

From Book to Text File

Realisation of a Book Scanner, and Programming of an OCR Software

By Christian Graber and Elias Mügler

Within the scope of a Maturaarbeit at the Kantonsschule Kreuzlingen we projected and realised a machine which is able to scan a book. The machine should transfer a complete book to a computer whereas the page turn over and the scanning process work automatically. In addition we wanted to develop an optical character recognition (OCR) software to handle the scanned image data.

First we outlined a system to manage the page turn task. For the movements we wanted to use electric motors: A rotatable arm lifts one page and a rod turns it. With the aid of a CAD software we could create the whole machine as a digital 3D model. So we could analyse and decide to scale. We had to reengineer and to advance our models. For example, we replaced the electric motors through pneumatic cylinders because our movements run from stop to stop.

When we had our definitive model, we arranged the elements on a wooden base. When it all fit together, we put it on a plexiglass slab.

A programmable logic controller (PLC) regulates the procedure of movements. The system works event-driven: Sensors at the cylinders notify the end of a movement; therefore the PLC starts the next one. The cylinders are managed by direction control valves; one-way restrictors allow to set the speed.

The second part of our project was the programming. We had to develop three programs: a PLC program, a communication software between machine and computer as well as the OCR engine. To split the page into lines the software counts the number of pixel along each pixel row. Subsequently, those lines are going to be splitted into separate characters. Each of these characters are going to be compared with a database containing all characters as reference. In each case, the program chooses the character with the lowest difference.

We wanted to do as much as possible by ourselves. Thus we could gain a lot of experiences in fields of activity that we didn't know before, such as CAD, pneumatic and programming. During our project we got to know various experts and generous enterprises. They introduced us to the different areas and helped us during the manufacturing process. We saw into the world of engineering.

As preparation for the competition of "Schweizer Jugend forscht" we optimized the machine and the software. We tried to improve the appearance of the engine. We also payed attention to the security aspect. A word test brings down the error ratio of the OCR engine.