OWN Narrow Fabric Defect Detection and Categorization

Area Of Interest:

Inspecting narrow fabrics for defects and using AI to categorise these Defects

Staff Member Contacted:

I contacted Amy Lowe who said it was an interesting idea and asked me where I intended to obtain a data set as I intend to use a neural net.

Project Description:

My terminally ill father started a company that inspect narrow fabrics (seatbelts, elastic waist bands, any fabric that is sold in ribbons). He did this using hand soldered boards, clever optics and photodiodes. While these machines worked well they were incredibly expensive to make and he unfortunately his illness meant he had to stop working before we had the opportunity to move to more modern methods and reduce cost. Furthermore, in the years leading up to the end of the company customers showed interest in a machine that could not only detect defects but categorise what kind of defect they were.

Hence, my project would be to build software that would allow me to take a live feed of narrow fabric and using a combination of computer vision and AI pick out defects then decide what type of defect they were, for example a loose thread, staple or tear.

I believe this would be approached in two stages, both to help me build the dataset and allow me to optimise the system. As the defect detection and categorisation will be done in real time the I will have to use what was taught in numerical computation and algorithms 1 and 2 to make the software runs as efficiently as possible. A divide and conquer method will probably be used to split each frame into smaller picture that can be more manageably inspected, next year’s optimisation module will also most likely help with this.

As I said before the inspection will be done in two stages the first will be to use computer vision most likely opencv to find which images contain defects. I am certain this first stage can be done without the use of AI as it is like what my father’s old solution did but using a camera and computer instead of photodiode and DSP. I also have some experience comparing histograms generated from images using opencv which could be one solution.

The second stage would then be to use some form of AI possibly a neural net to take these defects and categorise them, next years machine learning module and my previous module will likely help with this stage.

To address Amy’s question, as I am sure that the finding a defect can be done without AI I would only have to label what category each defect found falls into, not having to find the defects by hand should make building the data set much faster.

Equipment Requirements

I believe all I will require is raspberry pi, a camera module and an electric motor all of which I already have. I also could need some narrow fabric to test the system but this can be purchased in spoons hundreds of feet long for very cheap, and I already have about 100 meters to start with. A simple mechanical prototype may have to be made so I can take uniform pictures of the fabric, but I really do mean simply and will probably end up made from a shoe box. The focus is the software.