**Lean Idea: Automated ESD Test Data Logging with AI**

**Problem:**

* Traditional ESD testing requires manual recording of test level, tip type, and discharge location - inefficient and prone to errors.

**Solution:**

* **Visual Object Detection:**
  + Implement a YOLO model to**track the location of the tip in real-time and** **distinguish between two discharge tips** a video camera.
* **Voice Recognition:**
  + Integrate VOSK for **voice command recognition**. Automatically response to voice command like “mark”, “exit” etc.
* **Data Logging:**
  + Upon hearing "Mark", the system automatically records:
    - **Test level:** Preset based on test configuration.
    - **Tip type:** Identified by the YOLO model.
    - **Discharge location:** Bounding box from the video frame.

**Benefits:**

* **Single-operator testing:** Automates data logging, enabling one person to conduct the entire test.
* **Improved efficiency:** Eliminates manual data entry and reduces errors.
* **Enhanced data accuracy:** Real-time location tracking ensures precise recording.

**Additional Lean aspects:**

* **Focuses on core functionality:** Addresses the primary issue of manual data logging.
* **Modular design:** YOLO and VOSK models can be integrated with existing testing equipment.
* **Scalability:** The system can be adapted to accommodate different test setups and tip variations.

**Training Steps:**

* Take pictures or shoot video of the ESD gun for image training.
* Upload the pictures or videos to roboflow.com to start labeling
* Download the prepared dataset for training.
* Deploy the trained weight to yolo model and run on the local machine.

A close-up of a device

Description automatically generated

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# upload the dataset to Ultralystics

# use ultralytics to train, or use google colab to train or use my own agent

from ultralytics import YOLO, checks, hub

checks()

hub.login('628124d02e6121bc09fdd16e0ada274d94458d21b7')

model = YOLO('https://hub.ultralytics.com/models/G7FMx7AsqirOlwdqW00p')

results = model.train()

# Second Method. Download the dataset direclty from roboflow and train locally

#Get the data set first

from roboflow import Roboflow

rf = Roboflow(api\_key="QXwc4m5evRTT4dKlnCTd")

project = rf.workspace("probe-4b558").project("esdtips")

dataset = project.version(3).download("yolov8")

model = YOLO('ESDbest1.pt')

#Train locally

results = model.train(data='C:/Users/kuifenhu/python/yolo/ESDTips-3/data.yaml',imgsz=640,epochs=200)

**Abstract:** This paper proposes a novel approach to Electrostatic Discharge (ESD) test data logging utilizing two open-source machine learning models for computer vision and voice control. Traditional ESD testing manually recode data like test level, tip type, and discharge location, leading to inefficiencies and potential errors. This work presents an automated system leveraging YOLO object detection for real-time tip location tracking and voice recognition with VOSK for operator commands. The YOLO model is trained to recognize the ESD tip shape. The camera is therefore capable to track the location of the tip on DUT lively. Upon receiving a voice command to mark, the system automatically logs test level (by voice command), tip type (identified by YOLO), and discharge location (extracted from the video frame bounding box). Both vision and voice models runs on local machine with multiprocessing algorithm to reduce the latency. It could use API to cloud power to improve the performance. This program enables single-operator testing, eliminates manual data entry, and improves data accuracy through real-time tracking. Training steps for the YOLO models will be elaborated upon in the full paper. The paper demonstrates the application of computer vision and voice control model in the test automation. It can be extended to other fields such as EM scanning etc.