CRONOS・2025 AREA 1（PO：NAKAO）

Digital Cybernetics: Towards Next-Generation Communication Architecture

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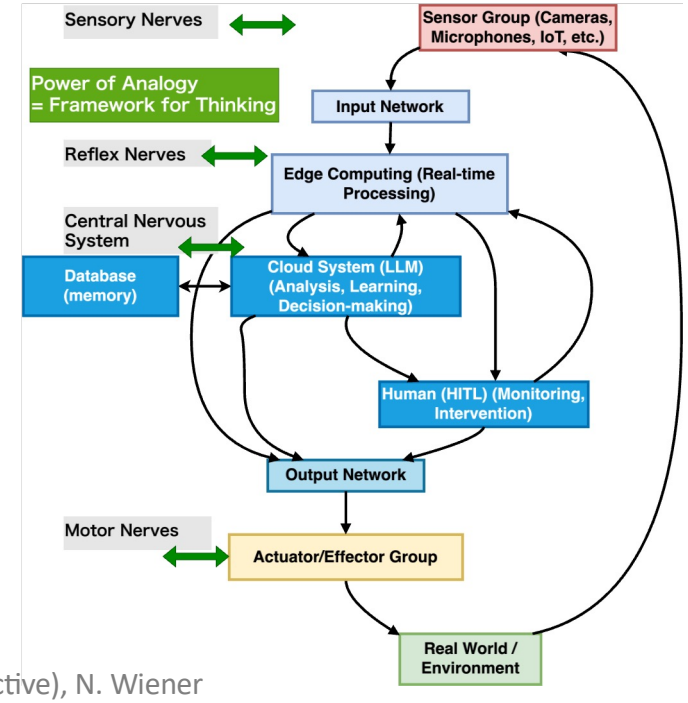
Grand Challenge and Goal：For 80 years, Shannon's architecture has guided digital communications. We now propose a new goal: communication for robust and autonomous digital cybernetic systems. Our challenge is to define the **"Post-Shannon Communication" that will shape the next 80 years**.

Summary：
This research project aims to realize "Post-Shannon Communication" that supports digital cybernetics systems (large-scale AI agent systems) with autonomy, adaptability, and robustness. We will develop theories and fundamental technologies for ① **Goal-oriented communication**, ② **Coding for very-large-scale communications**, ③ **Digital homeostasis**, ④ **Physics-aware signal processing**, and ⑤ **Learning systems based on fast & slow principle**. This will contribute to the creation of a next-generation communication architecture that will drive the evolution of information and communication technology. In the process, we will also foster young interdisciplinary talent and promote an international research network.

Social Impact：
* Pioneering a new academic field of Post-Shannon Communications
* Realizing the autonomy, adaptability, and robustness essential for disaster response, autonomous driving, and smart cities.
*Strengthening Japan's international competitiveness.

Digital Cybernetics (≈ AI Agent) = **LLM Control + Post-Shannon Communications**



Note: Cybernetics = Control + Communication (Viewing organisms and machines from the same perspective), N. Wiener