Software Requirements Specification

1. Introduction

1.1 Purpose of Writing

This document aims to detail the software requirements specification for the "HeartIsle - An AI-Driven Mental Health Social Support Platform". It defines the system's functional requirements, non-functional requirements, user scenarios, and system architecture, providing a basis for subsequent design, development, testing, and acceptance.

1.2 Project Background

- Software Name: HeartIsle - An AI-Driven Mental Health Social Support Platform
- Project Task Proposer: HeartIsle Development Team
- Project Developers: Lian Sentao, Wu Haotian, Lin Zejun, Wu Zhibin, Wu Yuting, Lian Zezheng, Jiang Xiancheng, Fang Lizhe, Yang Yuanzhen, Yang Yue, Fan Zhen, Chen Yipeng, etc.
- Project Background: In response to the growing societal demand for mental health support, this project integrates AI technology and social support to provide users with comprehensive mental health care services.

2. General Description

2.1 Product Perspective

HeartIsle is an innovative AI-driven mental health social platform designed to provide users with comprehensive mental health care services through daily simple psychological assessments, AI intelligent evaluation and support, and social interaction functions.

2.2 Product Functions

- Daily psychological assessment and AI evaluation system
- Anonymous blog sharing community
- Friend chat and social support system
- User registration and login system
- Mental health data tracking and analysis

2.3 User Classes and Characteristics

- Regular Users: Young people aged 18-55 facing various psychological pressures, seeking psychological support and social companionship.
- Administrator: Manages platform content, user data, etc. (Not yet defined in detail at the current stage).

2.4 Operating Environment

- Client: Cross-platform application developed based on Qt Creator.
- Server: Developed based on Visual Studio and deployed on a cloud server.
- Database: MySQL database, managed via Navicat.

3. Specific Requirements

3.1 Functional Requirements

3.1.1 User Authentication Module

Function Description: User registration and login system.

- REQ-AUTH-001: Users can register an account using a mobile phone number.
- REQ-AUTH-002: The system supports SMS verification code verification.
- REQ-AUTH-003: Users can log in using their mobile phone number and password.
- REQ-AUTH-004: The system supports MD5 password encryption storage.

Input/Output Format:

- Input: Mobile number (11 digits), username (8 characters), password (32-character MD5), verification code (4 digits).
- Output: Status code, user ID, username, avatar number, number of friends.

3.1.2 Daily Psychological Assessment Module

Function Description: Pushes daily psychological assessment questions and generates psychological profiles.

- REQ-QUIZ-001: The system daily pushes 1 emotional snapshot question + 1 rotational symptom question.
- REQ-QUIZ-002: Supports question rotation based on professional scales like PHQ-9.
- REQ-QUIZ-003: The system records user answer data and generates psychological profiles.
- REQ-QUIZ-004: Provides risk assessment and early warning mechanisms.

Assessment Dimensions:

- Emotional state (Daily)
- Stress and adaptation (2-3 times per week)
- Social support and connection (1-2 times per week)
- Self-cognition and growth (1-2 times per week)
- Lifestyle habits (Once per week)

3.1.3 Social Function Module

Function Description: Blog sharing and friend chat system.

- REQ-SOCIAL-001: Users can publish blogs anonymously.
- REQ-SOCIAL-002: Supports friend addition and management.
- REQ-SOCIAL-003: Implements real-time one-on-one chat.
- REQ-SOCIAL-004: Supports friend list display.

3.2 Non-Functional Requirements

3.2.1 Usability

- REQ-USABILITY-001: The interface design should be simple, user-friendly, and aesthetically pleasing for young people.
- REQ-USABILITY-002: The operation process should be simple and intuitive, with a low learning curve for users.
- REQ-USABILITY-003: Provides clear operational feedback and guidance.

3.2.2 Reliability

- REQ-RELIABILITY-001: The system should ensure stable 7x24 hour operation.
- REQ-RELIABILITY-002: Data loss rate should be lower than 0.1%.
- REQ-RELIABILITY-003: Supports automatic fault recovery.

3.2.3 Performance
- REQ-PERFORMANCE-001: Page response time should not exceed 3 seconds.
- REQ-PERFORMANCE-002: Supports 1000 concurrent users.
- REQ-PERFORMANCE-003: Ensures secure and encrypted data transmission.

3.2.4 Security
- REQ-SECURITY-001: User psychological data must be stored with strict encryption.
- REQ-SECURITY-002: Communication data must be transmitted encrypted.
- REQ-SECURITY-003: Implements comprehensive permission management and access control.

3.3 External Interface Requirements

3.3.1 User Interface
- Interface Style: Warm, healing, and concise visual design.
- Layout Requirements: Conforms to mobile operation habits, with key functions prominently displayed.
- Interaction Design: Smooth animated transitions and timely feedback.

3.3.2 Hardware Interfaces
- Client: Supports mainstream mobile devices.
- Server: Cloud server deployment.

3.3.3 Software Interfaces
- Database Interface: MySQL database connection.
- Third-party Services: SMS verification code interface, AI analysis interface (to be integrated later).

3.3.4 Communication Interfaces
- Protocol Format: Custom binary protocol, including request header and request body.
- Service Types: SMS_CODE, LOGIN, REGISTER, BLOG, MESSAGE, etc.
- Data Format: Fixed-length fields to ensure data transmission integrity.

Protocol Example:
```
// Request protocol
typedef struct {
int service_type; // Service type
int body_len; // Body length
} HEAD;

// Response protocol
typedef struct {
int status_code; // Status code
// Other business data...
} RESPONSE;
```

4. User Scenarios

4.1 Typical User Scenarios

Scenario 1: New User Registration and Initial Assessment

- Primary Actor: New user.
- Preconditions: The user has downloaded and installed the HeartIsle App.
- Trigger: The user opens the App and selects registration.
- Scenario Description:
    1. User enters mobile number to obtain a verification code.
    2. System sends an SMS verification code.
    3. User enters the verification code, sets a username and password.
    4. System verifies the information and creates an account.
    5. User completes the initial psychological assessment.
    6. System generates a preliminary psychological profile.

Scenario 2: Daily Psychological Assessment and Feedback

- Primary Actor: Registered user.
- Preconditions: User is logged into the system.
- Trigger: Daily at a fixed time or initiated actively by the user.
- Scenario Description:
    1. System pushes the day's assessment questions (1+1 mode).
    2. User completes the emotional snapshot question and the rotational symptom question.
    3. System records answers and updates psychological indicators.
    4. AI generates personalized feedback and suggestions.
    5. User views the psychological state trend chart.

Scenario 3: Social Interaction and Emotional Support

- Primary Actor: Registered user.
- Preconditions: User is logged in and has established friend relationships.
- Trigger: User needs emotional support or wants to share their mood.
- Scenario Description:
    1. User chooses to publish an anonymous blog post sharing their mood.
    2. Community users provide support through likes and comments.
    3. User engages in private chat with friends.
    4. System recommends relevant psychological support resources.

5. Class Diagram

Content to be perfected:

- Detailed design of user management classes.
- Attributes and methods of psychological assessment classes.
- Association relationships of social function classes.
- Complete definition of database entity classes.

6. Interface Prototype

(The interface prototype design has not been completed at the current stage and will be supplemented in subsequent development phases.)

Content to be perfected:

- User interface prototype design.
- Interaction flow prototype.

- Visual design specifications.
- Responsive layout scheme.

7. Function Description

7.1 Core Functional Modules

7.1.1 Psychological Assessment System
- Daily push mechanism: 1 emotional question + 1 rotational question.
- Question bank management: Based on professional scales (e.g., PHQ-9, SCL-90).
- Intelligent evaluation: AI-driven psychological state analysis.
- Trend tracking: Long-term psychological data visualization.

7.1.2 Social Support System
- Anonymous community: A safe space for emotional expression.
- Friend system: Establishes a trusted social network.
- Instant messaging: Provides real-time emotional support.
- Content management: Blog publishing and interaction.

7.2 Input and Output Formats

7.2.1 Data Input Format
- User registration information: Mobile number (11 characters), username (8 characters), password (32-character MD5).
- Psychological assessment answers: Question ID + selected option value.
- Social content: Text content, image attachments, etc.

7.2.2 Data Output Format
- User information: User ID, username, avatar number, psychological indicators, etc.
- Assessment results: Psychological profile, risk assessment, improvement suggestions.
- Social data: Blog list, friend information, chat records.

8. Acceptance Verification Criteria

8.1 Functional Acceptance Criteria

8.1.1 User Authentication Function
- SMS verification code sending success rate reaches 99%.
- User registration process is complete and error-free.
- Login verification accuracy is 100%.
- Passwords are stored encrypted securely.

8.1.2 Psychological Assessment Function
- Daily question 推送 is punctual and accurate.
- Psychological profile generation algorithm is correct.
- Risk assessment mechanism is effective.
- Data tracking function is complete.

8.1.3 Social Functions

- Blog publishing and display function correctly.
- Friend addition and management functions are complete.
- Chat system is real-time and stable.
- Anonymous mechanism is secure and reliable.

8.2 Non-Functional Acceptance Criteria

8.2.1 Performance Standards
- System response time is < 3 seconds.
- Supports 1000 concurrent users.
- Data storage accuracy is > 99.9%.

8.2.2 Security Standards
- User data is stored encrypted.
- Communication transmission is secure.
- Privacy protection mechanisms are sound.

8.2.3 Usability Standards
- Interface operation is intuitive and easy to understand.
- User learning cost is low.
- Error prompts are clear and effective.

8.3 Integration Acceptance Criteria
- Communication between client and server is normal.
- Database operations are accurate and error-free.
- All modules pass integration testing.
- System deployment and operation are stable.

Note:
The class diagrams and interface prototype sections in this document are currently unfinished and will be supplemented and improved in subsequent development phases. Corresponding improvements will be noted in the follow-up project blog.