

# Design of a 3D Gauge for Geometric Measurement of Complex Objects

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## 1. Introduction

This project presents a mechanical 3D gauge designed to capture the **Geometric Measurement of Complex Objects** using a purely mechanical, contact-based measurement technique. Unlike sensor-based or digital systems, our device functions entirely through mechanical components, offering a low-cost, durable, and electronics-free solution.

The main purpose of this gauge is to replicate the **surface contour of a selected body part**—such as the arm, leg, back, or torso—onto a mechanical frame using adjustable pins or rods. The captured contour can be applied in fields such as prosthetics, custom-fit protective gear, ergonomic seat or tool design, and garment tailoring.

In addition, the device can be used to **generate 3D contours or profiles of any irregular object or part**, not just human anatomy. This makes it valuable across a wide range of fields, particularly in situations where digital equipment may not be accessible or feasible.

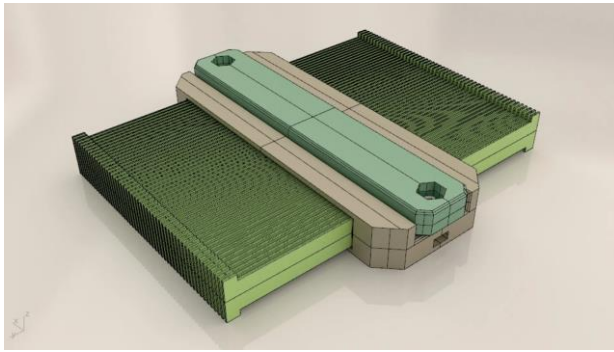
## 2. Description of the Model

The device consists of a rigid frame embedded with an array of movable rods or pins. These pins are manually or mechanically pressed against a specific body part (or object) to map its shape. Once in position, they are locked using friction.

The model comprises several arrays of **2D gauges**, each capturing a cross-sectional shape. These are arranged in a grid to form a 3D profile of the **target area or part**. This modular setup allows flexibility depending on the size and geometry of the object or body part being measured.

This purely mechanical method allows the gauge to be used in remote or low-resource environments where digital or electronic options may not be practical.

Furthermore, the gauge can also be **combined with a 3D scanner** to enhance its functionality. For example, once a physical contour is captured, it can be digitized for further processing or modeling. This application is particularly useful in the **medical field**, where it can assist in designing **temporary fixtures or molds for fractured bones**, enabling custom-fit supports during healing.



2D Gauge

This purely physical approach ensures the gauge can be used in environments where digital solutions may not be feasible due to cost or technology limitations.

### 3. Benefits of This Product Design

- **Fully mechanical** - Operates without the need for power, sensors, or software.
- **Low cost** - Simple construction leads to minimal manufacturing and maintenance expenses.
- **Durable and easy to use** - Built for reliability and hands-on operation.
- **Accurate profiling** - Physically captures the real shape of a body part or object without digital conversion.
- **Versatile application:**
  - Can be used to capture the 3D shape of **any object or part**.
  - Can work in conjunction with **3D scanning** to design **temporary fixtures or supports for medical applications**, such as for **fractured bones**.
  - Useful in prosthetics, orthotics, custom ergonomics, and personalized product design

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