[12]   **SHORT-TERM PATENT SPECIFICATION**
短期專利說明書

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[54]   A DEEP LEARNING MODEL OF DEFECT DETECTION METHOD AND SYSTEM FOR PLASTIC INJECTION MOLDING PRODUCTS

基於深度學習模型用於檢測注塑成型產品缺陷的方法及系統

[57]   The present invention discloses a defect detection method with machine learning for plastic injection molding products, comprising the steps of: collecting image dataset (100) from product samples with data augmentation by adjusting environment and camera settings (100a), and by a computational algorithm (100c); training a model (102) using the collected image dataset; evaluating the model (104); and detecting defects (106) by using the evaluated model. The training of model (102) comprises the steps of: applying transfer learning (102b) to the deep learning neural network; applying model structure of YOLOv5 (102a) to the deep learning neural network; passing the image to a single focus layer (102c) in the beginning layers of the deep learning neural network; using cross-stage partial (CSP) networks (102e) to duplicate and merge the feature map when concatenating the image; and adopting path aggregation network (PAN) (102d). The method of training model (102) in the present invention improves the performance and accuracy of bounding box prediction for localization. The method of training model (102) further provides for the detection of at least one defect and at least one type of defect on at least one product of the same kind.

本發明公開了一種基於機器學習的注塑成型產品缺陷檢測方法，包括以下步驟：通過調整環境和相機設置（100a）並通過計算算法 （100c），從通過數據增強的產品樣本中收集圖像數據集 （100）；使用收集的圖像數據集訓練模型（102）；評估模型（104）；及通過使用評估後的模型檢測缺陷（106）。模型的訓練（102）包括以下步驟：將遷移學習（102b）應用於深度學習神經網絡；將 YOLOv5 的模型結構（102a）應用於深度學習神經網絡；將圖像傳遞到深度習神經網絡起始層中的單一聚焦層（102c）；在連接圖像時使用 CSP 網絡（102e）複製和合併特徵圖；及採用路徑聚合網絡（PAN）（102d）。本發明的模型訓練方法（102）提高了用於定位的邊界框預測的性能及準確性。模型訓練方法（102）還提供了對至少一種同類產品的至少一種缺陷及至少一種類型的缺陷的檢測。