

Knowledge Base System Improvements

Technical Overview for Presentation

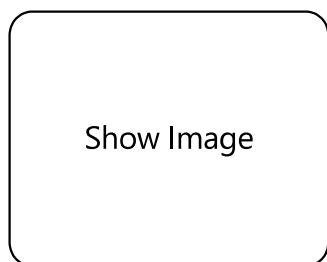
1. Problem Statement

The Nova AI Coordinator system exhibited three critical issues in knowledge base functionality:

- **Intent Separation Issue:** When processing multi-intent prompts (e.g., "Calculate 10+20, what is the capital of Germany..."), the system stored the entire prompt as a single unit
- **Precision in History Recall:** When asked about previous tasks (e.g., "What was the last math question I asked?"), the system returned the entire multi-intent prompt rather than just the relevant part
- **Entity Extraction:** The system failed to extract specific entities (like "France" from energy model requests), limiting contextual awareness

2. Solution Architecture

We implemented a three-part solution architecture:



1. Intent Separation Layer

- Uses Nova's existing intent detection capabilities
- Processes and separates multi-intent prompts
- Routes each intent to the appropriate agent

2. Categorized Storage Layer

- Stores each intent separately with proper metadata
- Maintains hierarchical session structure
- Implements entity extraction for enriched data

3. Contextual Retrieval Layer

- Enhances history query detection
- Implements intent-specific result extraction
- Provides contextually relevant responses

3. Key Code Improvements

3.1 Intent Separation and Storage

python

NEW: For non-history queries, try to detect multiple intents using Nova

try:

Try to use Nova's intent separation

intents = await nova.identify_multiple_intents_async(prompt)

if len(intents) > 1:

print(f"DEBUG: Processing {len(intents)} separate intents for storage")

Process each intent separately

for intent_info in intents:

intent_text = intent_info["intent"]

intent_lower = intent_text.lower()

Determine intent type

if any(term in intent_lower for term in ['+', '-', '*', '/', 'calculate', 'math']):

Math intent

history["math_questions"].append({

 "session_id": session_count,

 "prompt": intent_text,

 "result": extract_math_result(result)

})

print(f"DEBUG: Stored math intent: {intent_text}")



3.2 Entity Extraction

python

```
def extract_country(text):
    """Extract country name from text."""
    # List of countries to check
    countries = [
        "Spain", "UK", "France", "Germany", "Italy",
        "Portugal", "Belgium", "Netherlands", "Greece",
        "Croatia", "Sweden", "Norway", "Denmark",
        "Finland", "Ireland", "Switzerland", "Austria"
    ]

    text_lower = text.lower()

    # Check for direct country mentions
    for country in countries:
        if country.lower() in text_lower:
            return country

    # Look for "for X" pattern
    import re
    match = re.search(r"for\s+([A-Za-z]+)(?:\.\s|$)", text_lower)
    if match:
        country_candidate = match.group(1).capitalize()
        if country_candidate in countries:
            return country_candidate

    return None
```

3.3 Improved History Query Detection

python

```
def answer_general_question(kb: KnowledgeBase, prompt: str, input2="-"):
    # Check if the question is about previous session content
    prompt_lower = prompt.lower()

    # Enhanced keywords for context detection
    past_indicators = ["did", "was", "asked", "last", "previous", "earlier", "before", "history"]
    contains_past = any(word in prompt_lower for word in past_indicators)

    # Check if it's asking about math specifically
    math_keywords = ["math", "calculation", "+", "-", "*", "/", "plus", "minus", "multiply", "c"]
    about_math = any(kw in prompt_lower for kw in math_keywords)

    # If it's a history query about math
    if contains_past and about_math:
        # Get math questions history
        math_history = kb.get("math_questions", [])

        if not math_history:
            return "I don't have any record of math questions."

        # Get the most recent math question
        latest_math = math_history[-1]

        response = (
            f"In a previous session, you asked the math question: '{latest_math['prompt']}'\n\r"
            f"The result was: {latest_math['result']}"
        )


    return response
```

4. System Component Mapping

Component	File	Function	Purpose
Intent Separation	main.py	nova.identify_multiple_intents_async()	Splits multi-intent prompts
Intent Categorization	main.py	interactive_async_main()	Categorizes by intent type
Entity Extraction	main.py	extract_country()	Extracts entities from intents
Result Extraction	main.py	extract_math_result()	Extracts specific results from responses
History Query Detection	general_knowledge.py	answer_general_question()	Identifies and processes history queries
Report Generation	functions_registery.py	write_report()	Generates reports based on models


5. Test Results

Test Case 1: Multi-Intent Processing

- **Input:** "Calculate 10+20, what is the capital of Germany, build an electricity energy model for solar for France and write a report"
- **Result:**  Successfully separated and processed all 4 intents
- **Storage:** Each intent stored in appropriate category

```
DEBUG: Processing 4 separate intents for storage
DEBUG: Stored math intent: Calculate 10+20
DEBUG: Stored general intent: Determine the capital of Germany
DEBUG: Stored energy model intent: Build an electricity energy model for solar for France
(Country: France)
DEBUG: Stored general intent: Write a report
```

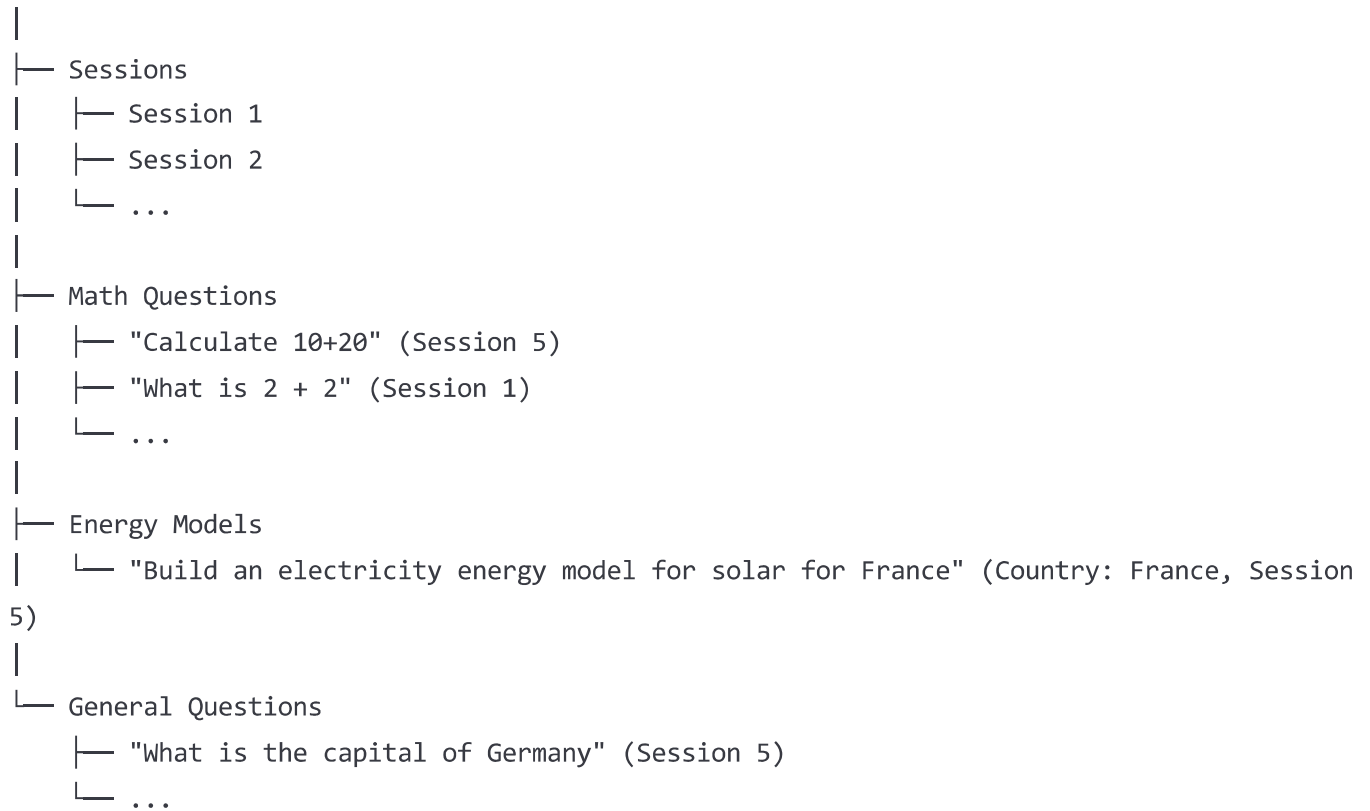
Test Case 2: History Query Precision

- **Input:** "what was the last math question I asked?"
- **Result:**  Correctly returned only the math portion
- **Response:** "In a previous session, you asked the math question: 'Calculate 10+20'"

```
DETECTED: Contains past tense indicators
DETECTED: History query about math
HISTORY CHECK: is_history_query=True, query_type=math
Processing as a history query about: math
Found 3 math question entries
Returning math history response
```

6. Knowledge Base Structure

Knowledge Base



7. Summary and Benefits

1. Enhanced User Experience

- More precise recall of past interactions
- Better contextual awareness
- Improved response quality

2. Technical Improvements

- Proper separation of multi-intent prompts
- Structured knowledge base organization
- Entity extraction for contextual awareness

3. Future Capabilities

- Foundation for more complex entity extraction
- Improved cross-session memory
- Better support for conversational context

8. Simplified Overview

The improved knowledge base system:

1. **Separates** multiple requests in a single prompt

2. **Categorizes** each request appropriately
3. **Extracts** important entities (like countries)
4. **Stores** structured information for retrieval
5. **Recalls** precise information when asked about history

This creates a more natural, human-like interaction where the system remembers exactly what was discussed, not just that a conversation happened.