User Process Flow Documentation

Real-World AR ChatGPT for Farmers

Document Information

- **Version:** 1.0
- **Purpose:** Complete user journey and process flow documentation
- **Target Audience:** Stakeholders, developers, designers, end users

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1. Executive Overview

This document describes the complete user journey through the Real-World AR ChatGPT for Farmers application, from initial discovery to becoming a power user. The application transforms traditional farming decision-making by providing instant, location-specific agricultural insights through an innovative AR interface powered by NASA satellite data and conversational AI.

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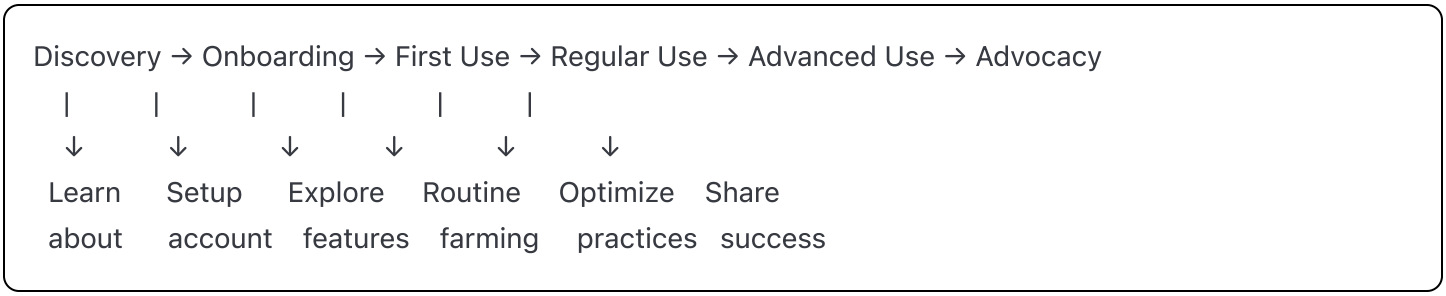
2. User Journey Map

2.1 Journey Stages



2.2 User Touchpoints

Stage	Primary Touchpoint	Secondary Touchpoint	Emotion
Discovery	Social media/Word of mouth	NASA website	Curious
Onboarding	Mobile web app	Tutorial	Hopeful
First Use	AR camera view	Permission prompts	Excited/Anxious
Regular Use	Daily insights	Chat assistant	Confident
Advanced Use	Recommendations	Companion alerts	Empowered
Advocacy	Community features	Success stories	Proud

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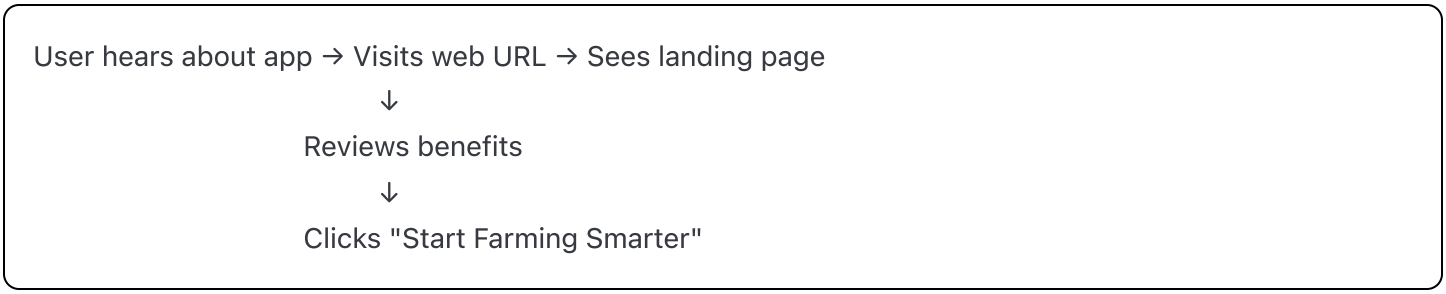
3. Primary User Flow

3.1 First-Time User Experience

Stage 1: Initial Access



User Actions:

1. Opens mobile browser
2. Enters app URL or clicks shared link
3. Views landing page with value proposition
4. Reads testimonials and features
5. Taps primary CTA button

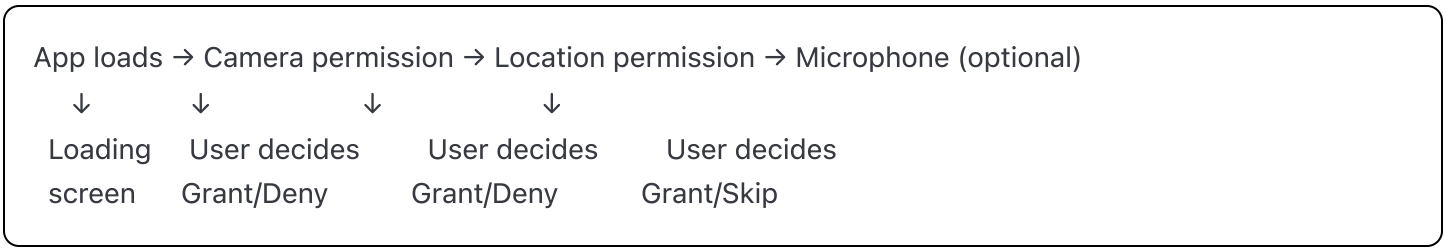
System Response:

- Detects mobile device and browser compatibility
- Displays optimized mobile landing page
- Shows loading animation
- Prepares WebAR session

Decision Points:

- Browser compatible? → Continue or show compatibility message
- First visit? → Show onboarding or skip to main app

Stage 2: Permission Requests



User Actions:

1. Sees camera permission request
2. Understands why camera is needed (AR features)
3. Grants or denies camera access
4. Sees location permission request
5. Understands benefits (local data)
6. Grants or denies location access
7. Optional: Grants microphone for voice features

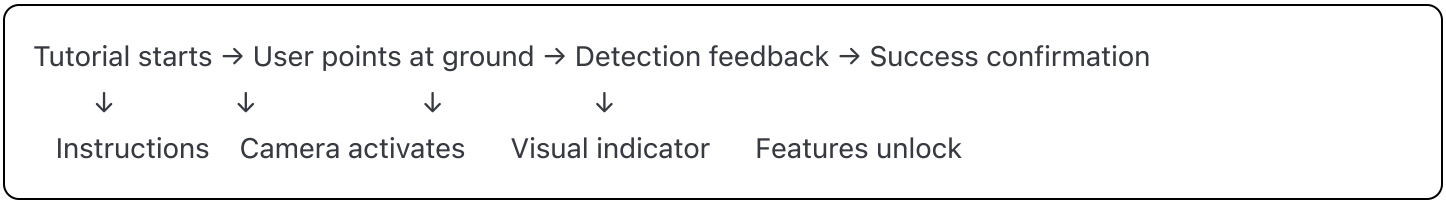
System Response:

- Explains each permission clearly
- Shows benefits of granting
- Provides alternatives if denied
- Saves permission status

Fallback Flows:

- Camera denied → Explain limitation, offer retry
- Location denied → Offer manual coordinate entry
- Microphone denied → Text-only chat mode

Stage 3: Ground Detection Tutorial



User Actions:

1. Reads brief instruction overlay
2. Points phone camera downward
3. Moves camera to find suitable ground
4. Waits for detection confirmation
5. Sees successful detection indicator

System Response:

- Displays animated guide

- Processes camera feed for planes
- Shows real-time detection status
- Validates ground vs other surfaces
- Confirms soil detection
- Estimates visible area

Visual Feedback:

- Red outline: No ground detected
- Yellow outline: Detecting...
- Green outline: Ground confirmed
- Soil icon: Soil validated

3.2 Core Feature Usage Flow

Flow A: Getting Location-Based Insights

Process Details:

1. **Automatic Data Retrieval**
   - System captures GPS coordinates
   - Sends request to backend
   - Backend queries NASA APIs
   - Fuses multiple data sources
   - Returns processed insights
2. **Data Display Sequence**
   - Loading spinner (0.5-1 second)
   - Soil moisture card appears
   - Temperature data slides in
   - NDVI visualization loads
   - Precipitation forecast shows

- All cards become interactive

3. **User Interaction Options**
   - Tap cards for detailed view
   - Swipe between data layers
   - Pinch to zoom visualizations
   - Long press for historical data

Information Architecture:

```
Main Insights View
├── Soil Moisture
│   ├── Current: 35% VWC
│   ├── Optimal Range: 40-60%
│   └── Trend: Decreasing
├── Surface Temperature
│   ├── Current: 28°C
│   ├── Daily Range: 22-31°C
│   └── Heat Stress Risk: Low
├── Vegetation Health (NDVI)
│   ├── Current: 0.72
│   ├── Status: Healthy
│   └── Change: +0.05 (7 days)
└── Weather Forecast
    ├── Rain: 30% tomorrow
    ├── Temperature: 26°C avg
    └── Wind: 15 km/h
```

Flow B: Conversational Assistance

```
User has question → Opens chat → Types/speaks query → Receives answer
      ↓              ↓              ↓                ↓
  Need arises    Chat bubble    Input method      AI processing
                                      ↓
                                Contextual response
                                with citations
```

Interaction Sequence:

1. **Chat Initiation**
   - User taps chat bubble

- Chat interface slides up
- Keyboard appears (or mic button)
- Previous context loaded

2. **Query Input Methods Text Input:**
   - User types question
   - Autocomplete suggestions appear
   - User taps send button

   Voice Input:
   - User holds microphone button
   - Speaks question clearly
   - Releases to send
   - Sees transcription

3. **Response Generation**
   - Loading dots animation
   - RAG system searches knowledge base
   - LLM generates response
   - Citations added automatically
   - Response appears progressively

4. **Response Interaction**
   - User reads answer
   - Taps citations for sources
   - Asks follow-up questions
   - Rates response helpful/not helpful

Sample Conversation Flow:

```
User: "What should I plant here in October?"
      ↓
System: [Retrieves location context + season data]
      ↓
Response: "Based on your location in Nebraska (40.71°N) and
        current soil conditions, I recommend:

        1. Winter Wheat - Optimal planting window
        2. Cover Crops - Rye or clover for soil health
        3. Garlic - Plant now for summer harvest

        Your soil moisture (35%) is slightly low, consider
        irrigation before planting. [NASA SMAP, Oct 2025]"
      ↓
User: "How much water for winter wheat?"
      ↓
System: [Maintains context about wheat]
      ↓
Response: "Winter wheat needs approximately 12-15 inches
        total through its growing season..."
```

Flow C: Crop Recommendations

```
User requests recommendations → System analyzes conditions → Generates options
        ↓                       ↓                  ↓
   "What to plant?"          Multi-factor analysis   Ranked suggestions
                                        ↓
                                User selects crop
                                        ↓
                                Companion activated
```

Recommendation Process:

1. **Data Collection Phase**
   - Current location data
   - Seasonal calendar check
   - Soil moisture levels
   - Temperature patterns
   - Historical success rates
   - Regional pest/disease data

2. **Analysis Algorithm**

```
Score = (Soil Match × 0.3) + (Climate Fit × 0.25) +
        (Season Timing × 0.25) + (Water Availability × 0.2)
```

3. **Presentation Format**

```
Top Recommendations:

1. CORN (Score: 92/100)
   ✓ Optimal soil moisture
   ✓ Perfect planting window
   ⚠ High water needs
   Expected yield: 180 bu/acre

2. SOYBEANS (Score: 87/100)
   ✓ Good moisture tolerance
   ✓ Nitrogen fixing benefits
   ✓ Lower water needs
   Expected yield: 50 bu/acre

3. SORGHUM (Score: 79/100)
   ✓ Drought resistant
   ⚠ Slightly late for planting
   ✓ Good market prices
   Expected yield: 100 bu/acre
```

3.3 Gamification Flow

Crop Companion Journey

```
Crop selected → Avatar appears → Daily interactions → Growth milestones → Harvest
     ↓              ↓                ↓                    ↓                ↓
  User choice   Seed character   Care activities   Stage transitions   Rewards
```

Companion Lifecycle:

1. **Initialization (Day 0)**
   - User selects crop from recommendations
   - Matching avatar appears (corn sprite, wheat sprite, etc.)

- Name your crop option
- Initial happiness: 100%
- Tutorial: "This is your crop companion!"

2. **Daily Interaction Loop**

```
Morning Check → Status Update → Action Prompt → User Response → Feedback
    ↓             ↓              ↓               ↓              ↓
App opened    Health/Mood    "Water needed?"   Takes action  Avatar reacts
```

3. **Alert System Flow**

```
Condition Detected → Alert Generated → Notification → User Opens → Action Required
    ↓                  ↓                 ↓              ↓              ↓
Heat stress >30°C   Priority set    Push/In-app    Views alert   "Add shade/water"
```

4. **Growth Stages**
   - **Seed Stage (Days 0-7)**
     - Avatar: Small seed with eyes
     - Needs: Consistent moisture
     - Alerts: Soil too dry/wet
   - **Seedling Stage (Days 8-21)**
     - Avatar: Small plant with face
     - Needs: Nutrients, water
     - Alerts: Pest warnings
   - **Vegetative Stage (Days 22-60)**
     - Avatar: Growing plant character
     - Needs: Regular monitoring
     - Alerts: Disease risk, nutrients
   - **Flowering Stage (Days 61-90)**
     - Avatar: Flowering character
     - Needs: Pollination support
     - Alerts: Weather risks
   - **Harvest Stage (Days 91+)**
     - Avatar: Mature happy plant

- Needs: Harvest timing
- Alerts: Optimal harvest window

Reward Mechanisms:

```
Daily Login → Streak Counter → Milestone Rewards
    ↓           ↓              ↓
 +10 points   7-day streak    Unlock features

Successful Actions → Achievement Unlocked → Badge Earned
      ↓                ↓              ↓
 Watered on time    "Hydration Hero"    Display in profile
```

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4. Advanced User Workflows

4.1 Irrigation Optimization Flow

```
Moisture Check → Forecast Review → Recommendation → Schedule Set → Reminder
     ↓              ↓                ↓               ↓            ↓
 Current: 25%   Rain in 2 days   "Wait to water"   User confirms  Alert saved
```

Decision Tree:

```
IF moisture < 30% AND rain_forecast = 0 THEN
   Recommend: "Water immediately"
ELSE IF moisture < 40% AND rain_forecast < 3 days THEN
   Recommend: "Wait for rain"
ELSE IF moisture > 60% THEN
   Recommend: "No water needed"
ELSE
   Recommend: "Monitor daily"
```

4.2 Multi-Field Management Flow

```
Field Selection → Switch Context → Compare Data → Prioritize Actions
      ↓              ↓               ↓              ↓
  Dropdown menu   Load new data   Side-by-side    Task list
```

Field Switching Process:

1. User saves multiple field locations
2. Labels each field (North-40, Home-Garden, etc.)
3. Swipes or selects to switch
4. System loads cached data
5. Updates recommendations per field

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5. Error Handling and Recovery Flows

5.1 Network Failure Flow

```
Request Made → Network Error → Cached Data Check → Fallback Display
    ↓            ↓              ↓                  ↓
 API called   Timeout/404   Local storage read   "Offline Mode"
```

Offline Capabilities:

- Last 7 days of data cached
- Basic recommendations available
- Chat limited to offline knowledge
- Queue actions for sync

5.2 Permission Recovery Flow

```
Feature Blocked → Explanation Shown → Retry Offered → Settings Guide
      ↓               ↓                  ↓               ↓
  No camera      "AR needs camera"   "Enable Now?"    Step-by-step
```

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6. User State Transitions

6.1 User Progression Model

```
Novice → Regular User → Power User → Advocate
  ↓          ↓            ↓           ↓
0-7 days   8-30 days    31-90 days   90+ days

Features Unlocked:
- Basic insights    ✓          ✓          ✓          ✓
```

- Chat assistant ✓ ✓ ✓ ✓
- Recommendations Day 3 ✓ ✓ ✓
- Companion Day 7 ✓ ✓ ✓
- Advanced analytics - Day 14 ✓ ✓
- Community features - - Day 30 ✓
- Mentorship - - - Day 90

6.2 Engagement Loops

Daily Loop:

Morning: Check companion → Review alerts → Take actions → Confirm completion
Evening: Review progress → Plan tomorrow → Set reminders → Close app

Weekly Loop:

Monday: Weekly summary → Review trends → Adjust plans
Friday: Prepare weekend tasks → Weather check → Schedule irrigation

Seasonal Loop:

Pre-Season: Plan crops → Prepare soil → Order supplies
Growing Season: Monitor → Adjust → Protect → Optimize
Harvest: Time picking → Execute → Record results
Post-Harvest: Analyze → Learn → Plan improvements

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7. Cross-Functional Flows

7.1 Data Flow Through System

User Input → Frontend Processing → API Gateway → Backend Services → Data Sources
↓ ↓ ↓ ↓ ↓
Location Validation Auth check Business logic NASA APIs
↓
User Display ← Frontend Render ← API Response ← Data Fusion ← Cache/Fresh Data

7.2 Authentication Flow

First Visit → Anonymous Session → Feature Use → Registration Prompt → Account Created

```
↓          ↓          ↓          ↓          ↓
Cookie set  Basic features  Trial limit  "Save progress?"  Full access
```

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8. Accessibility Flows

8.1 Voice-Only Navigation

```
Voice Command → Speech Recognition → Intent Parsing → Action Execution → Audio Feedback
    ↓          ↓          ↓          ↓          ↓
"Check moisture"  Transcribe      Understand need  Query data     "Moisture is 35%"
```

8.2 Low-Vision Accommodation

```
High Contrast Mode → Larger Touch Targets → Audio Descriptions → Haptic Feedback
     ↓          ↓          ↓          ↓
  Toggle in settings  150% default size  Screen reader ready  Vibration cues
```

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9. Performance Optimization Flows

9.1 Progressive Loading

```
Initial Load → Critical Path → Enhanced Features → Background Sync
    ↓          ↓          ↓          ↓
  HTML/CSS    Core JS/AR     Chat/Voice        Historical data
  (1 second)  (2 seconds)    (3 seconds)       (Async)
```

9.2 Caching Strategy

```
First Request → Cache Miss → Fetch Data → Store in Cache → Serve to User
    ↓          ↓          ↓          ↓          ↓
  Check cache   Not found    API call     Redis + Local    Display

Second Request → Cache Hit → Validate TTL → Serve from Cache
    ↓          ↓          ↓          ↓
  Check cache    Found      Still valid    Instant display
```

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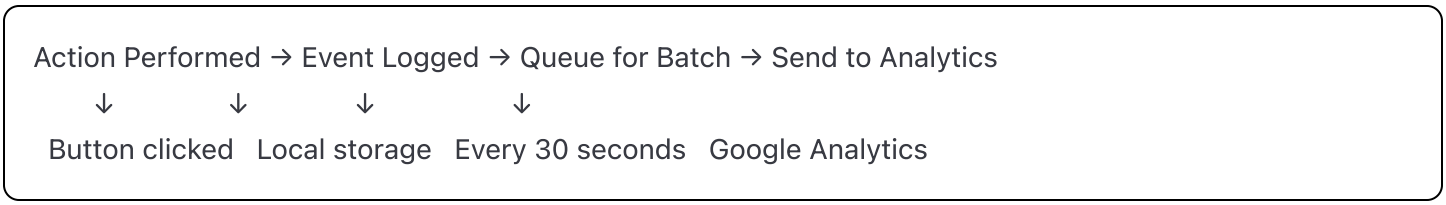
10. Analytics and Tracking Flows

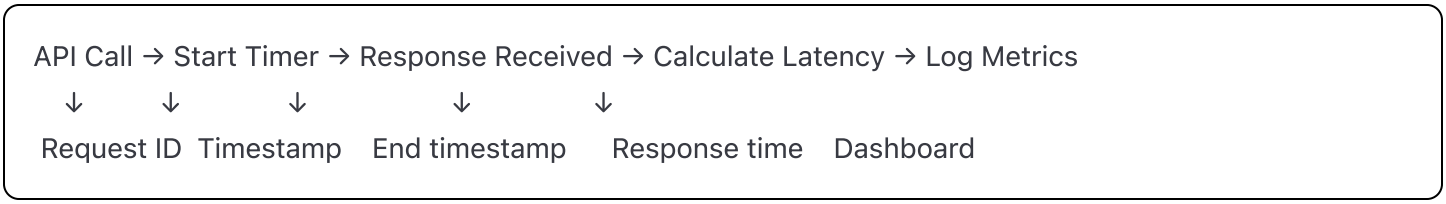
10.1 User Behavior Tracking



Key Events Tracked:

- Session start/end
- Feature usage (AR, Chat, Voice)
- Crop selections
- Recommendation acceptance
- Alert interactions
- Error occurrences

10.2 Performance Monitoring



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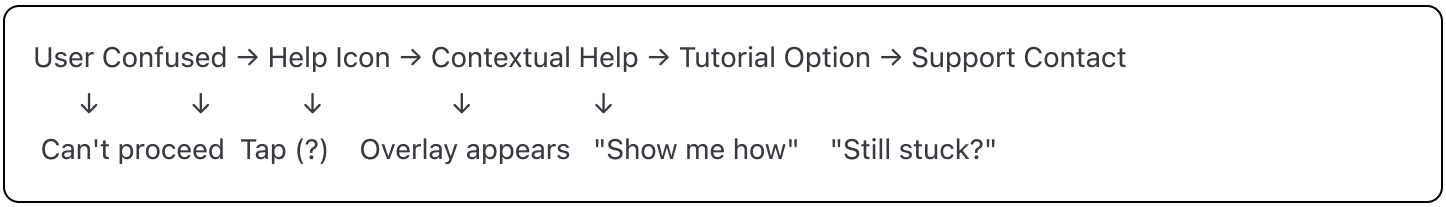
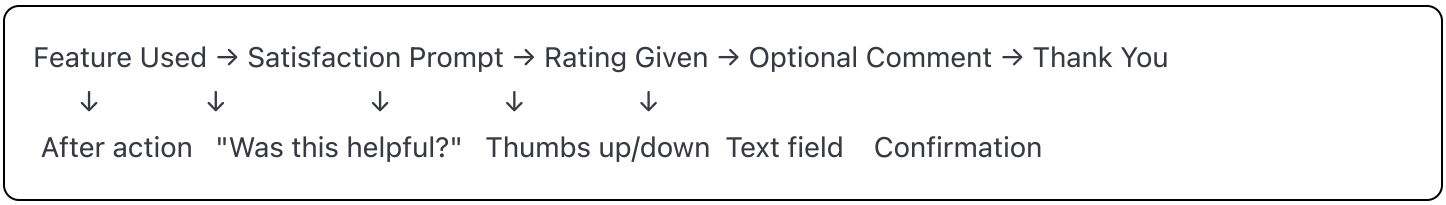
11. Support and Help Flows

11.1 In-App Help System



11.2 Feedback Collection



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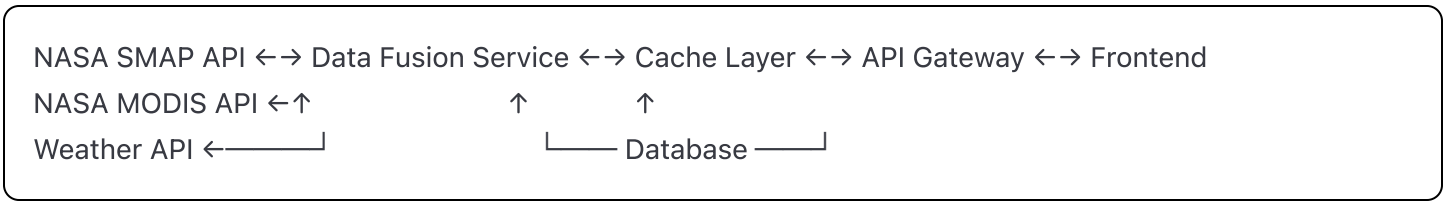
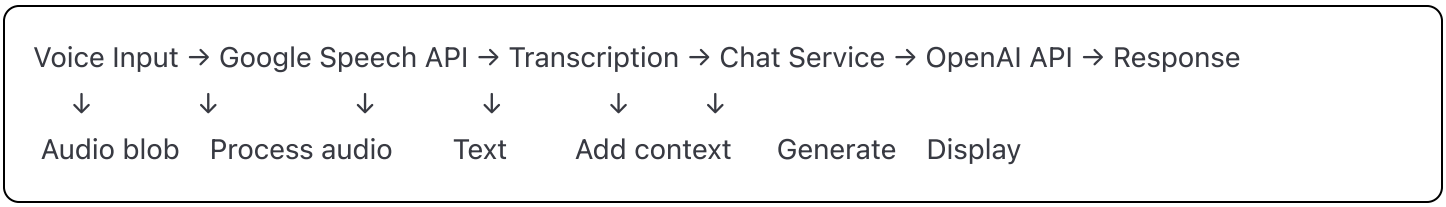
12. Integration Points

12.1 External System Interactions



12.2 Third-Party Service Flow



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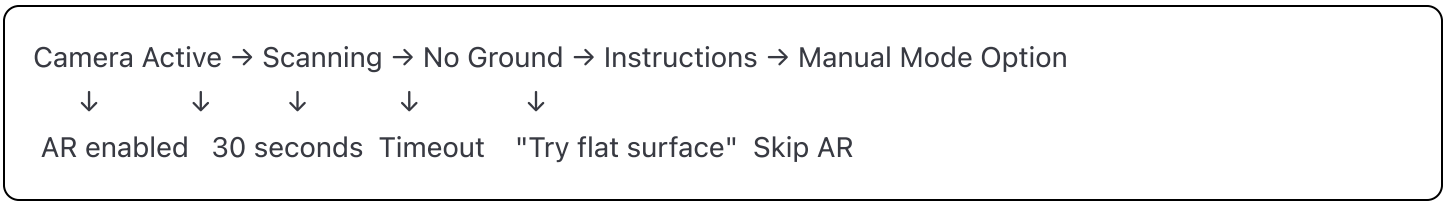
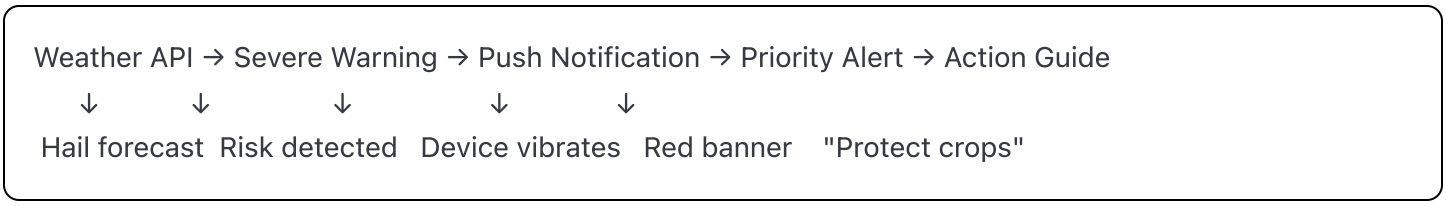
13. Edge Cases and Special Flows

13.1 No Suitable Ground Detected



13.2 Extreme Weather Alert Flow



13.3 API Quota Exceeded

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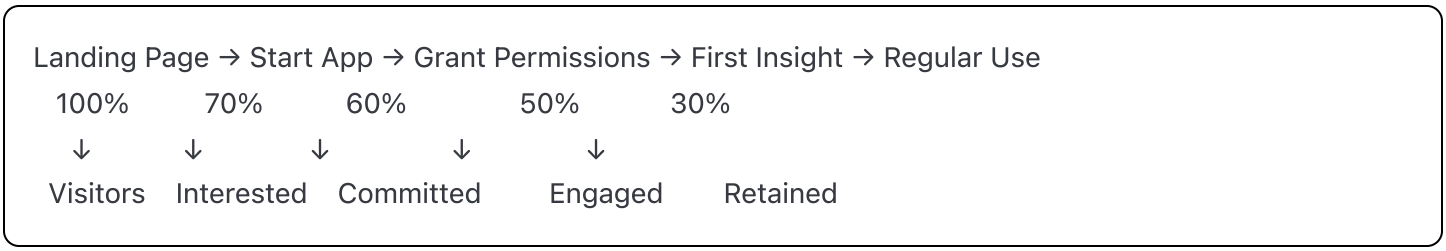
14. Success Metrics and Flow Optimization

14.1 Conversion Funnel



14.2 Time-to-Value Metrics

- Time to first insight: <30 seconds
- Time to first question answered: <2 minutes
- Time to first recommendation: <3 minutes
- Time to companion setup: <5 minutes

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15. Future Flow Enhancements

15.1 Planned Features

15.2 Optimization Opportunities

- Predictive caching based on user patterns
- Proactive alerts before user checks
- Automated action suggestions
- Cross-user insight sharing
- Seasonal planning automation

Appendices

Appendix A: Screen Flow Diagrams

Visual representations of all major flows

Appendix B: Decision Trees

Complete logic for all automated decisions

Appendix C: Error Message Catalog

All possible error states and recovery options

Appendix D: Accessibility Compliance

WCAG 2.1 AA adherence documentation

Appendix E: Performance Baselines

Expected timings for all critical paths