

102 學年度大四工工專題摘要

第 12 組	以快速光學檢測技術與行動管理平台 提升石英晶體產業效率 Rapid Optical Inspection of Quartz Blanks and M2M Remote Management via Mobile Devices	
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摘 要		
中文摘要： 自動光學檢測是基於影像處理與電腦視覺所開發之技術，此技術被廣泛的應用於現代化製造生產之中，尤其在高科技產線之品質管制領域，扮演十分重要的角色。傳統人工檢測耗費大量工時且易有人為誤判，自動光學檢測不僅能夠大幅提升產線的良率，亦能因自動化提升運作效率並減低人力成本。在目前低毛率且高度競爭的製造產業之中，自動光學檢測實為不可或缺之關鍵技術。此外，隨著自動化設備與網路基礎設施的發展，M2M 的概念亦逐漸導入工廠，本研究透過無線通訊技術連結生產機台與手持式運算裝置，藉由手機與平板電腦實現遠程管理與操控之目的，實驗證明此想法可有效增進生產效率。 本專題期望透過開發嶄新的影像比對演算法與 M2M 行動管理平台，提升石英頻率控制元件之製程檢測與管理效率。透過自動檢測演算法的改善提升影像比對的效率並降低錯誤判斷的比例。在此研究之中，所開發的自動檢測應用包含下列兩項製程：晶片黏著檢測以及字樣打印檢測。本研究所提出之比對演算法皆以 NCC 比對演算法基礎，透過板模參數的調整、Winner Update 演算法的結合、最大堆積樹資料結構的使用，可大幅降低大量比對所需之運算量，使所提出的自動光學檢測系統可達到即時運算的目的。實驗結果顯示，採用本研究所提出的結果，兩項檢測準確率皆可分別達到 90% 以及 95% 以上，而檢測所需的時間僅需約 0.06~0.07 秒。 將此檢測演算法以 LabView 實作在產線機台中，並以 M2M 行動管理技術開發對應之 Android APP 與伺服主機系統，並以此改善生產效率。實驗結果顯示，每部機台每日停機次數約可降低 50%，而產能利用率可由原先 80% 上升至 86%。本專題研究部份相關內容已實際應用於台灣晶技的生產線中，達到提升總產能、減少人力成本與增加良率等多重功。 英文摘要： Automated visual inspection (AVI) techniques are developed based on image processing and computer vision, which are widely adopted in modern manufacturing processes. Especially in the quality control filed of high technology manufacturing, AVI plays an important role to improve the yield rate of		

the manufacturing process while reducing human capital. In addition, the concept of Machine to Machine (M2M) gradually involves into the industry as long as the development of automatic equipment and the network connection. This work proposed a mobile management system on hand-held computing devices which connected with the manufacturing equipment by wireless communication technology. This management platform can achieve the purpose of remote control by mobile devices and smartphones to increase the manufacturing efficiency.

This research focus on develop a novel image inspection algorithm and a M2M mobile management system to improve the inspection and management efficiency of quartz crystal units. The proposed inspection algorithms is based on Normalized Cross Correlation(NCC)method and combines with winner update scheme and max heap tree decrease large computation during the inspection process. Several parameters of the temple can be adjusted according the product attributes. The experimental shows that the two target inspection task studied in this work can achieve higher than 90% and 95% accuracy respectively while the total process only needs 0.06-0.07 second every image. The proposed inspection algorithm is compiled with LabView system to practically implement in the production line, and an Android APP which is developed based on M2M mobile technologies are also adopted in management. The experiment shows that the false alarm of AVI equipment can be reduce to half times of original, and the utilization rate can be raised from 80% to 86%.