 mistakes were made, accounting for 77% of the total number of tasks.

The use of the Malva Alcea software in combat operations and during training allows for a significant reduction in calculation time and greatly reduces the risk of making errors during calculations and inputting initial data.

7. Challenges, solutions and future directions

The journey of developing the React Native application for the Ukrainian Navy was not without its challenges. Each obstacle presented an opportunity for innovation, leading to solutions that not only addressed immediate problems but also laid the groundwork for future enhancements.

7.1 Overcoming Development Challenges

Security and Data Integrity: One of the foremost challenges was ensuring the security and integrity of encrypted data, crucial for maintaining operational secrecy and reliability. The solution involved implementing advanced encryption methodologies and secure storage practices, ensuring that sensitive data remained protected while still accessible for necessary calculations.

Adaptability and Scalability: Ensuring the application's adaptability for future updates was another significant challenge. The project's architecture was designed with modularity in mind, allowing for the seamless integration of new mathematical models and updates without compromising the core functionality.

User Interface and Experience: Developing an intuitive UI/UX that could cater to users with varying levels of technical proficiency under high-stress conditions was crucial. The application employed a lightweight material UI and minimized user input requirements, significantly reducing the learning curve and potential for input errors.

7.2 Future Directions

Integration with Broader Defense Systems: Looking ahead, there are plans to integrate the application with larger situational awareness and defense platforms. This integration aims to provide a more holistic view of operational readiness and enhance decision-making capabilities at strategic levels.

Expansion to Other Platforms: While the current application is tailored for Android devices, there is potential for expansion to iOS and Windows platforms. This would ensure wider accessibility and usability across different devices used within the naval forces.

Incorporating AI and Machine Learning: Future iterations of the application could benefit from incorporating artificial intelligence and machine learning algorithms. These technologies could offer predictive analytics, enhance calculation accuracy, and provide real-time tactical recommendations based on dynamic operational data.

8. Conclusion

This paper embarked on a journey to explore the transformative potential of a React Native-based mobile application in revolutionizing missile targeting calculations for the Ukrainian Navy. By transitioning from traditional, manual methodologies to a digital framework, this initiative aimed to significantly enhance operational efficiency, accuracy, and user engagement in critical defense scenarios.

8.1 Synthesis of Key Arguments

The development and deployment of the mobile application underscored the critical need for technological innovation within military operations. The React Native framework was pivotal in creating an intuitive, reliable, and scalable solution that addressed the inherent limitations of manual calculations, including time-intensive processes and the high risk of human error.

8.2 Evaluation of Impact

The application's impact on the Ukrainian Navy's operational capabilities has been profound. By reducing calculation times from 1.5 hours to mere minutes and minimizing the potential for errors, the application has not only streamlined operational planning but also ensured a more effective allocation of missile resources. User feedback has highlighted the application's usability and precision, reinforcing its value in high-stakes defense environments.

8.3 Recommendations for Future Research and Development

While the application represents a significant advancement, there is an ongoing need for further research and development to expand its capabilities and integration. Future work could explore:

– Integration with broader situational awareness and command-and-control systems, enhancing decision-making processes at higher operational echelons.

– Adaptation to other platforms such as iOS and Windows, broadening accessibility and usability across different devices and operational contexts.

– Continuous user engagement and feedback loops to refine UX/UI designs, ensuring the application remains intuitive and responsive to the evolving needs of naval operations..

8.4 Final Reflections

The journey from conceptualization to implementation of the React Native application for missile targeting calculations encapsulates the dynamic interplay between technology and military strategy. As we move forward, the continuous iteration and innovation in such digital tools will remain paramount in bolstering defense capabilities, not just for the Ukrainian Navy but for military operations worldwide.

In conclusion, "The Digital Admiral "Malva Alcea" stands as a testament to the power of digital transformation in the military domain, offering a blueprint for future endeavors in defense technology and operational excellence.

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