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A MOBILE APPLICATION WITH GAME MECHANICS FOR MONITORING PET CARE

Abstract

The article considers the development of a cross-platform mobile application with gamification elements for monitoring and planning pet care. The relevance of the study is determined by the need to improve the regularity of pet care procedures, reduce the influence of the human factor, and increase user motivation through game mechanics. Existing mobile solutions in the field of pet care are analyzed, including applications focused on reminders, medical records, and pet activity tracking. Their limitations are identified, in particular the insufficient use of gamification, limited family coordination, and weak support for motivating users to perform routine care tasks regularly. The proposed application combines pet profile management, care schedule generation, reminders, logging of completed procedures, progress tracking, XP rewards, penalties for missed actions, and family interaction through chat.

The architecture of the application is based on cross-platform mobile technologies, using React Native, TypeScript, Redux, SQLite, and Firebase services. The designed database structure provides storage of information about users, pets, care events, completed actions, gamification parameters, and family communication. Functional and non-functional testing confirmed the correctness of the main scenarios, stable operation of the application, acceptable response time, and usability of the interface. The proposed solution can be used as a tool for organizing pet care and forming responsible behavior among users, especially

in a family environment.

Keywords: mobile application, pet care, gamification, React Native, TypeScript, SQLite, reminders, testing.

Problem statement

Modern mobile technologies are increasingly used to support everyday processes related to time management, task control, health monitoring, and the formation of useful habits. One of such processes is pet care, which includes regular feeding, walking, hygiene procedures, play activity, veterinary control, and other actions that directly affect the physical and psychological condition of an animal [1], [2].

In practice, the quality of pet care often depends on the human factor. Pet owners may forget individual procedures, perform them irregularly, or lack a single tool for monitoring the care schedule. This problem becomes especially relevant in family care, when responsibility for a pet is distributed among several family members. In such cases, there is a risk of duplicated actions, missed procedures, or unclear distribution of responsibilities.

Existing mobile applications for pet care usually perform the functions of a calendar, reminder system, or electronic pet profile. They help store information and plan events, but they do not always take into account the motivational aspect. The routine nature of care procedures can reduce user engagement, especially among children and teenagers involved in caring for pets. Therefore, it is relevant to create a mobile application that not only reminds users about necessary actions, but also motivates them to perform these actions regularly through game mechanics.

Gamification makes it possible to transform routine care into a clearer, more visually attractive, and more motivating interaction. The use of experience points, levels, rewards, indicators of a virtual pet’s state, and immediate feedback

contributes to increasing user responsibility and forming stable habits. Therefore, combining planning, monitoring, and gamification functions within one mobile application is a relevant direction in software development.

Analysis of recent research and publications

Pet care is considered in modern sources as an important component of responsible animal ownership. Regular feeding, walking, hygiene procedures, and veterinary care have a direct impact on the health and quality of life of animals [1], [2]. At the same time, pet owners often face practical problems related to forgetfulness, irregular schedules, lack of systematic control, and insufficient coordination of care actions.

The analysis of existing software solutions shows that there are several mobile applications aimed at supporting pet care processes. One of such solutions is PetDesk, which is focused on pet health management, interaction with veterinary clinics, appointment scheduling, medication reminders, and storage of medical information [3], [4]. This application is useful for organizing veterinary communication and managing important health-related events. However, its functionality is mainly focused on informing the owner and supporting medical records, while game-based motivation for regular daily actions such as feeding, walking, or hygiene care is not sufficiently developed [3], [4].

Another analyzed solution is 11pets: Pet Care, which provides a comprehensive approach to pet care management. It supports care schedules, reminders, medical records, journals, notes, and multiple pet profiles [5]. The advantage of this application is its wide functionality and orientation toward systematic organization of care. However, it has limited gamification capabilities, does not include a developed system of rewards, levels, or XP, and does not fully support scenarios of family coordination and task delegation between several users [5].

The DogCat App/ Pet Care Tracker application provides basic functions for creating pet profiles, setting reminders, maintaining a care calendar, and recording care activities [6]. Its main advantage is simplicity and accessibility for users who need basic tracking of pet-related tasks. At the same time, the functionality of this application is limited. It does not provide game progress, a reward system, levels, social interaction, or personalized motivation mechanisms [6].

The reviewed applications show that the current market offers tools for storing information, setting reminders, and maintaining records related to pet care. However, these solutions mainly solve organizational tasks and do not fully address the problem of user engagement. In particular, they do not sufficiently support gamified motivation, family interaction, or visual feedback based on the regularity of completed procedures.

In addition to the analysis of pet care applications, the technological basis of mobile software development was also considered. React Native is widely used for cross-platform mobile development because it allows developers to create applications for Android and iOS using a single code base [8]. TypeScript improves code reliability through static typing and better control of data structures during development [9]. Redux is commonly used for centralized state management in applications with multiple interacting modules [10]. SQLite is suitable for local data storage and offline access to structured information [11], while Firebase services can be used for authentication, notifications, and synchronization [12], [13].

Thus, the analysis of existing research, publications, documentation, and software solutions confirms the relevance of developing a mobile application that combines pet care planning, reminders, family coordination, local data storage, and gamification. Such a combination makes it possible to solve not only the task of informing the user, but also the task of forming responsible and regular care

behavior.

Purpose of the article

The purpose of the article is to present an approach to the development of a cross-platform mobile application with game mechanics for monitoring pet care. The application is intended to automate the planning of care procedures, control their completion, increase user motivation, and support family interaction.

Presentation of the main material of the study

Within the study, the main problems of the subject area that should be solved by the mobile application were identified. These problems include irregular completion of care procedures, low user motivation, lack of coordination between family members, insufficient personalization of care, and absence of convenient feedback and control. For each problem, an appropriate direction of automation was determined.

To reduce missed procedures, the application provides a care schedule, timers, and push reminders. To increase motivation, the system uses XP points, levels, and visualization of the virtual pet's state. To support family interaction, the application includes an action log and an "Ask for help" function. To provide personalization, users can configure types and times of care procedures. To support control and analysis, the application provides statistics, history, and state indicators.

The functional model of the application includes two main roles: the primary user and a family member. The primary user creates a pet profile, configures care parameters, generates or edits the procedure schedule, manages family member access, views statistics, and controls the completion of actions. A family member can receive reminders, perform assigned procedures, confirm their completion, and participate in family communication.

The main functional capabilities of the application include user registration and login, creation and editing of a pet profile, configuration of care parameters,

automatic generation of the initial procedure schedule, viewing, adding, and editing care events, receiving push reminders, completing care actions through interactive screens, confirming completed procedures, recording completed actions in the log, assigning rewards or penalties in the form of XP, updating the state of the virtual character, viewing progress and statistics, and coordinating care through chat.

A special role in the application is played by the gamification module. After a care procedure is completed, the system records the action in the log, determines its status, and assigns experience points to the user. If the procedure is completed on time, the user receives a reward. If the action is missed or completed late, the system may apply a penalty or reduce certain indicators of the virtual pet's state. This approach creates a clear cause-and-effect relationship between the user's actions and the state of the virtual pet.

Visualization of the character's state is an important component of motivation. The application can display mood, cleanliness, activity, or needs of the pet depending on how regularly the procedures are performed. As a result, the user receives not only text reminders, but also visual feedback in a clear game-based form. This is especially useful for children and teenagers, for whom visual and interactive feedback is often more understandable than a traditional task list.

Family interaction is implemented through the ability to manage family members and coordinate care through chat. The primary user can add other participants, distribute responsibility, and send help requests. For example, if one family member cannot perform walking or feeding, they can contact another participant using the "Ask for help" function. This reduces the risk of missed procedures and makes the care process more organized.

The architecture of the application was designed taking into account the requirements for cross-platform development, scalability, extensibility, and local data storage. React Native and TypeScript were chosen for the implementation of

the user interface and business logic. React Native enables the creation of a mobile application for different platforms using a single code base [8]. TypeScript improves development reliability due to static typing, which reduces the number of errors when working with data models, function parameters, and application states [9].

Redux was used to manage the state of the application. This technology makes it possible to store information about the user, pet profile, schedule, completed actions, and gamification parameters in a centralized way [10]. This is important for an application where different modules interact with the same data. For example, the care schedule, reminders, action log, XP module, and virtual pet state depend on the same set of user actions.

SQLite was used for local data storage. This solution makes it possible to store structured information directly on the user's device and access it even without a permanent internet connection [11]. Local storage is especially important for mobile applications related to everyday tasks, because users should be able to view schedules, confirm actions, and save information even when the network connection is unstable.

Firebase services can be used to implement authentication, push notifications, and synchronization features [12], [13]. Authentication is required to identify users and manage access to pet profiles and family functions. Push notifications are necessary to remind users about planned care procedures. Synchronization can be used for interaction between family members and for updating shared data on different devices.

The data structure of the application includes several related entities. The main entities are User, Pet, Care Event, Action Log, XP Record, Family Member, Chat Message, and Virtual Pet State. The User entity stores information about the application user. The Pet entity contains basic data about the animal, such as name, type, age, and individual care parameters. The Care Event entity describes

planned procedures, their type, time, recurrence, and status. The Action Log entity records completed actions, the time of completion, the performer, and the result. The XP Record entity stores information about rewards and penalties. The Family Member entity supports access management and distribution of responsibilities. The Chat Message entity stores family communication related to care coordination. The Virtual Pet State entity stores current indicators that are changed depending on user activity.

During implementation, the main screens of the application were developed. These include the login screen, pet profile creation screen, main screen, care settings screen, schedule screen, procedure execution screens, statistics screen, and family interaction screen. The interface is focused on simplicity, visual clarity, and accessibility for users of different ages. The main actions should be available in a minimum number of steps, and the key interface elements should be visible and intuitive.

The non-functional requirements of the application include performance, reliability, security, usability, compatibility, and scalability. The main screen should open within approximately two seconds under normal operating conditions. Transitions between screens and confirmation of completed procedures should be performed without noticeable delays. In case of temporary loss of network connection, the application should store data locally and synchronize it after the connection is restored.

Security requirements include protection of personal user data, information about family members, and care actions. Authentication data should be stored securely, and access to application functions should be granted according to user roles. Usability requirements assume that the interface should be understandable for users of different ages, including children. Compatibility requirements involve correct operation on modern mobile devices with different screen sizes and orientations. Scalability is ensured by the possibility of further adding new

types of procedures, user roles, game mechanics, and external services.

Functional and non-functional testing was carried out to verify the operation of the application. Functional testing covered typical scenarios such as registration and login, pet profile creation, care parameter configuration, schedule generation, reminder receiving, procedure completion, action logging, XP calculation, virtual pet state update, statistics viewing, and sending messages in the chat. The results of the verification showed that the main scenarios were performed correctly.

Non-functional testing was aimed at evaluating performance, stability, usability, and correctness of interface behavior. The verification showed that the application provides acceptable response time, works stably during the execution of main operations, and correctly handles typical errors, such as empty required fields, incorrect parameters, or absence of data for display. It was also confirmed that the gamification logic correctly responds to completed and missed procedures.

Experimental verification of the achievement of the purpose showed that the use of a schedule, reminders, and gamification contributes to increasing the regularity of care and the convenience of monitoring completed actions. The application helps the user see not only the list of planned procedures, but also the result of their activity through XP, statistics, and the state of the virtual character. This makes pet care more structured, understandable, and motivating.

In order to confirm the effectiveness of the proposed solution, an experimental study of the mobile application was conducted. The purpose of the experiment was to determine whether the combination of a care schedule, reminders, action logging, and gamification mechanics can improve the regularity of pet care procedures and increase user engagement.

During the experimental study, users performed typical scenarios of interaction with the application, including creating a pet profile, configuring care

parameters, viewing the schedule, receiving reminders, completing care procedures, confirming completed actions, and analyzing progress through statistics and the XP system. The effectiveness of the application was evaluated according to several criteria: regularity of completed care actions, number of missed procedures, convenience of schedule control, clarity of the interface, and user motivation to continue using the application.

The results of the experimental study showed that the use of reminders and visual progress indicators helped users better control planned care procedures. Gamification elements, such as XP points, rewards, penalties for missed actions, and changes in the virtual pet's state, increased user interest in completing routine tasks. The action log and statistics provided a clearer understanding of performed and missed procedures, while the family interaction function helped coordinate responsibilities between several users.

Thus, the experimental study confirmed that the proposed mobile application can improve the organization of pet care, reduce the risk of missed procedures, and increase user motivation. The obtained results indicate that the use of gamification in pet care monitoring is appropriate, especially in cases where several family members are involved in the care process or when it is necessary to form regular and responsible care habits.

Conclusions

The article presents an approach to the development of a mobile application with game mechanics for monitoring pet care. The analysis of the subject area showed that pet care requires regularity, control, personalization, and coordination between users. The main problems include missed procedures, low motivation, lack of systematic feedback, and difficulties in distributing responsibilities between family members.

The analysis of existing mobile solutions showed that most of them provide basic functions of reminders, pet profiles, medical information storage,

and care planning. However, they have limited gamification capabilities and insufficient support for family interaction. This confirmed the feasibility of creating an application that combines care planning, reminders, an action log, statistics, an XP system, visualization of the virtual pet's state, and chat for coordination between family members.

The proposed application was implemented using React Native, TypeScript, Redux, SQLite, and Firebase. This technology stack provides cross-platform development, support for local data storage, convenient state management, push notifications, and the possibility of further functional expansion. The designed data structure allows storing information about users, pets, care events, completed procedures, progress, gamification parameters, and family communication.

Functional and non-functional testing confirmed the correctness of the main functional modules, application stability, acceptable response time, and compliance with basic usability requirements. The application correctly processes typical user scenarios, including pet profile creation, care schedule configuration, procedure completion, XP calculation, progress display, and family communication.

An experimental study was also conducted to evaluate the effectiveness of the proposed system. The results showed that the combination of reminders, schedule control, action logging, visual progress indicators, and gamification mechanics helps users better organize pet care procedures. The use of XP points, rewards, penalties for missed actions, and changes in the virtual pet's state increased user motivation and made routine care tasks more engaging.

Therefore, the obtained results indicate the practical value of the proposed solution. The developed mobile application contributes to improving the organization of pet care, reducing the risk of missed procedures, increasing user engagement, and forming responsible care habits. The use of gamification in pet

care monitoring can be considered an effective approach, especially in a family environment where several users are involved in the care process.

Further development of the application may include cloud synchronization, personalized recommendations based on user behavior, integration with veterinary services and smart devices, as well as expansion of the gamification system through achievements, ratings, story elements, and more detailed care analytics.

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