Functional Requirements Document

Project: Home Appliance Control System (HACS)

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Introduction

This document outlines the detailed functional requirements of the proposed Home Appliance Control System (HACS). The requirements are derived through user surveys, especially targeting house-working women, and are aligned with modern smart home trends. Each functional requirement is explained clearly with justification, source, and impact.

FR1: User Authentication and Session Management

FR1.1: Secure Login
The system must require users to log in using a unique username and password before accessing any appliance features.

FR1.2: Account Lockout After Multiple Failures
After three incorrect login attempts, the system must lock the account temporarily and alert the user.

FR1.3: Password Reset Mechanism
Users should be able to reset their password through a secure email-based verification process.

FR2: Appliance Menu and Selection Interface

FR2.1: Dynamic Appliance Listing
Upon successful login, the system must display a dynamic list of connected appliances (Microwave, Washing Machine, AC, Sprinkler, Pet Feeder, Watch, etc.).

FR2.2: Real-Time Status Display
Selecting an appliance should immediately show its current status (e.g., ON/OFF, Running, Idle, Scheduled).

FR2.3: Actionable Operation Menu
The system should display available operations for each appliance and allow selection.

FR2.4: Appliance History and Service Info
When an appliance is selected, the system must show its usage history, model details, last service date, and upcoming service schedule.

FR2.5: Appliance Photos and Uploads
Each appliance must be displayed with an icon or photo (e.g., washing machine image), and users should be able to upload photos of broken or malfunctioning appliances.

FR2.6: Technician Suggestion System
If a user uploads an image of a broken appliance, the system should forward it to certified technicians who can provide first aid repair tips or schedule visits.

FR3: Remote Control of Appliances

FR3.1: Cross-Platform Access
Users must be able to control appliances via smartphone, desktop, or tablet using the internet or WAP.

FR3.2: Instant Command Execution
Commands such as ON/OFF or mode changes should be executed instantly and feedback displayed to the user.

FR3.3: Multi-Device Support
The system should allow different family members to control appliances from their own devices.

FR4: Appliance Scheduling

FR4.1: Time-Based Scheduling
Users must be able to set appliances to operate automatically at specified times.

FR4.2: Recurring Schedules
Support should be provided for repeating tasks (e.g., feed pet every 4 hours).

FR4.3: Notification System
Users should receive notifications before and after scheduled operations.

FR5: Voice Command Integration (Innovative)

FR5.1: Voice Command Activation
Users should be able to issue voice commands like "Turn on AC" or "Start washing machine."

FR5.2: Language and Accent Adaptation
System should recognize common voice patterns and support at least English and one local language.

FR5.3: Voice Confirmation Feedback
Appliance should confirm the command verbally (e.g., "Microwave is now warming").

FR6: Gesture-Based Appliance Control (Innovative)

FR6.1: Gesture Recognition Using Sensors or Camera
System should support basic hand gestures to operate appliances (e.g., wave to turn on lights).

FR6.2: Customizable Gesture Settings
Users should be allowed to define their own gesture-action mappings.

FR6.3: Gesture Control Toggle
Users should be able to enable or disable gesture mode at any time.

FR7: Smart AI Behavior (Learning & Suggestions)

FR7.1: Usage Pattern Analysis
System must analyze frequent user habits and suggest schedules or auto-routines.

FR7.2: Predictive Notifications
System should suggest: "You usually turn on the sprinkler at 6:00 AM. Would you like to schedule it daily?"

FR7.3: User Control Over AI Suggestions
Users should always have the option to accept, modify, or decline smart suggestions.

FR8: Real-Time Feedback System

FR8.1: Operation Acknowledgment
After executing a command, the system must show confirmation: "Fan turned ON."

FR8.2: Error Alerts
If any operation fails (due to power or hardware issue), the system must alert the user.

FR8.3: Visual and Audio Feedback
Feedback can be visual (popup or screen message) or auditory (voice).

FR8.4: Emergency Notification to Mobile
If a critical fault is detected in any appliance (like electrical short), an emergency alert SMS or push notification must be sent to the user's registered mobile number.

FR9: Admin Panel

FR9.1: User Management
Admins can add, delete, or modify user access.

FR9.2: Appliance Management
Admins can register new appliances, update settings, or remove devices.

FR9.3: Logs and Reports
Admins must be able to view usage logs and generate reports for performance, errors, and user activity.

FR10: Safety & Emergency Handling

FR10.1: Auto Shut-Off on Malfunction
If an appliance shows abnormal behavior (overheating, no response), system must automatically turn it off.

FR10.2: Emergency Alert to User
Immediate alert (SMS or in-app) should be sent to the user.

FR10.3: Emergency Contact Option
System should allow users to save a contact number (e.g., technician) for instant help.

FR11: Enhanced User Interface Features (Innovative)

FR11.1: Dashboard Taskbar Navigation
After login, users should see a taskbar with options: Home, Settings, About/Help, and Profile.

FR11.2: Icons and Visual Cues
Each taskbar button and appliance entry should have an appropriate icon or image (e.g., home icon, washing machine photo).

FR11.3: Profile Customization
Users should be able to manage their profile with bio, contact info, and personalization options.

FR11.4: About/Help Section
The app must include a help section that explains how to use each feature and troubleshoot common issues.

FR11.5: Settings Customization
Users should be able to: - Change the language - Select themes (light/dark/custom) - Set daily screen time limits or reminders for app usage

Summary Table of Functional Requirements

ID	Requirement Area	Description
FR1	User Authentication	Secure login, reset, session control
FR2	Appliance Menu Interface	Appliance listing, history, service info, photo upload
FR3	Remote Control	Cross-device access and control
FR4	Scheduling	Set, repeat, and notify scheduled actions
FR5	Voice Commands	Speak to control, multilingual, feedback
FR6	Gesture Controls	Hands-free appliance control via motion
FR7	Smart AI Behavior	Learn usage and suggest automation
FR8	Real-Time Feedback	Confirmation, alerts, and mobile notifications
FR9	Admin Panel	Manage users and appliances
FR10	Safety & Emergency	Auto shutoff, alerts, technician contact
FR11	UI Enhancements	Taskbar, icons, help, settings, profile features