Method And An Apparatus For Providing Self-learning Based Automated Welding
IITM Technology Available for Licensing

Problem Statement

- Generally, there is **a high demand for performing welding without any manual intervention** specially during when product shape/size changes.
- The existing methods of making welding process automation plays a vital role in modern manufacturing industries to meet production targets.
- Today's automotive welding, including industrial robots are **smart machines which can be used to perform physical activity along with decision making,** however they need to re-programming of fabrication when product shape or size changes, thus making it difficult to work without manual intervention.
- Here, this invention offers an alternative solution **to carry out welding of jobs with varying location, size, shape** and orientation by using photogrammetry and a self-learning AI algorithm.

Technology Category/ Market

Robotics, Automated Welding
Applications - Automotive vehicles, factories, transportation, power generation and transmission, telecommunication.

Market - The Robotic Welding Market size was valued at **USD 6.8 Billion** in **2021** and is projected to reach **USD 15.7 Billion** by **2030**, growing at a **CAGR of 9.5%** from **2023-2030**.

Technology

- The principal object of the present patent is to provide a method (refer **FIG.1**) and **an apparatus for self-learning based automated welding**.
- Referring to the FIG. 2, in intelligent weld system (18) the **CMOS camera** (19) is attached to welding torch (11), the camera moves around the work piece and captures images of the work piece.
- **An image capturing controller** (20) sends the captured images to cloud for image processing.
- The **cloud (21) which determine geometric and semantic information** of the work piece and marks the weld trajectory in the digital space.
- The identified weld seam will be converted to G code to perform the welding in the physical space.

FIG.1. Flow chart illustrating a method for providing self-learning based automated welding.

Capturing at least one image of work pieces in a workspace that has to be welded with each other using at least one camera (19).

Converting at least one image of the work pieces into a 3D model.

Identifying dimensions and orientation of the work pieces in the workspace from the 3D model using photogrammetry.

Detecting weld trajectory on the dimensions and orientation of the work pieces by considering intensity differences of each work pieces using a self-learning algorithm.

Transforming the identified weld trajectory into machine instructions to perform welding in a physical space.

Instructing a welding torch (11) to weld on the weld trajectory using the machine instructions.

Intellectual Property

- IITM IDF Ref. **2131**
- **IN 430825 - Patent Granted**

TRL (Technology Readiness Level)

TRL - 3, Proof of concept stage.

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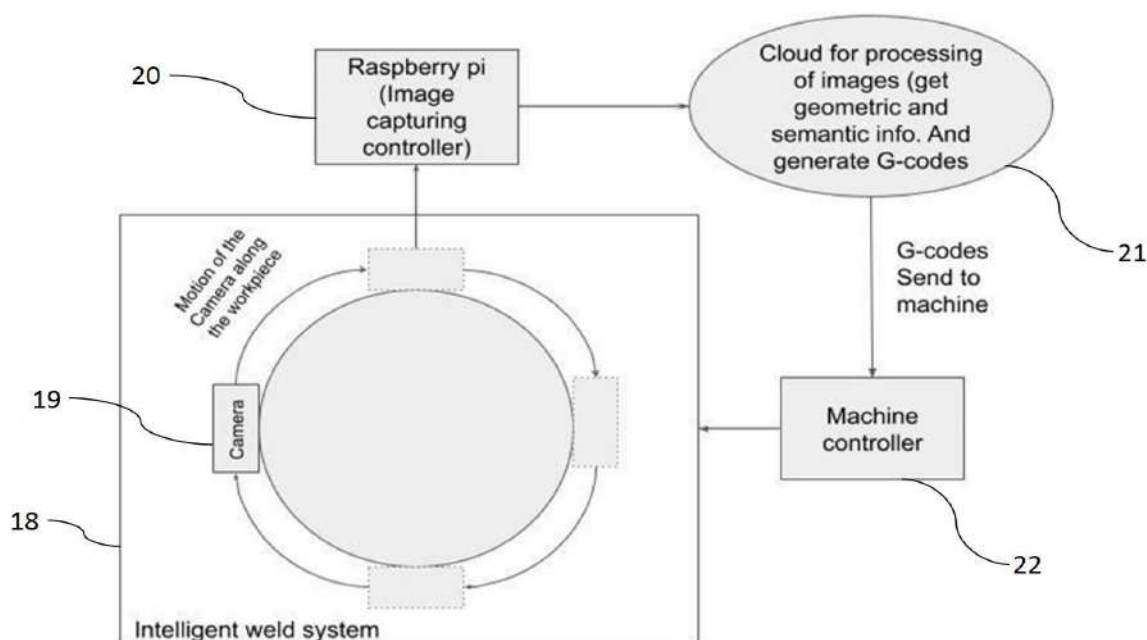sm-marketing@imail.iitm.ac.in
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Key Features / Value Proposition

1. The method effectively identify dimensions and orientation of a work pieces in the workspace from the 3D model using photogrammetry.
2. This method **detects weld trajectory on a dimensions** and orientation of the work pieces by considering intensity differences of each work pieces using a self-learning algorithm.
3. This method transforms the identified weld trajectory into machine instructions to perform welding in a physical space.
4. The **size of the work piece and the weld seam is not limited** by the workspace.
5. This method can be used for **welding large structures** that are bigger than the workspace.
6. This system is designed to use fusion arc welding processes such as **gas tungsten arc welding (GTAW), gas metal arc welding (GMAW),** etc.

FIG. 2. is a block diagram illustrating an implementation of G-codes for the intelligent weld system.

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