

16/1

Smart Product Design

→ Project Exp : April 12 — 1 Smart functionality

Group size : 10

Space Docking — ISRO

Single smart functionality of a Metaphor

Definition of Intelligence

Levels of Intelligence

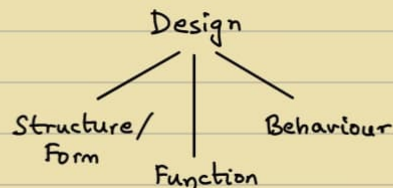
Dimensions of Intelligence

Smartness → Behaviour in a particular system.
(Process)

Parts & Connections which bring out Purpose externally.
Such an entity → System

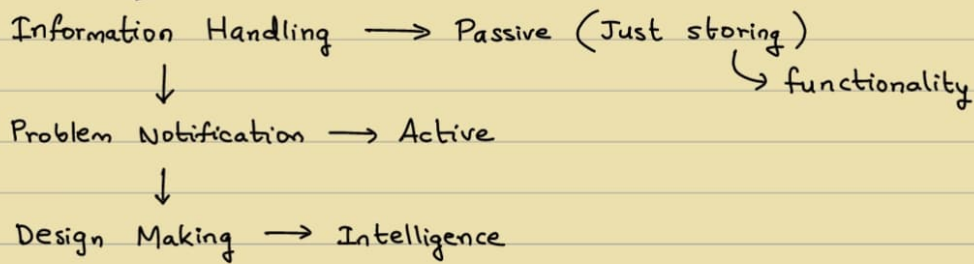
Design : Find proper requirement for the correct behaviour.
└─ Context decides the real requirement.

Requirement should be defined as per the condition/context.
└─ Designer defines



Intelligence measures an agent's ability to achieve goals in a wide range of environment.
└─ All the parameters and the systems surrounding & interacting.
└─ system └─ functionality
└─ "What the system does"

- Level of Intelligence



- Location of Intelligence:

Intelligence at object \rightarrow Embodied systems (Decision making within system)

Intelligence in network \rightarrow Remote (Cloud)

- Aggregation Level of Intelligence:

Intelligence item (component level)

\hookrightarrow Able to communicate with subsystems

Intelligence container (product level)

\rightarrow Dimensions of Intelligence:

Set of functionalities to exhibit a behaviour

- (i) Cooperative: System cooperates with the environment & vice-versa
- (ii) Adaptability: Adjusting to environment using self's functionalities
- (iii) Reactive: Changing the environment, Set of functionalities
- (iv) Personality: Credible character (Same functionality over and over executed in same fashion) - Reliability & Durability
- (v) Human-like: Human-like Interaction
- (vi) Autonomy: Self Decision-making capability according to context/condition

- Behaviour change \Rightarrow Intelligence change

- Equilibrium \rightarrow System being a stable state

Amplification \rightarrow Increasing the Amplitude of Information.

Right decision making comes by Information Amplification.

Information Intensity \propto Intelligence \propto Stability

All information comes from biosystems.

Self - Configuration

Self - Organization: Ability of seeing environment

Self - Optimization: Ability to pick correct/selecting something right

→ Feedback loops:

- Information related to consequence + Already Inherited Intelligence
- Internal loops which help in executing functionalities.

Positive feedback loop \rightarrow Self-reinforcing feedback loop

- ↳ Amplifies the current change

Negative feedback loop \rightarrow Natural Tendency to resist change.

→ AI techniques:

Data \rightarrow Credible

Sensors 

- (i) Rule based systems
- (ii) Fuzzy Logic systems
- (iii) Artificial Neural Networks
- (iv) Evolutionary computations

→ Define a functionality from the image & justify it as a smart behaviour (for specific purpose or condition)

Dog raising it's tail to indicate some form of alert behaviour.

→ function

→ Purpose

Single functionality \rightarrow Smartness \rightarrow For a purpose

- ☐ Group Formation
- ☐ Choosing Metaphor

Note :

Smartness : Using intelligence in a context

Design : Process of developing a Form/Structure, Behaviour or Function for the requirement.