Good Stack, Bad Stack, Red Stack, Blue Stack- Stack Quality Detection Device

Overview
In digital printing systems, the proper handling of the paper through the machine is of utmost importance and one of the biggest challenges to do accurately, quickly, and repetitively. Of utmost importance is the delivery of the final stack to the customer. The objective of the project is to develop an innovative solution for detecting bad paper stacks; the device must be 95% accurate and detect a minimum of a 5mm offset in the wrong direction.

Objectives
- Meet the customer design requirements in an efficient, resourceful, and cost-effective manner.
- Develop a final deliverable prototype that can be implemented by Xerox.

Approach
- The team used early stages of the semester to brainstorm various solutions to the problem, such as using imaging software or photoelectric sensors.
- The team visited a local printing center at Penn State to analyze the printer that Xerox uses.
- After analysing cost requirements and size constraints, it was decided that using photoelectric sensors would be the most effective and least costly solution to the problem.
- Existing products, patents, and processes were researched and analyzed, allowing the team to select the most useful sensors, which were found and ordered online.
- The team made use of Gantt charts, need matrices and flow charts to analyze different methods and solutions.
- It was decided that the team would replicate the output area of the printer with PVC pipe and attach photoelectric sensors to detect stacks of paper; the prototype was modeled using CAD software before design began.
- The team created a PVC prototype, but there were issues due to material deficiencies, so some parts were replaced.
- Three photoelectric sensors were coded using C programming software and were implemented in the prototype.
- The sensors were tested using stacks of paper; stacks were made to simulate those defined by Xerox.
- Data was analyzed and verified based on Xerox definitions; real paper was used for credibility.

Outcomes
- The prototype was finalized and presented at a senior design showcase.
- The project resulted in a new, innovative approach to detect stack quality issues that can be implemented by the sponsor.
- The sponsor can build off of ideas presented in the prototype and use it as foundation for future work.