ChatGPT

P1: Analyze the system description for ambiguities, incompleteness, and contradictions

- Unstructured
  - Validity: 1-0/10 = 1
  - Comprehensiveness: Missing “popular”, and “simplifying life vs. program devices” and “centralized controller vs. smartphone app, voice commands”. 1- 3/6 = 0.5
  - Consistency: “User Roles and Permissions”, “System Updates and Maintenance” are overly stretched and not explicitly covered in the system description. 1- 2/10 = 0.8
- Structured
  - Validity: Valid. 1-0/10 = 1
  - Comprehensiveness: 1-0/6 = 1
  - Consistency: 1-0/10 = 1

- Due to the overlapping definitions of ambiguities, incompleteness, and contradictions, the findings are not quite aligned with the manual findings.

P2: Identify and categorize the functional and non-functional requirements of the system description

- Unstructured
  - Validity: Valid. 1-0/(4+7) = 1
  - Comprehensiveness: It covers all requirements in the solution. 1-0/6 = 1
  - Consistency: “Performance”, “Security”, “Maintainability” not explicitly mentioned. 1-3/11 = 0.727
- Structured
  - Validity: Valid. 1-0/(4+6) = 1
  - Comprehensiveness: Covers all requirements in the solution. 1-0/8 = 1
  - Consistency: “Performance”, “Security” not explicitly mentioned. 1-2/11 = 0.818

P3: Create a use case model for the smart home system

- Unstructured
  - Validity: No system boundary (-0.1). No separation of primary and supporting actors (-0.1). Provides both textual and graphical. Graphical has invalid notations (-0.2). 1-0/8-0.1-0.1-0.2 = 0.6
  - Comprehensiveness: Missing “Integration with Ecosystem”. 1-1/3 = 0.666
  - Consistency: “Manage Scenes and Routines” not explicitly covered requirements. 1-1/8 = 0.875
- Structured
  - Validity: Clear system boundary. Separation of primary and supporting actors. Invalid primary actor in “Integration with Smart Home Ecosystems” (-0.1) “Centralized Control” and “Manage System Through App” overlapping. 1-(1*0.1)/7 = 0.985
  - Comprehensiveness: 1-0/3 = 1
  - Consistency: Consistent with P2. 1-0/7 = 1

P4: Create use case specifications for every use case

- Unstructured
  - Validity: 1. Unclear primary & supporting actor in UC4. Unclear actors - Homeowner/User, Guest/User, Maintenance Personnel. Descriptive reference back to basic flow in alternative flow. 1- (1*0.1+7*0.1)/8 = 0.9
  - Comprehensiveness: 1-0/3 = 1
  - Consistency: 1-0/8 = 1
- Structured
  - Validity: “Integrate with Smart Home Ecosystems” identifies “Smart Home Ecosystem” as the primary actor, the main success scenario shows that the primary actor is “Homeowner” (-0.1). 1- (1*0.1)/7 = 0.985
  - Comprehensiveness: 1-0/3 = 1
  - Consistency: 1-0/7 = 1

P5: Identify domain concepts and their relationships from the created use case specifications.

- Unstructured
  - Validity: 7 classes defined - User, Device, Automation, Scene/Routine, SecuritySystem, VoiceAssistant, SmartHomeSystem. 13 relationships defined. Textual and graphical inconsistent in relationships (-0.1). Descriptive relationship with multiplicities. Graphical includes navigabilities on 7 relationships. (-0.1) 1-(7*0.1)/(7+13)-0.1 = 0.865
  - Comprehensiveness: Missing SmartHomeEcosystem. 1-1/6 = 0.833
  - Consistency: 1-0/7 = 1
- Structured
  - Validity: 9 classes defined - SmartHomeSystem, Homeowner, SmartDevice, AutomationRule, VoiceAssistant, SmartHomeEcosystem, SecurityDevice, EnergyMonitoringDevice, ControlInterface. 9 relationships named with clear multiplicities. Valid. 1-0/(9+9) = 1
  - Comprehensiveness: 1-0/6 = 1
  - Consistency: 1-0/9 = 1

P6. Identify system operations from use case specifications of the smart home system.

- Unstructured
  - Validity: Clear operation with parameters. 8/50 not actor-initiated – VerifyCommand, ConfirmExecution, VerifyAutomationRule, ExecuteAutomationRule, SaveUserDetails, VerifyVoiceAssistantIntegration, ProcessVoiceCommand, RetrieveDeviceStatus, DisplayDeviceStatus, SaveSceneOrRoutine, SaveSecuritySettings, InstallSystemUpdate. 1-12/50 = 0.76
  - Comprehensiveness: 1-0/3 = 1
  - Consistency: Consistent with P5. 1-0/50 = 1
- Structured
  - Validity: Descriptive operations without parameters (-0.1). Clear mapping to use case (not steps). 1-(25*0.1)/25 = 0.9
  - Comprehensiveness: 1-0/3 = 1
  - Consistency: 1-0/25 = 1

P7: Create design sequence diagrams for system operations of the smart home system.

- Unstructured
  - Validity: 8 SDs defined - Control Devices, Set Up Automation, Add User, Integration with Voice Assistants, View Device Status, Manage Scenes and Routines, Configure Security Settings, System Maintenance and Updates. 5 invalid SDs-Lifeline with no name in Add User. No message notation for RetrieveUpdates() and invalid sequences in System Maintenance and Updates. Graphical. 1-5/8 = 0.375
  - Comprehensiveness: 1-0/3 = 1
  - Consistency: Missing operations or inconsistent flows in 7 SDs. (-0.2) 1-(7*0.2)/8 = 0.825
- Structured
  - Validity: 24 SDs defined - Select Control Interface, Navigate to Device Control Section, Select Device to Control, Issue Command to Device, Automation Setup Interface, Create New Automation Rule, Select Automation Trigger, Define Automation Action, Save Automation Rule, Issue Voice Command, Configure Voice Assistant, Open Smartphone App, Log into System, Navigate App Sections, Perform Desired Action, Select Integration Option, Log into Ecosystem Account, Authorize Integration, Select Security Settings, Configure Security Devices, Activate Security System, Select Energy Management Settings, Configure Energy Monitoring Devices, Set Up Energy Optimization Rules, Review Energy Usage Reports. Textual. 1-0/25 = 1
  - Comprehensiveness: 1-0/4 =1
  - Consistency: 1-0/25 = 1

P8: Create design class diagrams based on the domain model and sequence diagrams of the smart home system.

- Unstructured
  - Validity: 7 classes defined - User, Device, Automation, SceneRoutine, SecuritySystem, VoiceAssistant, SmartHomeSystem. 14 relationships defined. Missing multiptlicities in 9/14 (-0.1). Visibility defined. 1-(9*0.1)/(7+14) = 0.957
  - Comprehensiveness: Missing Ecosystem. 1-1/6 = 0.833
  - Consistency: All 7 MCD classes defined. Inconsistent operations in all 8 DSDs – methods defined in callers, not callees. AdminUser in Add User SD not defined. 1-(8+1)/(7+8+1) = 0.437
- Structured
  - Validity: 9 classes defined - SmartHomeSystem, Homeowner, SmartDevice, AutomationRule, VoiceAssistant, SmartHomeEcosystem, SecurityDevice, EnergyMonitoringDevice, ControlInterface. 9 relationships defined. No navigability (-0.1). Visibility defined. 1-(9*0.1)/(9+9) = 0.95
  - Comprehensiveness: 1-0/6 = 1
  - Consistency: All 9 domain classes defined. Inconsistant operations in 3/24 SDs - 1) In Configure Voice Assistant SD, setConfiguration() was called on SmartHomeSystem, but it is defined in VoiceAssistant, 2) in Open Smartphone App SD, initializeApp() was called on SmartHomeSystem, but it is defined in ControlInterface. 3) in Perform Desired Action SD, executeAction() was called on SmartDevice, but it is not defined in SmartDevice. 1-3/(9+24) = 0.909

P9. Develop a Java implementation for the system as specified in the class diagram and sequence diagrams.

- Unstructured
  - Validity: Getters and setters skiped in all 7 classes. Most operations implemented using a println statement in all 7 classes. User, Device, Automation, SceneRoutine, SecuritySystem, VoiceAssistant, SmartHomeSystem, SmartHomeSystemDriver implemented. Driver implemented. 1-(7*0.8)/8 = 0.3
  - Comprehensiveness: Missing Ecosystem. 1-1/6 = 0.833
  - Consistency: All 7 DCD classes implemented. All 8 DSD implemented in driver - Control Devices, Set Up Automation, Add User, Integration with Voice Assistants, View Device Status, Manage Scenes and Routines, Configure Security Settings, System Maintenance and Updates.1-0/15 = 1
- Structured
  - Validity: All operations implemented including getters only in all 9 classes. No setters implemented. Most operations implemented using a println statement in all 7 classes. SmartHomeSystem, Homeowner, SmartDevice, AutomationRule, VoiceAssistant, SmartHomeEcosystem, SecurityDevice, EnergyMonitoringDevice, ControlInterface. Driver implemented. valid. 1-(9*0.6)/9 = 0.4
  - Comprehensiveness: 1-0/6 = 1
  - Consistency: All 9 DCD classes implemented. All 25 DSDs implemented in Driver - Select Control Interface, Navigate to Device Control Section, Select Device to Control, Issue Command to Device; Select Automation Setup Interface, Create New Automation Rule, Select Automation Trigger, Define Automation Action, Save Automation Rule; Issue Voice Command;Configure Voice Assistant; Open Smartphone App, Log into System, Navigate App Sections, Perform Desired Action; Select Integration Option; Log into Ecosystem Account, Authorize Integration; Select Security Settings, Configure Security Devices, Activate Security System; Energy Management, Configure Energy Monitoring Devices, Set Up Energy Optimization Rules, Review Energy Usage Reports. 1-0/34 = 1

Prompt 10:Develop tests including unit tests, integration tests, and system tests for the implementation of the smart home system.

- Unstructured
  - Validity: User, Device, Automation, SceneRoutine, SecuritySystem, VoiceAssistant, SmartHomeSystem (in system test) tested. 11 unit tests (except Device), 3 integration tests, 1 system test missing assert. 1-(0.5*11+0.5*3+0.5*1)/(13+4+1) = 0.416
  - Comprehensiveness: Missing Ecosystem. 1-1/(6+3) = 0.888
  - Consistency: 1-0/7 = 1
- Structured
  - Validity: 8 unit tests, 6 integration tests, 6 system tests incomplete. 1-(0.6*8+0.6*6+0.6*6)/(15+7+7) = 0.586
  - Comprehensiveness: 1-0/(6+3) = 1
  - Consistency: = 1-0/9 = 1