CONSTRUCTION METHODOLOGY OF STRUCTURAL ELEMENTS USING CONCRETE 2D PRINTING

IITM Technology Available for Licensing

Problem Statement & Unmet Need

- 3D-printed structural elements are limited to **compression-carrying members** such as **walls and columns**; whereas the **beams** and **slabs** require reinforcement bars that make 3D printing equipment **complex**.
- Detailed 3D model development is required to determine the **printer nozzle's path plan** for **material deposition** at the **right locations**.
- The above-mentioned difficulties are eased by introducing the concept of **concrete 2D printing**, eliminating the need for **actuators** for movement in the **z-direction**.

Technology Category/ Market

Civil Engineering
Industry: Construction, Structural Engineering, Precast construction
Applications - Concrete 3D printing, beam and slab, automated construction

Technology

- A **2D printing system** for the **construction** of concrete structures which does not have the degree of freedom in the vertical direction,
- The **printer bed** is mounted on a **lifting mechanism** that moves both **upwards** and **downwards**.

The **method** as claimed in the patent comprises:

The structural elements to be printed consists of **smaller 2D printable parts which** are **planar in shape**

The shape of 2D printable parts are designed such that there is efficient transfer of internal forces at the joints and material is provided only where it is needed to resist internal forces

The geometry of the 2D printable parts is input to the system by marking with paint on the printer bed which is **scanned** by a **camera** mounted on the gantry system.

An example of a **standard element** used for constructing **beams** is shown in **Fig 1a;** wherein **Part A** is a **planar member** printed with the **minimum thickness** permitted by the size of the nozzle.
Based on the printer bed size, **multiple pieces** are printed together and kept side by side to create the **complete profile of the beam** as shown in **Fig 1b.**

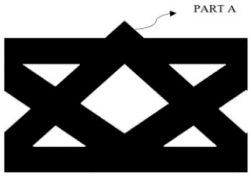

Fig: 1a

Fig: 1b

Intellectual Property

- **IITM IDF Number:** 2164
- **IP Patent Number:** 418328 (**Granted**)

Key Features / Value Proposition

❖ **User Perspective:**

The system has a simple and **more compact design** than 3D printing and is **cost-effective**. It can print structures based on **line-drawings**.

❖ **Technical Perspective:**

- The **efforts** required for modeling the object to be printed are **reduced** since only two-dimensional information needs to be **input**.
- A **camera** is used to capture drawings or any other markings on the **printer bed** and processes the **data** to generate a **model** to be printed.

❖ **Industrial Perspective**

- Simpler, cost-effective design of the concrete printer.

TRL (Technology Readiness Level)

TRL – 2; Technology concept formulated

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