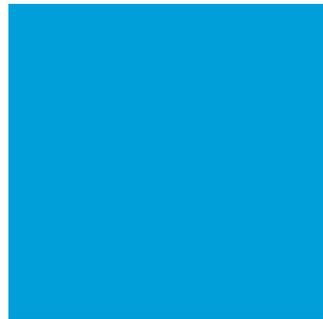


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New opportunities in parcel automation

TRENDS AND CHALLENGES IN MAIL SORTING AUTOMATION

For many years image processing and address recognition technologies have been used to speed up mail sorting and reduce manual data entry costs. With today's increased competition in the postal business, changing customer behaviour and uncertain mail volumes, it is even more critical to respond quickly to market change. The recent growth in e-commerce has also increased international and domestic postal parcel traffic, along with interest in automatic parcel sorting. Growth in international parcels – 4.2 percent between 2000 and 2005 – came from greater e-commerce activity. Analysts at Capgemini expect an increase of 3-5 percent per year in this segment – a cumulative growth of 20-25 percent to 2015. Since parcel processing is labour intensive, reducing costs associated with parcel sorting and delivery has also received increased urgency.

Postal and courier parcel sorting centres currently introducing or upgrading parcel sorting systems are at an advantage over mail centres that automated letters and flats in past years. Today more mature technology and business models provide higher savings to make solutions viable. Furthermore accumulated experience can help in arriving at the most efficient and cost-effective solutions for automated parcel sorting.

In particular, innovative universal OCR solutions, already implemented in letters and flats sorting automation, may be adapted and successfully applied to the parcel industry. These modularised systems are not tied to specific hardware platforms and can be easily implemented to provide an accurate, fast, flexible and cost-effective solution in an existing environment. Until



recently suppliers were offered only integrated solutions that included both OCR and transport components.

This tight integration of sorting equipment and OCR modules hampered the periodic replacement or update of just one of the components. An OCR/video coding system (OCR/VCS) open interface standard was created over the past two years to enable postal operators to work with different suppliers for needed replacements or expansions to subsystems without incurring major engineering costs. Universal OCR systems that may be considered separately from the upgrade of sorting equipment make it possible to unify automation efforts and provide address recognition improvements for several mail stream types simultaneously.

There are other advantages of universal technology that are worth considering. First the ability of an OCR engine to provide high performance levels on both machine-printed and handwritten addresses makes automation investments more viable despite the ratio of handwritten and machine-print addresses in the full mail stream. Second, universal technology automatically identifies and locates address blocks and labels on any parcel despite its format. It also requires comparatively less expense to adapt (for address formats and structure, coding rules, unique handwriting styles, etc) for specific countries. This approach requires lower development expenses and makes even small business opportunities feasible and attractive.

Universal OCR solutions were designed to answer the entire range of market needs and proved their efficiency in a number of postal and parcel automation projects

worldwide. The software incorporates the latest achievements in artificial intelligence in areas such as neural network technology, fuzzy logic, hidden Markov models, multiple independent engines and contextual information. Using these innovative methods, universal OCR successfully resolves address location and recognition challenges that parcel images pose. In particular they allow the software to successfully solve the task of 'region of interest' (ROI) location. Though often underestimated or taken for granted, ROI location is a necessary step in applications in postal and courier parcel sorting and is a key to the success of the solution overall.

In cases where parcel images contain several blocks of information, such as the sender's address, company logos and barcodes, as well as the destination address, ROI location is one of the main challenges. Finding the small address block among different pieces of data should be approached in a very precise way, yet the process must have flexibility to accommodate different applications. First, it is necessary to separate the image of a mailpiece from the background. In this step the ROI is the image of the mailpiece, which is found within a larger image, which also captures a piece of a conveyer belt used to transport the item.

Despite the difficulty of the task, the best modern technologies successfully locate ROIs on parcels and bundles. The most advanced algorithms rely on two main approaches:

- In heuristic algorithms a set of rules is created to describe the possible layouts of various elements of a mailpiece. During the location process an algorithm tries to classify an input layout by matching it against a set of fixed layout descriptions.
- Neural net technologies are used to recognise relationships between items on a mailpiece. The neural network is trained on a large image set of mailpieces and uses accumulated knowledge to locate the ROI during the mail-handling process.

The software separates the ROI, cleaning up the image for processing. Then, the second-level ROI represents the required information found in either a 'simple' address block or a label containing an address block. Finally, for labels that contain additional information such as

return address, phone number, account number or barcode, the destination address block is located. While processing labels, a new ROI location task is assigned to extract the destination address data only. Sophisticated ROI algorithms filter out irrelevant objects at this stage.

Universal OCR removes background noise from the parcel images and identifies address blocks and labels, as well as detecting images that lack a destination address. Unique label-type independent techniques can be used to locate address blocks on any parcel and provide a universal solution for a mixed stream of packages.

When the address is located, the software reads machine printed and handwritten addresses on parcel images that are often of poor quality, rotated at random angles, skewed and often include multiple types of 'noise'.

Universal address recognition solutions are now available to parcel processors to locate and recognise country-specific

“Parascript has offered a unique solution, with both machine-print and handwritten address recognition”

addresses on any parcel. These solutions enable global automation and raise quality and data accuracy standards regardless of geographic location.

From technology to the real world Recent declines in letter volume, and particularly in first-class mail, have created concerns for many companies that are in the business of sorting mail. Those in the commercial mail market segment – where presort mailers enjoyed the benefits of postal work-share discounts for years and postage savings were driven by stable overall mail volume – are particularly concerned.

A couple of years ago the US Postal Service's new shape-based rates increased discounts for automation of first-class flats, making it an attractive extension for letter processing. With further mail volume declines anticipated, as a result of electronic substitution and online initiatives, commercial parcels can be seen as an additional avenue of compensation for possible revenue declines, helping to

provide a sustainable commercial mail business. According to Boston Consulting Group, package volume growth provides a bright outlook for the next decade, with increases of around 40 percent in volume anticipated between 2009 and 2020.

Parascript's parcel recognition technology has been used successfully through integrator partners in a number of USPS programmes, including the Automated Package Processing System (APPS). Recently Parascript was awarded a multi-million dollar contract to automate the processing of parcels and bundled mail for the USPS under its Automated Parcel Bundle Sorter (APBS) OCR programme. Under the terms of the contract Parascript will provide close to 200 OCR units for USPS facilities throughout the USA.

The Parascript APBS-OCR systems will provide recognition, arbitration and connectivity services to the USPS APBS. The technology will automatically locate and recognise destination addresses,

optional endorsement lines and presort stickers on parcels and bundled mail, and will output finalised address information based on an address directory database. Parascript has offered a unique solution, with both machine-print and handwritten address recognition provided through a single vendor, exceeding the USPS's requirements. This creates a great opportunity for increased efficiency and greater flexibility in system lifetime management and potentially a better return on investment.

With increasing parcel volumes and growing demand for OCR technology suitable for the commercial parcel market, Parascript intends to make the most of its technology through the introduction of its AddressParcel product, designed specifically for commercial parcel processing. Parascript is already working towards this goal with leading postal integrators. International customisation of Parascript's technology for parcel processing is also available. ■