New World CAD/CAM
Development Ltd.

# Robot arm for sorting flats / packets

Reference # :W-0257

By New World CAD/CAM Dev. Ltd.

# Company Background

- New World CAD/CAM Development Ltd.
- Company Mission
  - To provide turnkey solution for plastic mold, precision machining parts as well as automation production facilities to IT, inspection equipment, automotive and medical device industries.

# Company Profile

- Products
  - Plastic Injection Molds
  - Precision Machining Parts
  - Industrial Automation System
- Services
  - Plastic Injection and machining part design review for cost effective manufacturing (DFM)
  - Finite element analysis of plastic injection mold to reduce part warpage and production cycle. (FEA)
  - Automation production system design for plastic injection, machining and custom applications to meet the challenge of industry 4.0
- Company Size
  - 20 staffs in Hong Kong
    - Four Ph.D (Graduated from HKU and HKUST)
    - Two Master graduates

# Our Customer















# Project requirement & Expected outcome

- Flats and packets are small mail items with different sizes and shapes. HKPost would like to adopt robot arm to sort the mail items into bins / drop bags by reading the mail information through barcode scanner / OCR.

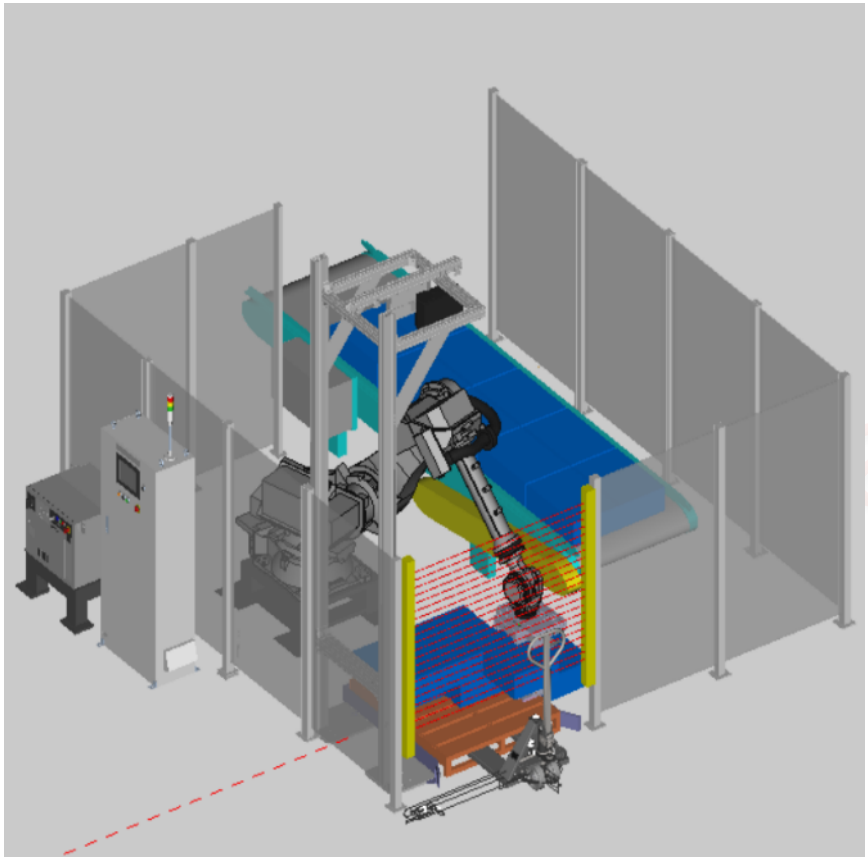
- The robot arm shall quickly identify the delivery location of the mail items and then place them correctly into the right positions for further handling. The output shall be greater than current one.

# Target objects to be handled by Robot
# For local Posting Service

**Letter mail are classified by mail format strictly according to its size and weight to either Small Letter, Large Letter or Packet.**

| Mail Category | Size Limits | | Maximum Weight |
|---|---|---|---|
| | Maximum | Minimum | |
| Small Letter | Length: 245 mm<br>Width: 165 mm<br>Thickness: 5 mm | Length: 140 mm<br>Width: 90 mm | 50g |
| Large Letter | Length: 381 mm<br>Width: 305 mm<br>Thickness: 20 mm | Length: 140 mm<br>Width: 90 mm | 500g |
| Packet | non-Roll Form:<br>▸ Combined measurement of length, width and depth must not exceed 900 mm and the greatest dimension must not exceed 600 mm<br><br>Roll Form:<br>▸ Length plus twice the diameter must not exceed 1,040 mm and the greatest dimension must not exceed 900 mm | non-Roll Form:<br>▸ 90 mm x 140 mm<br><br>Roll Form:<br>▸ Length plus twice the diameter must not be less than 170 mm and the greatest dimension must not be less than 100 mm | 2kg |

# Our Proposal



Collaborative Robot System integrated with 3D Vision

- Collaborative 6 axis Robot
- 3D vision system
- Loading & Unloading station (option: conveyor)

# Collaborative Robot

Suggestion:

Techman Robot

Model : TM12

Payload : 12Kg

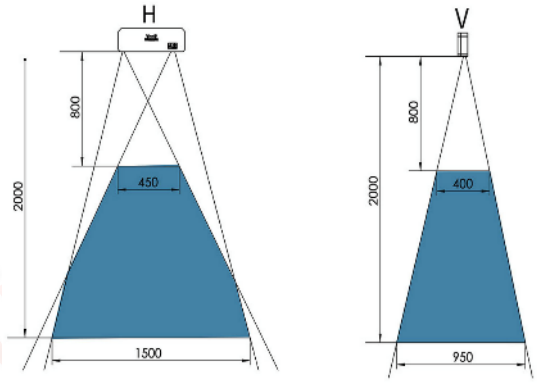
Reach : 1300mm

| Model | | TM12 | TM14 | TM12M | TM14M |
|---|---|---|---|---|---|
| Weight | | 33.3Kg | 32.6Kg | 33.3Kg | 32.6Kg |
| Payload | | 12kg | 14kg | 12kg | 14kg |
| Reach | | 1300mm | 1100mm | 1300mm | 1100mm |
| Typical Speed | | 1.3m/s | 1.1m/s | 1.3m/s | 1.1m/s |
| Joint ranges | J1 | +/- 270° | | | |
| | J2,J4,J5 | +/- 180° | | | |
| | J3 | +/- 166° | +/- 163° | +/- 166° | +/- 163° |
| | J6 | +/- 270° | | | |
| Speed | J1~J2 | 120°/s | | | |
| | J3 | 180°/s | | | |
| | J4~J5 | 180°/s | 150°/s | 180°/s | 150°/s |
| | J6 | 180°/s | | | |
| Repeatability | | +/- 0.1 mm | | | |
| Degrees of freedom | | 6 rotating joints | | | |
| I/O ports | | Control box | | Tool conn. | |
| | Digital in | 16 | | 4 | |
| | Digital out | 16 | | 4 | |
| | Analog in | 2 | | 1 | |
| | Analog out | 1 | | 0 | |
| I/O power supply | | 24V 1.5A for control box and 24V 1.5A for tool | | | |
| IP classification | | IP54 | | | |
| Power Consumption | | Typical 300 watts | | | |
| Temperature | | The robot can work in a temperature range of 0-50°C | | | |
| Power supply | | 100-240 VAC, 50-60 Hz | | DC 22V~60V | |
| I/O Interface | | 3×COM, 1×HDMI, 3×LAN, 4×USB2.0, 2×USB3.0 | | | |
| Certification | | CE, SEMI S2(Option) | | | |
| Variation Models | | X: without hand eye camera, SEMI: SEMI S2 certified | | | |
| | | | | | |
| **Robot Vision** | | | | | |
| Eye in Hand (Built in) | | 1.2M/5M pixels, color camera | | | |
| Eye to Hand (Optional) | | Support Maximum 2 GigE cameras | | | |

# 3D Vision System

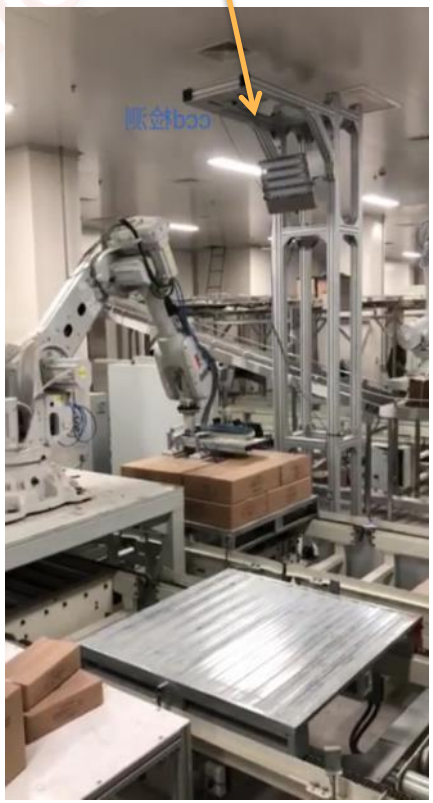
| | |
|---|---|
| Scanning Time | 0.3s-0.9s<br>(Depends on customers' requirements) |
| Resolution | 1280 x 1024 |
| Optimal Scanning Range | 800 mm-2000 mm |
| Accuracy | 0.5 mm @ 1 m |
| Interface | Ethernet |
| Customized Service | Smart camera can be customized. |
| Power Supply | 12VDC |

Camera Vision Dim.





3D Vision Camera



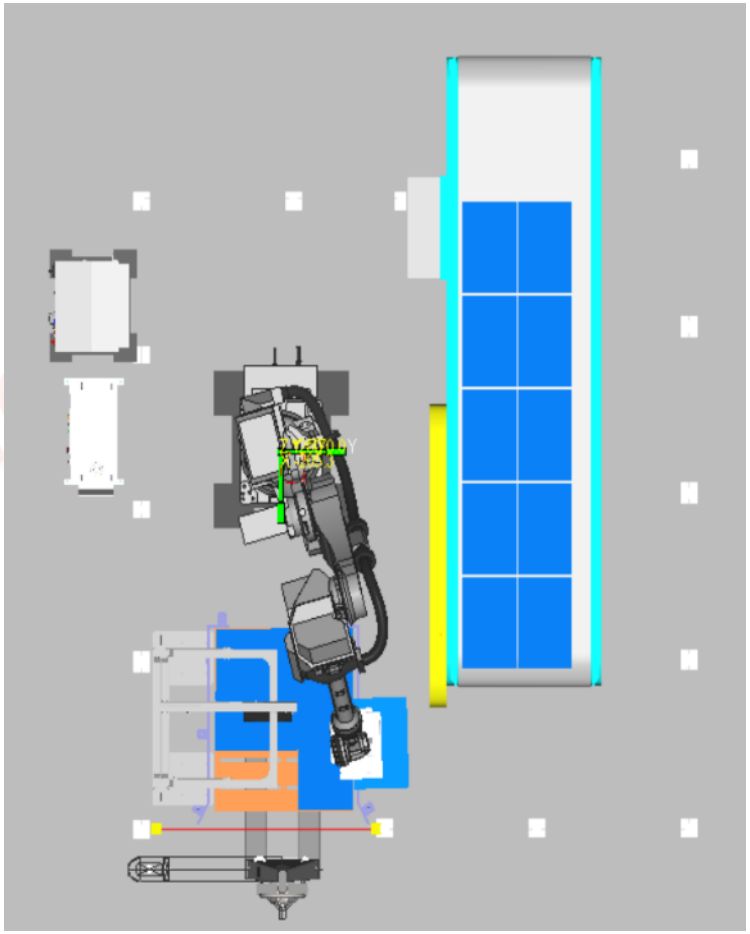
# Proposed Workflow

(1) Operator load mail/package onto the loading station

(2) 3D vision to determine the mail/ package position automatically

(3) Robot arm pick the targeted item and recognize the information by OCR

(4) Robot place the item to designed location after auto determination



# Components and Requirements

Facilities

- Control system with user operation panel
- 6 axis Collaborative Robot
- 3D vision system

Requirements

- Power: 220V 13A single phase
- Compressed Air: 6 bar 18 cfm

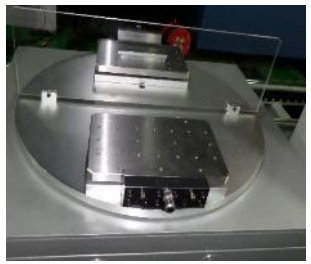
# Implementation Plan

## Robotic Mail/Package Sorting System

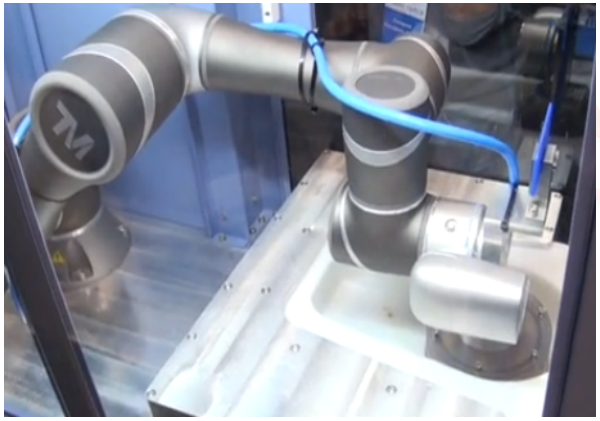
| | Weeks |
|---|---|
| 1. Mechanical design & development | 5~6 |
| 2. Main control & UI software development | 7~8 |
| 3. 3D vision Software optimization | 2~3 |
| 4. System integration & testing | 5~6 |
| 5. On site testing & trail run | 4~5 |
| Total : | 23~28 |

Project Reference :
Industrial Automation (6-axis-robot)

# Industrial Automation (7-axis-robot)

# R&D Project for EMSD / CSD (H. K. Government)

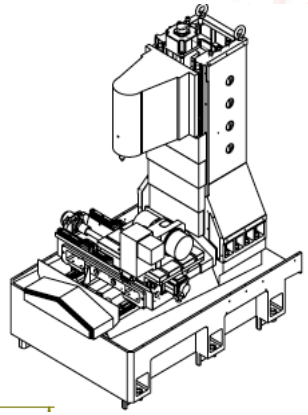


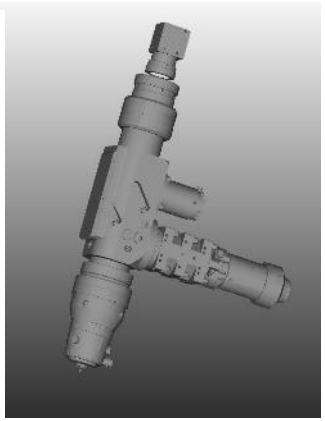
- Develop a Drug detection Robot system for Correctional Services Department
  - Customer made a Mobile Robot system for CSD officer to perform daily drug detection operation
  - System included Robot, Waterjet, Vision and Embedded operation system

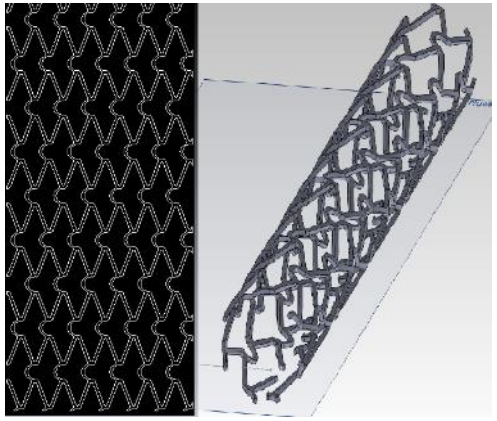
# Project for Aliplay – Unmanned Shop (Robotic Coffee)

# Custom Machines

- Join Development with The Hong Kong University of Science & Technology
- Aim
  - To Develop the process for laser cutting of micro components such as stent for medical use
  - To build the 4-axis CNC controlled laser cutting machine to enable the cutting of micro-components manufacturing







# Thank You!