Vision System for Round Ground Metals

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Abstract
This project consists of the design and development of a quality control vision system. Round Ground Metals produces small diameter stainless steel bars that are used in various industries. A vision system is proposed that would be able to detect various defects in the bars. The defects that would be looked for include: nick, burr, scratch, and dents. The system will use the Cognex In-Sight 7402 camera, which has a high-speed rating of its class (12 times that of the model 7010), a 1280 x 1024 pixel count, and is capable of running at 60 frames per second. The software used to detect the defects is the In-Sight Explorer 4.9.1. This software is programmed to work directly with the Cognex camera and provides various detection and measurement tools that are specifically calibrated to fit the steel shaft that is being inspected.

Method
The Cognex In-Sight 7402 is the top of the line model in the Cognex 7000 camera series. With a 60 frames per second acquisition rate, it has the best speed rating of its class (12 times that of the model 7010), a 1280 x 1024 resolution, and is compatible with every tool and sensor provided by the associated software. This is one of the best cameras to have in the field of Vision.

Background
Round Ground Metals Inc. was established in 1988 and has been providing the Steel Service Center Industry the highest quality stainless and carbon shafting products available in North America.

Results
As with any vision system, the number one problem is figuring out the correct combination of lighting and shading to provide the best picture possible. Using the ambient light from the room is not a good option for this. The reflectiveness of the steel shafts act almost as a mirror so each individual light bulb in the room will be represented as a streak in the picture. While this illuminates the bar enough to see the defects, this creates problems for the sensors to detect any of the defects because the sensors cannot distinguish between the actual defect and shadows created by the reflected light on the bar.

Conclusions
The lighting of the shaft is going to have to be done through reflecting colored light onto the shaft. This can be done with the reflectors we have and by having a metallic surface on the sides of the platform to reflect the light onto the shaft. This project will be completed by Edgar Fajardo during the summer of 2015. I am responsible for training Edgar on how to use the Cognex vision systems, the In-Sight Explorer Vision Software, and the tools included, PLC ladder logic programming and uses of the Direct Logic 85 PLC, and basic cabinet design techniques he will use to design the system. A visit to Round Ground Metals to see the manufacturing process will be completed. Design of the marking system, coding of the visual display and user interface, and fabrication of a prototype will be done by Edgar this summer. I as well as Dr. Mirman will be providing guidance and advice when asked along the way. My provided suggestions include pneumatics for the marking system, visual basic coding working with Microsoft Excel for the visual display, and a simple I/O interface when using the PLC.

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Cliff Mirman
Edgar Fajardo
NIU Research Rookies Program
College of Engineering and Engineering Technology
Round Ground Metals Inc.

References