

Portfolio of Vision Projects

The table below shows a small selection from over 600 projects that CPE Systems have successfully delivered over the past 16 years. A few non-vision projects have been included to highlight the vast breadth of experience on-tap at CPE.

Client	Description	Vision	High Precision	High Speed	Industrial Environment	Outdoor Environment	Stringent Validation
Albany Intl.	Production Fibre Inspection	Green	Green	Green	Green		
Australia Post	Culler Facer Cancellor Image Capture	Green	Green	Green	Green		
AIP	Paper Measurement Instrument		Green	Green	Green		
AWTA	Wool Measurement Instrument	Green					Green
BT Imaging	Solar Cell Imaging Software	Green	Green	Green	Green		
Cochlear	Bionic Ear Electronics Testers		Green				Green
F&P Healthcare	MR290 Vision System	Green	Green		Green		Green
F&P Healthcare	ICON Test System Vision Driver	Green			Green		Green
Hella	Vision Tester for LED Assemblies	Green	Green	Green	Green		
Integrarian	Video Analyser for Testing of DVR100	Green					
Integrarian	Video Analyser for DP2 DVR	Green					
James Hardie	Laser Profiler		Green	Green	Green		
Medsaic	Scanner for Cancer cell detection	Green					
PINP	Remotely Controlled Cameras	Green				Green	
Securrency	Hologram Inspection System	Green		Green	Green		
Tru-Test	Image Recognition Software	Green	Green	Green	Green		
Varian/Agilent	Grating Mirror Alignment	Green	Green	Green	Green		
Varian/Agilent	Monochrome Alignment	Green	Green		Green		
Varian/Agilent	Pre-optics Alignment	Green	Green		Green		

CPE Systems won the Zenith 2009 Award, in the Energy category, for the BT Imaging project

Albany International

Albany International supply fabric and paper products for industrial applications. One of their products is a thick felt used as a core for building facades, called an 'Alternate Fibre Cement' or AFC. The AFC is made up of a number of layers. The first layer is a woven fabric, upon which parallel lengths of yarn are glued on one side. Both sides are then covered in a felt like material that have certain properties specific to the materials final use. The AFC is supplied to building materials manufacturers who layer cement onto the AFC to create their facades.

Project: P500 - Production Fibre Inspection

Description:

Albany International have an automated system to manufacture their AFC material. The woven fabric, or "backing" is conveyed across two large cylinders that rotate at a speed that determines the amount of AFC produced each minute.

A set of yarn reels sits adjacent to one of the rollers, which dispenses about 35 strands of yarn through a comb onto the backing material. The yarn dispensing rig also applies glue to each strand so that it adheres to the backing material. The yarn dispensing rig only covers a width of around 120mm with the 35 strands, so the backing material continually rotates while the yarn dispensing rig moves along the side of the cylinder. In this way, the yarn can be applied to the whole width of the backing material (up to around 10m).

The vision system detects the last row of applied yarn, and feeds back an analog signal to the yarn dispensing rig to adjust its position, so that the next row of yarn does not overlap or underlap the last row of yarn.

A camera is mounted on the yarn dispensing rig along with a CVS that acquires and analyses images from the camera. The images are 100mm x 100mm, and the camera should be able to handle operating temperatures up to around 40 degrees. In most cases, the vision system is completely autonomous, not requiring any interaction from an operator, however occasionally the operator does vary the vision system parameters such as threshold values and frame rates. The analysis system displays the latest processed image on a screen, along with an overlay of the latest "offset" value fed back to the yarn dispensing rig. As the dispensing rig moves along the cylinder, the last laid yarn is central to the acquired image, the offset of the yarn from the centre of the image determines the feedback value to the PLC that controls the rig speed. The fastest production speed = 60 metres per minute, which equates to 10 frames per second.

Technologies:

- LabVIEW
- LabVIEW Vision Builder
- NI CVS-1455 Vision Block

Australia Post

Australia post have a mail sorting system that determines which envelopes are postage paid and which are not. This machine is called a culler facer canceller (CFC). The CFC automates the mail-preparation stage of mail-sorting operations. It first culls non-machinable mail from mixed postal items loaded by operators. The postage on the mail is then cancelled with a postmark that indicates the post office name and cancelling date, and the mail is faced in accordance with the location of the postage. Finally, the mail is stacked into stackers corresponding to a range of mail types such as ordinary mail, express mail, bar-coded mail or metered mail.

Project: P512 - Culler Facer Cancellor Image Capture

Description:

Australia post required image acquisition and analysis capabilities added to their CFC. They wanted to be able to identify the type of postage paid envelope as it moves along a conveyer.

CPE developed a system that uses a camera triggered by the existing conveyer system, at which time an image is captured and analysed to determine which type of mail it is. The capture and analysis is completed within 100ms so that the existing machine can send the envelope to the right stack.

The prototype system uses a standard Windows XP computer with a CameraLink image capture card and software development environments installed.

CPE developed a custom algorithm for the vision processing that proved to be very successful.

The patterns identified are:

- contrast bar (may or may not be within AP specifications), various colour shades
- sample patterns for Postage Paid imprints
- new franked mail impressions based on Data matrix barcodes

This project was executed in 4 phases

1. Test of camera and capture hardware capabilities
2. Interfacing issues with various controllers inside the RAP17 Culler Facer Cancellor
3. Interface to CFC Sorter
4. System Commissioning Lead and Trail

Technologies:

- LabVIEW
- LabVIEW Vision Builder

Australian Industry Partners (AIP)

AIP have developed a truly unique technique for measuring the strength of paper. This technique measures the quality of the paper by generating and monitoring ultrasonic waves as they transverse through the paper. This technique has now been developed into systems that have very successfully undergone extensive trials both here in Australia and overseas.

Project: P520 - Paper Qualities Measurement System

Description:

CPE developed software to implement the concepts developed by AIP. This involved complex, high-speed signal processing and very precise triggering and synchronizing of the data acquisition with the generation.

CPE also designed and built custom electronics to provide the drive for the piezo-electric transducers which induce the ultrasonic waves into the paper.

One of the big challenges was the environment in which the equipment has to operate which was in a paper manufacturing facility which is both high temperature, high humidity and very filthy. Also access to the equipment is all but impossible when it is operating because of personal safety.

Technologies:

- LabVIEW
- Electronics for a Custom High Speed Piezo-electric Amplifier

Australian Wool Testing Authority (AWTA)

The Australian Wool Testing Authority was established in 1957 by the Commonwealth Government ... in response to requests from the Australian wool industry. Its purpose is to control and administer a wool testing service in Australia

Project: S1162 - Laserscan - Laser Profiling of Wool

Description:

A system for measuring the size of wool was developed by CSIRO in the early 90s. It used a suite of off-the-shelf data acquisition and control circuit boards mounted in a custom rack.

The system uses a laser directed through a clear glass tube through which a sample of the wool flowed quietly quickly in an alcohol solution. The shadow cast by the strands of wool is collected by an array of fibre-optic fibres and fed to fibre-optic receivers. The pattern that is cast across these fibres is then analysed to give the size of the wool.

The proved to be accurate but was expensive to build and maintain, as well as being physically quite large.

CPE analysed the performance and the design of the system and over a 6 month period designed new electronics based on an Altera FPGA . As well as providing the interface to the fibre optics and the system computer, via Ethernet, it which was also programmed to have an embedded 32-bit microprocessor to control the process and manage errors as needed.

The whole system was designed on to one printed circuit board which reduced manufacturing costs by a factor of five, reduced the power consumption dramatically, and reduced the size, so that the electronics could become part of the optics as one module.

Technologies:

- Microsoft C
- Altera NIOS
- PCB Design

BT Imaging

At BT Imaging our goal is to enable the photovoltaic industry to reach grid parity across the world. From achieving higher ingot quality and differentiated wafer quality to the best cell efficiency and highest module reliability, our portfolio of proprietary photoluminescence-based tools enable photovoltaic manufacturers to maximize their yields and profits.

Project: **Solar Cell Imaging Software**

Project No.: S1162

Description:

BT Imaging Require Assistance with the development of LabVIEW Software for their Solar Cell Imaging System.

The work will be completed in Phases: Requirements Analysis and System Design, Code Refactoring, User Interface Overhaul, Image Analysis Functionality and so on.

As these are products that will be made in reasonable quantity it was important that they look good. So one of the big challenges with this project was the emphasis on good presentation on-screen.

This was achieved with programming at the lower levels of Windows, and accessing these functions through LabVIEW. The results are quite spectacular and have helped give the machine a very professional tone.

Technologies:

- LabVIEW
- LabVIEW Vision Builder

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Cochlear

Cochlear manufacture electronics ear implants for the profoundly deaf. They have been delivering these for three decades to over 170,000 people.

Project: P356 - SP12 Test System

Description:

CPE have developed over 20 systems for Cochlear for testing of the electronics external to the implant.

While the technology did provide some challenges, by far the biggest challenges related to the very short timeframes for development and manufacture of the systems, and the verification and Validation (V&V) of the systems.

From knowing nothing about what the electronics did, what was required of the test system, CPE delivered the first systems up-and-running within 3 months of receiving the order.

While not a big challenge, but certainly a large consignment of work, was the verification and validation of the systems. As these are classified as medical devices, the V&V requirements are very stringent and comprehensive. This involves a great deal of lengthy design descriptions and reporting with enormous attention to detail. As these are testing the products, which themselves have tight tolerances, these testers need an order of magnitude of accuracy greater than the product. In-effect we had to develop a tester for the tester.

In addition to the system and software design, there was a considerable amount of effort dedicated to the design and manufacture of custom electronics for the interface between the test instrumentation and the device-under-test (DUT).

After significant effort and close collaboration with the skilled staff at Cochlear CPE was able to meet all requirements and deliver systems that all involved had complete confidence in.

Technologies:

- LabVIEW
- Custom Electronic Design
- Test Fixtures

Fisher & Paykel Healthcare

F&P Healthcare is a leading designer, manufacturer and marketer of a range of innovative healthcare devices which incorporate unique features to improve patient care.

Fisher & Paykel entered the respiratory care market in 1971 with the development of a unique respiratory humidifier system for use in critical care. They now offer a broad range of products and systems for use in respiratory and acute care and the treatment of obstructive sleep apnea (OSA).

Project: **S1132 - MR290 Vision System**

Description:

CPE developed a vision system for detecting the alignment of gaskets that form part of the humidifier system for obstructive sleep apnea. The gaskets are checked by the system for correctly positioning and being installed the right way up.

A smart camera was chosen which could be programmed in a number of ways to allow for the different types of gaskets that need to be tested. The output from the camera interfaced with a PLC so that the faulty items could be steered off into a reject bin.

Extracting the information from the gasket image was quite a challenge as there is a lot of variability in the object being analysed. To help with this a unique combination of Region-of-interest (ROI) and a line drawn by laser was developed which proved to be very successful.

The system needed to have a high acceptance rate so 5,000 samples were tested with excellent results.

Project: **S1183 - ICON Test System Vision Driver**

Description:

A second vision system was needed on a separate product. This time the vision software was developed as a driver that integrated into the existing test sequence. This made the programming of the overall test system quite simple, which in turn saved significant development costs.

CPE developed a universal algorithm in the driver that has proved to be very flexible. This means that new products for testing can be included quite simply and inexpensively.

Technologies:

- Smart camera
- Laser line lighting
- TestStand

Hella (NZ)

Hella New Zealand is part of the Hella Asia Pacific Group. Today the company designs and manufactures innovative lighting products for the commercial transport and automotive industries, using the latest LED (Light Emitting Diode) technology. With these products Hella New Zealand is a supplier to automotive manufacturers and commercial transport fleets all over the world.

Hella is a prominent brand in the New Zealand aftermarket and in the commercial transport sector, with key relationships with original equipment bus, coach and trailer manufacturers.

Project: S1130 - Vision Tester for LED Assemblies

Description:

CPE NZ developed a system for testing LED light assemblies at the end of the production system for Hella. If a faulty assembly is detected the system sends a signal to the PLC controlling the process to reject the item and place it in a 'Faulty' bin.

Statistics are kept by the system and passed on to the central manufacturing computer, so that yields can be accurately assessed.

The requirements were very exacting in that the spectral diversity was very important, as well as the high speed at which the machine has to operate. Also the assembly line operates 24 hours a day, so that maintenance was a large part of the consideration in how the system was designed.

Another large challenge was the mechanical assembly of the tester that had to be designed to accommodate special requirements for handling of the products at high speed. Also 8 assemblies are tested at the one time.

Technologies:

- LabVIEW
- LabVIEW Vision Builder

Integrian

The Company entered the rail transit market in 1995, supplying a range of traction control and data recording equipment for the Melbourne suburban rail fleet. In 1999, the Company secured several large contracts for digital CCTV, Passenger Information Systems and train location systems for large rail fleets in Melbourne and Sydney.

In 2003 the Company began developing a market leading mobile CCTV solution – the DVR-100. In 2005 the Company secured a transit CCTV contract for a large bus operator in New Jersey. In 2006, the Company secured a large contract to supply vigilance and event recording systems to the Melbourne suburban rail network, known as VICERS.

Project: P471 - Video Analyser for Testing of DVR-100

Description:

This test system was used to test for missing data on the DVR-100 Digital Video Recorder. It analyses the video and audio from a recorder which is used for surveillance on trains and buses. The analysis needs to determine, with great accuracy, whether any information is being lost by the recorders.

Project: P476 - Video Analyser for DP2 DVR

Description:

This is a tester that was developed for prototype, preproduction and eventually production testing of the DP2 Digital Video recorder.

A unique approach was developed for the testing. 72 unique frames were loaded on to the Video Generator which cycled cycle through these continuously. The Audio Generator was configured with a frequency defined under 'Setup'. Generation continued until either the Abort button is pressed, or the Generation Time Period has been reached.

The user could select between PAL or NTSC video Formats, and it also accommodated a radar input to the DP2 recorder.

Again, high accuracy and speed were important factors in the design.

Technologies:

- LabVIEW
- LabVIEW Vision Builder
- PXI-5431 Analog Video Signal Generator.pdf
- AVI Video data processing

James Hardie

James Hardie produce a variety of products for the building industry. They use a laser profiling system to measure the thickness of wall materials before and after weathering. James Hardie approached CPE Systems to upgrade the system, primarily to improve the accuracy and speed of measuring each material sample.

Project: **P525 - Laser Profiler Upgrade**

Description:

The previous laser profiling system was inefficient and inaccurate.

The new Laser Profiler System allowed the operator to measure the thickness variation of sample boards at user selectable special resolutions and save that data to file. The file can be retrieved for reporting or used to provide a comparison between identical samples before and after weathering.

The system measures the thickness variation by moving the board in a raster pattern while top and bottom lasers measure the thickness as a function of position. The data is used to build a 2D surface of thickness variation.

Technologies:

- LabVIEW
- Motion Control

Medsaic

Medsaic Pty Ltd was formed to commercialise a platform technology based on a protein microarray for the diagnosis of disease through the identification of patterns of antigen expression on cells.

Medsaic's first commercial-ready DotScan™ product is for the diagnosis of leukaemia and lymphoma. The system consists of a microscope slide dotted with an array of specific antibodies which capture cells, a proprietary slide scanner to record the pattern of cell binding, and software to interpret the binding pattern which leads to a diagnosis.

Project: P388 - Electronics for P54 - G3 Scanner for Cancer cell detection

Description:

The DotScan is a small portable device that uses a small drawer which is automatically driven out to accept a blood sample on glass slide. When the glass slide is retracted, a small Firewire camera takes an image of the sample under special illumination provided under the glass slide. The image is then analysed.

CPE investigated the design of the electronics to control the device and capture the images.

There were a number of challenges associated with the interface with the Firewire cameras that needed significant investigation.

The control of the device was handled by a microprocessor with firmware that CPE developed for the application.

Technologies:

- Custom Electronics for Firewire Cameras

Philip Island National Park

Phillip Island Nature Parks is an award winning, not-for-profit organisation dedicated to international excellence in nature conservation and ecotourism.

Mission: To conserve and enhance the Nature Park environment for current and future generations whilst achieving a balanced environmental, economic and social outcome.

Vision: 'To be a world leader in environmental, economic and socially sustainable nature based and ecotourism experiences'

Project: P378 - Video Analyser for Testing of DVR

Description:

CPE designed and installed a system for transmitting images of seals who live on an island 2 Kms off- shore back to a visitors centre.

The Camera Tower is mounted on a 1m diameter pole situated some 20 metres from the shoreline of Seal Rocks which 2 kms off-shore. Atop this pole is a capsule that is used to house the electronic equipment. Three broadcast cameras are used to capture video of the seals at Seal Rocks. A 2.4GHz radio link is used to encode the video and communicate it back to the shore facility. At the Nobbies visitor centre the signal is converted into the 3 video signals and then distributed to projectors or recording devices.

Visitors can view the images from the cameras and control the position and zoom of the cameras via industrial grade joysticks.

As the system operates 7 days a week and is located in a semi-remote part of Victoria maintenance and diagnostics were a prime consideration.

The supervision of the system is controlled by computers in a dedicated control room under the visitors centre. From there the status and maintenance of the system can be monitored. Extensive diagnostic and setup features have been designed into these computers to provide reliable and high-quality operation.

Technologies:

- LabVIEW
- Remote control of the Camera position and the Lens
- Remote Power Systems

Securrency

Securrency International Pty Ltd, which is majority owned by the Reserve Bank of Australia, manufacture the polymer substrate on which banknotes are printed at Note Printing Australia. The banknotes are for many countries around the world, including Australia and may be run as a continuous process 24 hours a day.

Project: P602 - DOE Inspection System

Description:

Verification of the DOEs (holograms) occurs prior to the reel of polymer film being cut into individual sheets. Sheets are continuously printed onto a continuous reel of film with each sheet consisting of columns and rows of banknotes (typically 5 columns of 8 rows). Securrency refers to columns as lanes. Each sheet is separated by a gap with a "sheeter box" to define the sheet boundary (just a small clear window). The speed at which the film passes a point may vary.

CPE developed a system which operates 24 hours a day which checks every image on every sheet printed. There are 5 cameras in the system, one for each 'lane'. Up to 40 images are passing each camera, per second.

If any image on any sheet is found to be out of tolerance, the system generates a signal that feeds a PLC which will reject that sheet.

Each camera is connected to a NI EVS Realtime Vision System which processes the image with a program written in LabVIEW.

A supervisory computer manages the 5 realtime systems and sets configuration for the system and the type of hologram being printed.

Technologies:

- Multiple (x5) Ethernet Camera Operation
- High Speed Processing (200 images per second)
- NI EVS Realtime Vision Systems with Supervisory computer
- LabVIEW Vision Builder

TruTest

SimpleMFG, a subsidiary of TruTest, are contract manufacturers of electronic assemblies. They are located in Auckland and do work for companies from all around the world.

Project: P567 - Image Recognition Software

Description:

Part of a production line test system needed to include a camera which could recognize the ID parameter on a LCD display. The system had to work with two cameras, and possibly more in the future, that are totally independent of each other.

CPE developed a system which searches for a serial number that is stored in a text document in the program folder. The system automatically searches for a different group of numbers based on which test jig, with a different camera mounted in it, is connected to the tester.

By being automatic there is no input required by the operator, and therefore less likelihood of errors being made.

Technologies:

- LabVIEW
- Optical Character Recognition
- LabVIEW Vision Builder

Varian / Agilent Technologies

Varian (now part of Agilent) are leaders and innovators in creating solutions that solve a wide range of challenges in life science and industry. In particular, they excel in creating high performance products, often combining our diverse technologies and capabilities to create new ways to meet the evolving needs of our customers. Their instruments, consumable supplies, and solutions are key tools in bio-molecular and academic research, pharmaceutical R&D and manufacturing, and industrial R&D and quality control, and in developing everything from disease-resistant crops to cosmetics to testing drinking water and monitoring quality in the petrochemical industry.

Project: **P533 - Grating Mirror Alignment Rig**

Description:

CPE developed an application in LabVIEW that was part of a test system developed by Varian. The application performs measurements associated with the alignment of a grating mirror and instructs operators on which adjustments are to be made in order to properly align the mirror.

The instrument is used in the medical industry as a spectrometer to determine the chemical composition of a substance in plasma form.

In the manufacture of the instruments, the grating mirror is required to be correctly aligned. The grating mirror is rotated and tilted to its proper alignment manually. The process uses a LED laser and a firewire camera.

The program designed by CPE is simple enough that operators will place the mirror in the test fixture, run the program, and it will guide them through the whole process and record the results. The application repeatedly asks the operator to retest the mirror until it is satisfied the mirror is correctly aligned. When finished the test results will be saved off to a 'csv' file for external reference.

Project: **P557 - Monochromator Alignment Rig**

Description:

Similar to the previous application, CPE developed a LabVIEW application that guides an operator through the procedure of aligning the collimating mirrors in the monochromator that is to be installed as part of an optical spectrometer. The application interfaces to a test rig that had been designed by Varian and consists of three firewire cameras.

Technologies:

- LabVIEW
- LabVIEW Vision Builder
- Firewire cameras

Project: P557 – Pre-Optics Alignment Rig

Description:

Similar to the previous application, CPE developed a LabVIEW application that guides an operator through the procedure of aligning the toric mirrors in the pre-optics that is to be installed as part of an optical spectrometer. The application interfaces to a test rig that had been designed by Varian and consists of two firewire cameras.

Technologies:

- LabVIEW
- LabVIEW Vision Builder
- Firewire cameras