Textile composition detection based on near infrared spectroscopy

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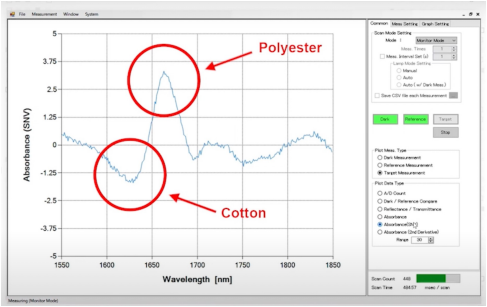
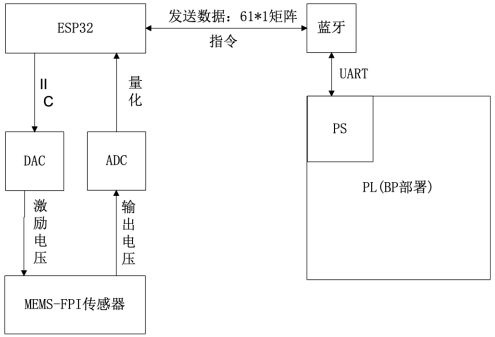
INTRODUCTION

Textile enterprises have a great demand for rapid quality inspection of products. For chemical methods, time cost too much. For **near-infrared spectrometer**, it is expensive and bulky, and some traditional instruments cannot distinguish specific the fabric composition. Therefore, at present, enterprises often use manual sorting methods, and manual detection is slow, inefficient, and not objective enough. In order to improve the intelligence and convenience of textile fiber detection, we try to deploy the **textile composition detection model on the FPGA**, so as to improve the performance of detection and rapid identification efficiency of textile fabric components.

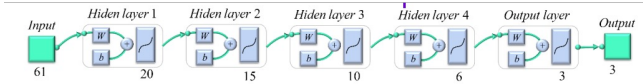


NIR spectrum sensor and its application

Architecture and structure of observation system



The near-infrared absorption wavelength and intensity of different chemical groups (such as methyl, methylene methyl, benzene ring, etc.) or the same group at different chemical environments are significantly different. The spectrum has a wealth of structure and composition information, which is ideal for **measurement of hydrocarbon organic substances**. If the composition of the samples is the same, their spectra are also the same, and vice versa. **Analytical model** can be established with the **mapping between the spectrum and the parameters** to be measured. Parameters can be conclude just based on NIR spectrum. In this project, we use **BP neutral network** to train analytical model.



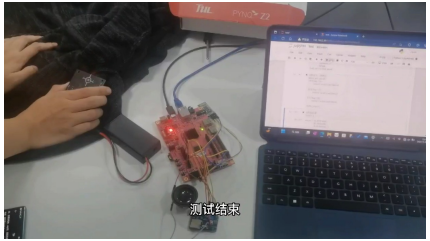
Principle of BP neutral network for analytical model

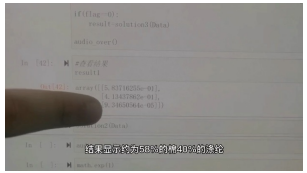
CREATIVE DESING

On board test by PYNQ-Z2

RESULT

Demo of textile composition detection with spectrum sensor





The future plan:

1. Add a camera to obtain fabric images while scanning with a near-infrared spectrum sensor, use **CV algorithm** to analyze images
2. consider to build a **textile database** to accelerate the efficiency of data calling;
3. Build a **graphical UI with Bluetooth**, and use the mobile phone APP to interact with the system;
4. Customize a **better measurement** to provide a constant temperature, constant humidity and stable measurement environment