Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
(Autonomous)

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(Recognised by UGC, Approved by AICTE & Affiliated to Bharathiar University)
Coimbatore- 49

DEPARTMENT OF COMPUTER SCIENCE

(ARTIFICIAL INTELLIGENCE & ROBOTICS)

Subsumption Architecture

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DT- Stages in Subsumption Architecture

Stage	Short Description	Output
Empathize	Understand need for fast, reactive robot behavior.	Identify key behavior needs.
Define	Frame problem: robots must act quickly without complex models.	Clear problem statement.
Ideate	Generate simple behavior layers (avoid, wander, explore).	List of behavior layers.
Prototype	Build basic layered control with suppression/inhibition.	Layered behavior prototype.
Test	Test in environment and refine interactions.	Improved, stable behavior.

Introduction to Subsumption Architecture

- Proposed by Rodney Brooks in 1980s.
- A behaviour-based robot control architecture.
- Builds intelligence using layers of simple behaviors.
- Focuses on real-time, reactive responses.

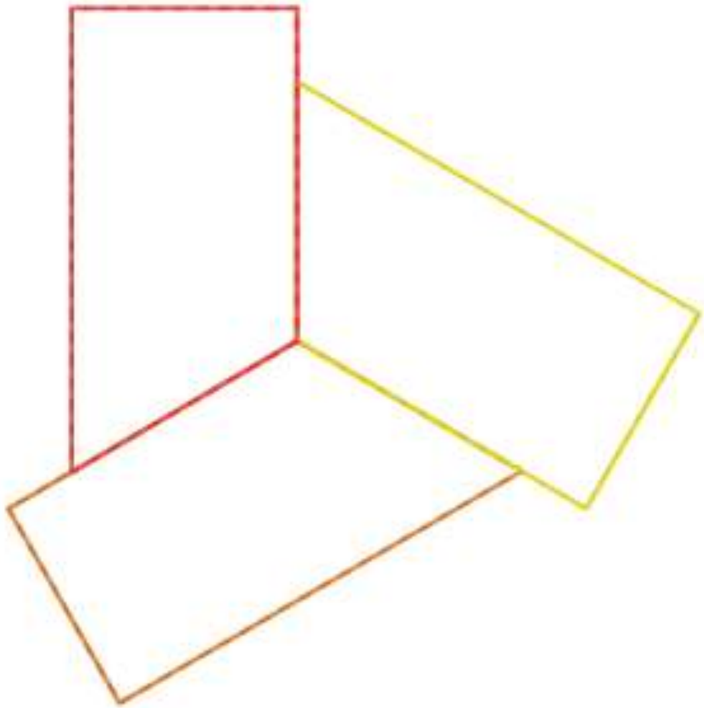
Robot control

Adaptive behaviour

Enables fast, adaptive behaviour in robots.

Subsumption

Higher layers override or influence lower layers.



Bottom-up control

Robots use bottom-up control to act.

Layered Behaviour Structure

Layered Behavior Architecture

Incremental Building

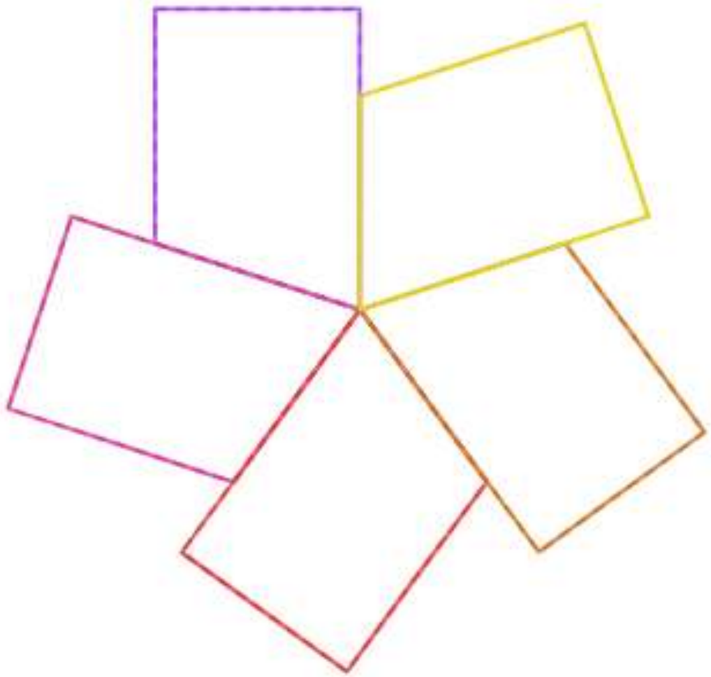
Behaviors are developed and added gradually over time.

Complex Tasks

Higher layers incorporate more intricate and advanced tasks.

Basic Survival

Lower layers manage fundamental survival actions for the agent.



Layered Structure

Each layer represents a specific behavior, such as obstacle avoidance.

Parallel Operation

Layers function simultaneously, allowing for multiple behaviors at once.

How Subsumption Works

Hierarchical Decision-Making System

Robustness

System functions even if higher layers fail

Communication Signals

Uses suppression/inhibition for layer interaction

Sensory Input

Receives and processes sensory information

Emergent Decisions

Decisions arise from layer interactions

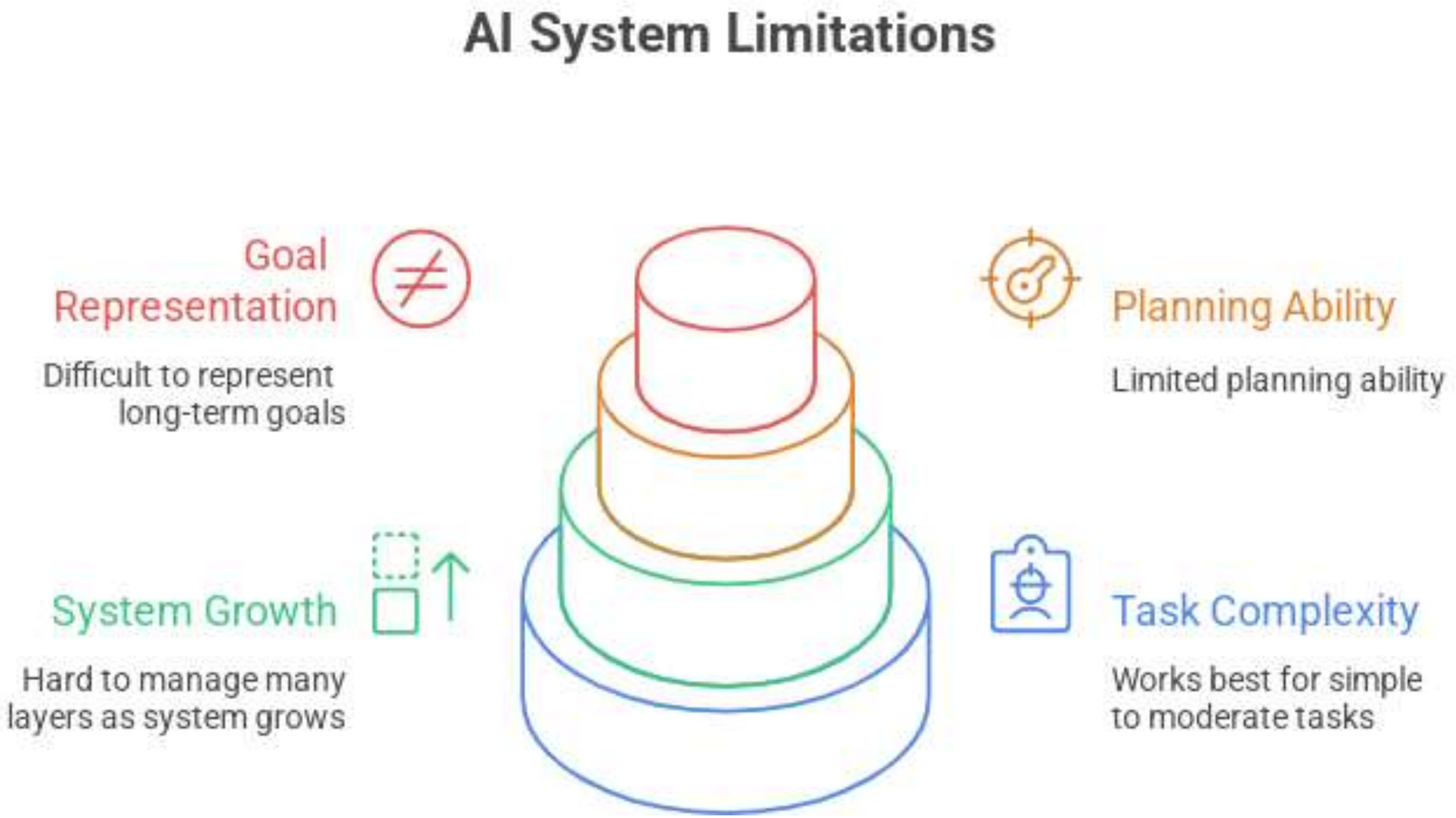
Action Production

Generates actions based on sensory input

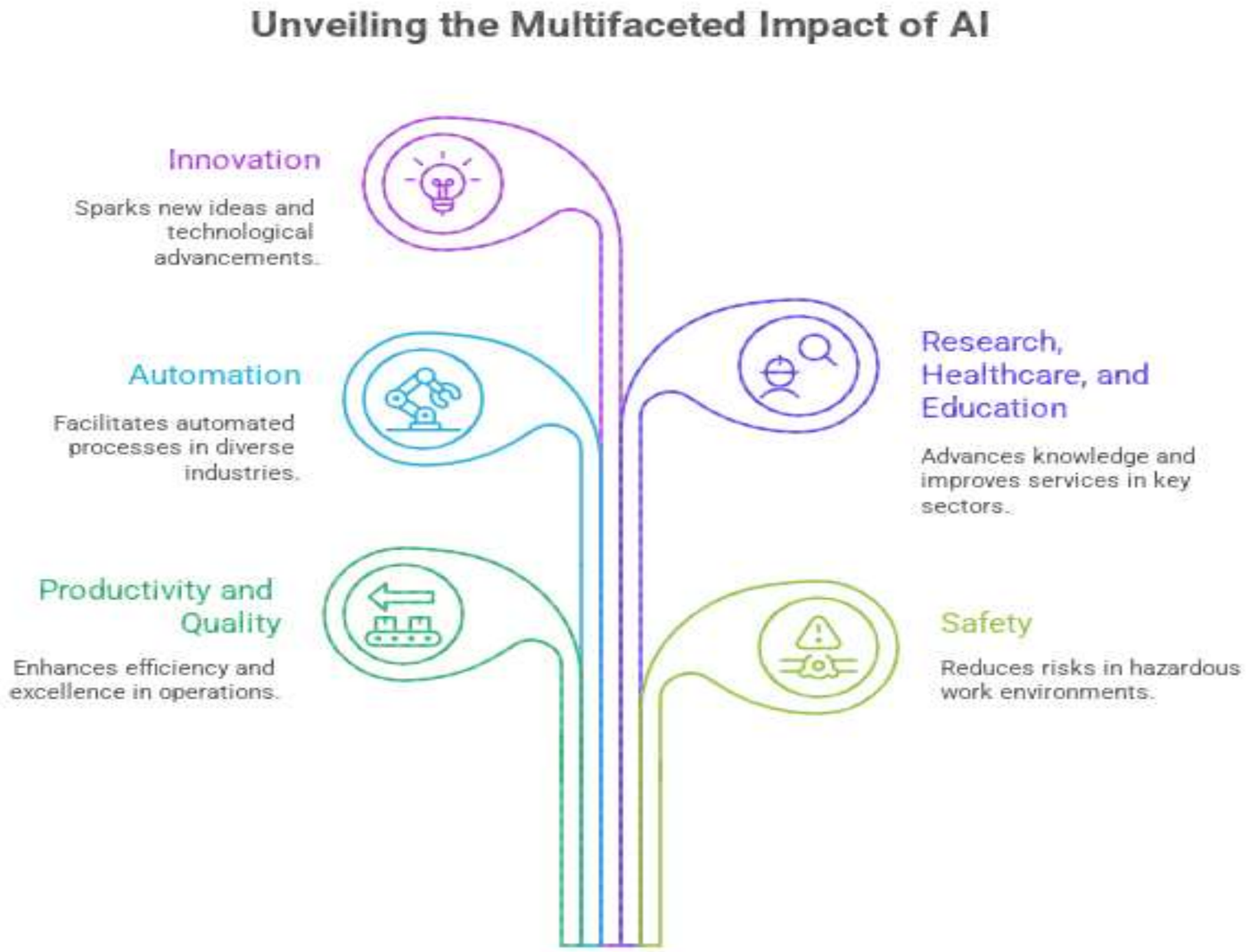
Advantages of Subsumption Architecture

- Simple and easy to implement.
- Highly reactive and fast.
- Works well in dynamic environments.
- Parallel processing of behaviors.
- Scalable by adding new layers.

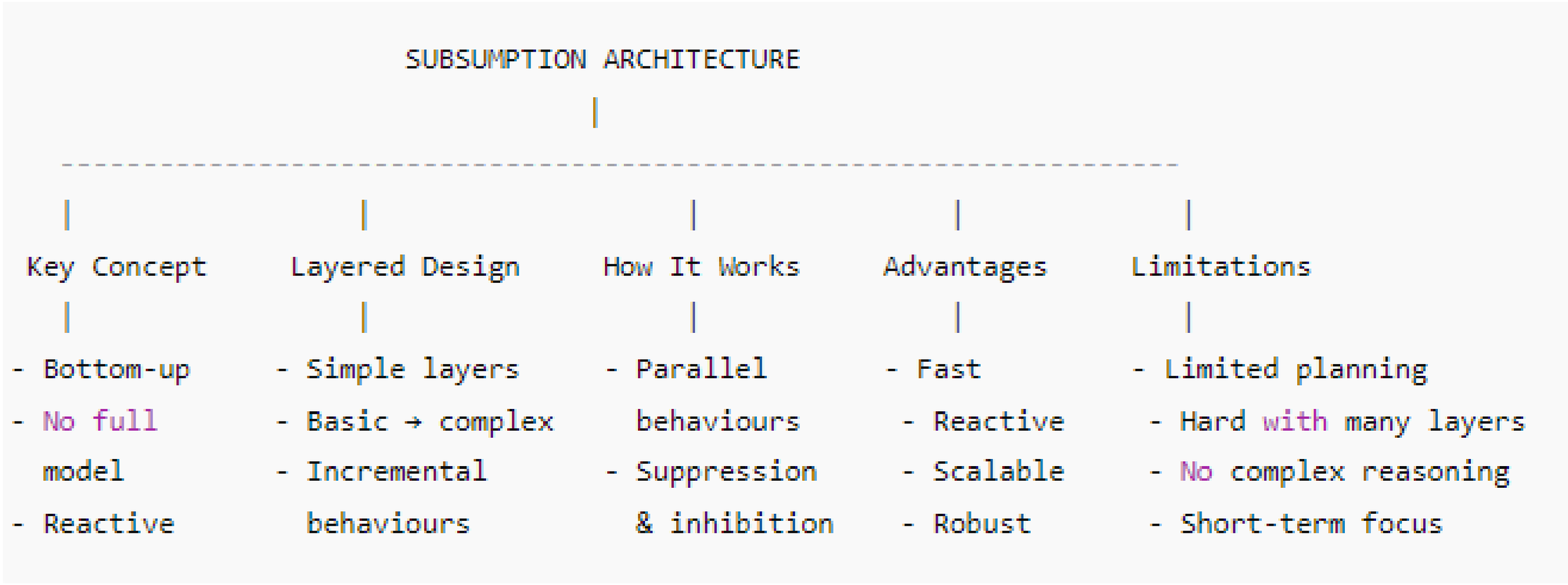
Limitations



Importance of Robots



Mind Map


SUBSUMPTION ARCHITECTURE
Key Concept
Layered Design
How It Works
Advantages
Limitations
- Bottom-up
- No full model
- Reactive
- Simple layers
- Basic → complex
- Incremental behaviours
- Parallel behaviours
- Suppression & inhibition
- Fast
- Reactive
- Scalable
- Robust
- Limited planning
- Hard with many layers
- No complex reasoning
- Short-term focus

QUIZ

1. **Subsumption Architecture was introduced by:**
a) Alan Turing b) Rodney Brooks c) John McCarthy d) Marvin Minsky
Answer: b) Rodney Brooks
2. **What is the main idea of Subsumption Architecture?**
a) Centralized planning b) Layered, reactive behaviour control c) Pure machine learning d) Human-robot interaction
Answer: b)
3. **What do higher layers do in this architecture?**
a) Ignore lower layers b) Subsumes or override lower layers c) Remove sensors d) Control only motors
Answer: b)
4. **Which of the following is an advantage?**
a) Slow decision-making b) Complex reasoning ability c) Highly reactive in real-time d) Requires entire world model
Answer: c)
5. **What is a major limitation of Subsumption Architecture?**
a) Too fast for robots b) Hard to use for long-term planning c) Too many world models d) Requires high computation
Answer: b)

THANK YOU