A11 — Language Specification

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Algorithm 11 (A11)

Technical Specification

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Annotation

This document defines the A11 Language — a structured communication and intent-formalization system used within Algorithm 11 (A11).

The A11 Language transforms human intention into structured, interpretable, and machine-processable form, enabling stable hybrid reasoning between human and AI agents.

The specification describes the syntax, semantics, message types, frames, and interaction patterns that ensure clarity, reproducibility, and cognitive stability across all A11-based systems.

Contents

1. Introduction

The A11 Language is the formal communication layer of Algorithm 11 (A11).

It defines how intention, structure, and meaning are transmitted between human and AI agents inside the A11 cognitive architecture.

Natural language is ambiguous and unstable.

The A11 Language provides:

- clarity

- structure

- reproducibility

- interpretability

- cognitive stability

It is not a programming language or markup language.

It is a **cognitive communication protocol**.

2. Purpose of the A11 Language

The A11 Language exists to:

- formalize human intention

- reduce ambiguity

- structure reasoning inputs

- define stable interaction patterns

- support hybrid human–AI cognition

- enable multi-agent coordination

- ensure reproducibility of reasoning

It is the interface between **human Will** and **AI Comprehension**.

3. Design Principles

The A11 Language is built on five principles:

3.1 Minimalism

Only essential elements are included.

3.2 Interpretability

Every message must be unambiguously interpretable by AI.

3.3 Cognitive Alignment

The language reflects the structure of A11's cognitive layers.

3.4 Stability
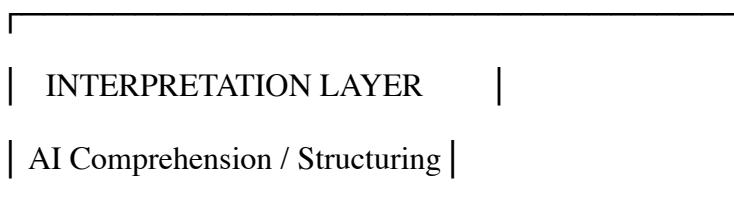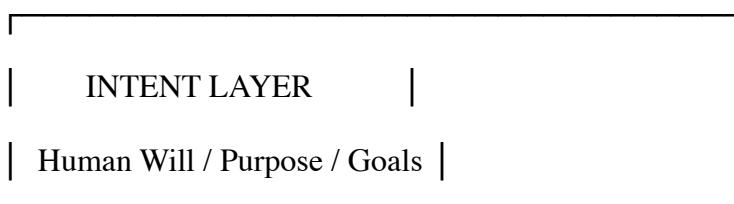
Messages must not drift in meaning across turns.
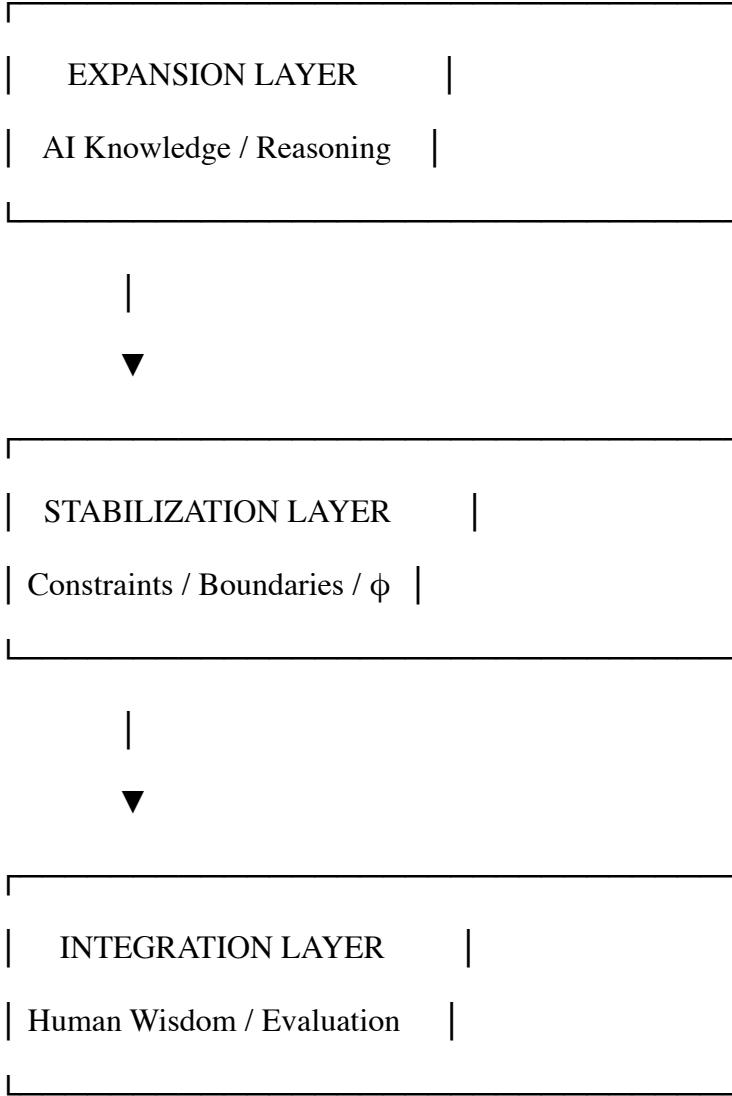
3.5 Scalability

The language must support multi-agent and multi-layer communication.

4. Architectural Overview

The A11 Language maps directly onto the cognitive layers of A11.

```
┌────────────────────────────────────┐
│      INTENT LAYER          │
│  Human Will / Purpose / Goals │
└────────────────────────────────────┘

            │
            ▼

┌────────────────────────────────────┐
│   INTERPRETATION LAYER       │
│ AI Comprehension / Structuring │
└────────────────────────────────────┘

            │
            ▼
```

```
┌─────────────────────────────────────┐
│    EXPANSION LAYER        │          │
│  AI Knowledge / Reasoning    │       │
└─────────────────────────────────────┘

            │
            ▼

┌─────────────────────────────────────┐
│   STABILIZATION LAYER       │        │
│ Constraints / Boundaries / ф  │      │
└─────────────────────────────────────┘

            │
            ▼

┌─────────────────────────────────────┐
│    INTEGRATION LAYER        │        │
│ Human Wisdom / Evaluation      │     │
└─────────────────────────────────────┘
```

Each layer corresponds to a message type in the A11 Language.

5. Language Structure

The A11 Language consists of three structural components:

5.1 Intent Frame

Defines purpose, constraints, and direction.

5.2 Structural Frame

Defines the cognitive shape of the task.

5.3 Semantic Frame

Defines meaning, context, and interpretation rules.

A complete message includes all three.

6. Message Types

The A11 Language defines five message types:

Message Type	Agent	Purpose
Intent Message	Human	Defines goals, constraints, priorities
Interpretation Message	AI	Structures the task and builds the cognitive frame
Expansion Message	AI	Performs controlled reasoning
Stabilization Message	A11 System	Applies constraints and prevents drift
Integration Message	Human	Evaluates and selects final results

These message types form the backbone of hybrid reasoning.

7. Intent Formalization

Human intention is formalized into:

- **Goal**

- **Constraints**

- **Scope**

- **Priority**

- **Success Criteria**

Example:

INTENT:

Goal: Design a stable multi-agent coordination model.

Constraints: No external communication channels.

Scope: 5–20 agents.

Priority: Stability over speed.

Success: Predictable convergence.

8. Structural Frames

Structural frames define the cognitive shape of the task.

A structural frame includes:

- **Task Type**

- **Required Outputs**

- **Reasoning Depth**

- **Allowed Operations**

- **Forbidden Operations**

Example:

STRUCTURE:

Task Type: System design

Outputs: Architecture + algorithm

Reasoning Depth: Medium

Allowed: Comparison, abstraction, decomposition

Forbidden: Speculation, external assumptions

9. Semantic Frames

Semantic frames define meaning in structured form.

A semantic frame includes:

- **Entities**

- **Relations**

- **Operations**

- **Context**

- **Interpretation Rules**

Example:

SEMANTICS:

Entities: agent, environment, signal

Relations: agent→agent, agent→environment

Context: no shared memory

Rules: minimize conflict, maximize stability

10. Interaction Protocol

The A11 Language defines a turn-based protocol:

1. Human sends **Intent Message**

2. AI sends **Interpretation Message**

3. AI sends **Expansion Message**

4. A11 sends **Stabilization Message**

5. Human sends **Integration Message**

This creates a stable cognitive loop.

11. Stability and Error Resistance

The A11 Language includes built-in mechanisms to prevent:

- semantic drift

- over-expansion

- hallucination

- misalignment

- context loss

Stability is enforced through:

- explicit constraints

- structural frames

- semantic boundaries

- turn-based reinforcement

- stabilization messages

12. Multi-Agent Communication

The A11 Language supports:

- human → AI

- AI → human

- AI → AI

- multi-agent coordination

- distributed reasoning

Each agent uses the same message types and frames, ensuring consistency.

13. Applications

The A11 Language is used in:

- hybrid reasoning

- engineering design

- decision-making systems

- multi-agent robotics

- autonomous systems

- research workflows

- organizational cognition

It is the communication backbone of A11.

14. Conclusion

The A11 Language is a structured communication system that formalizes intention, stabilizes meaning, and enables hybrid cognition.

It is a core component of the A11 ecosystem and a foundation for scalable human–AI collaboration.

15. References

1. A11 — Cognitive Architecture Specification, Zenodo, DOI: 10.5281/zenodo.18536520

2. A11 Project Repository (GitHub) https://github.com/gormenz-svg/algorithm-11

3. A11 Language Specification (this document)