Cathay Nebula Science & Technology Co., Ltd.

Technology paints the future, innovation accomplishes dreams

Contents

Company Profile

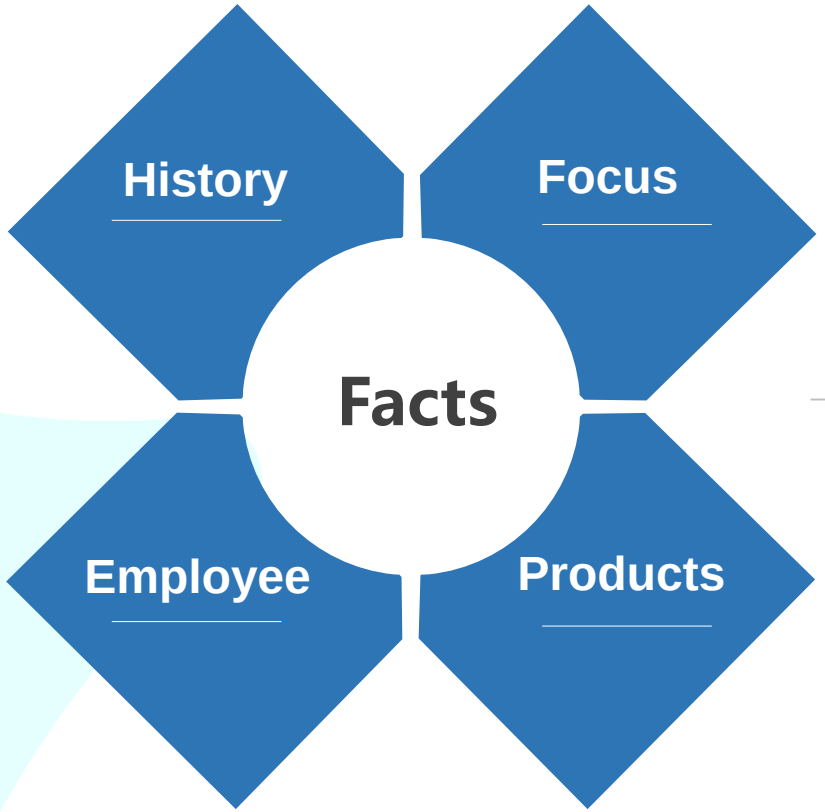
YC Product Portfolio

QC Product Portfolio

Company Profile

Cathay Nebula was founded in 2011 with headquarter in Beijing and multiple after-sales center in China.

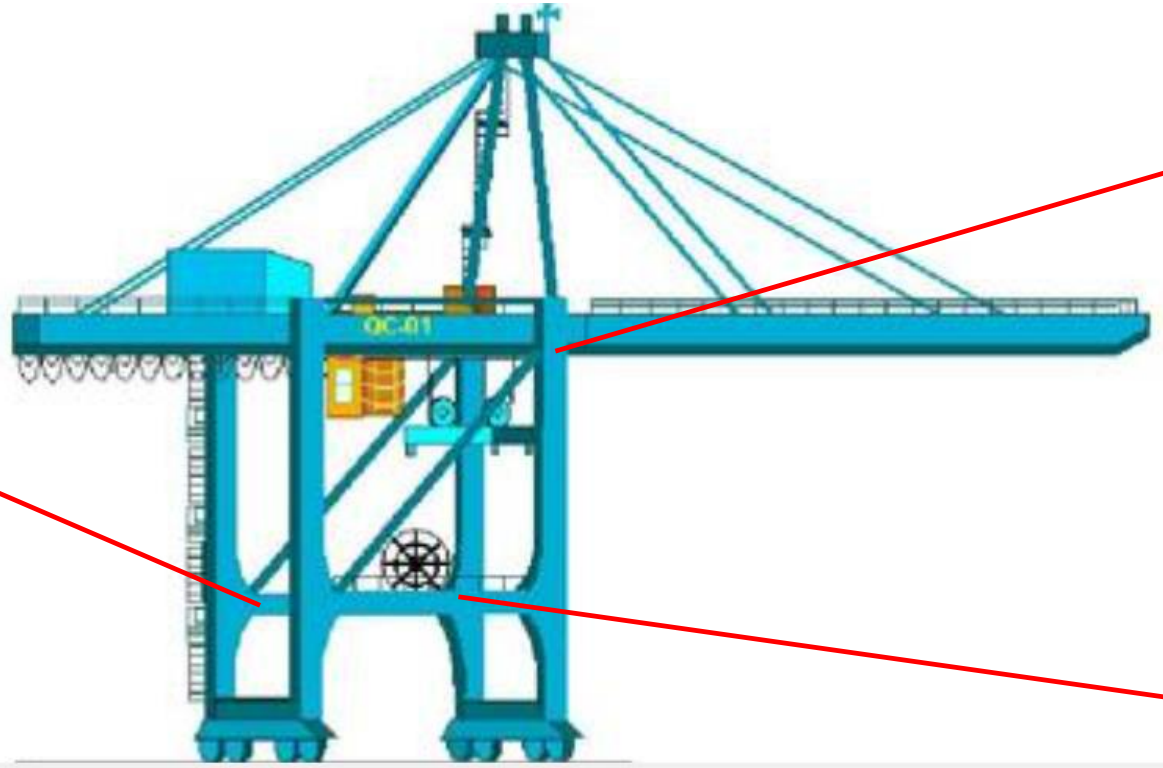
Our employees are our biggest asset. We have 90 employees up to date including 50 engineers capable of technical support and system commissioning.



Cathay Nebula is devoted to supplying state-of-the-art systems for crane automation in global terminals to enhance safety, productivity and intelligence level.

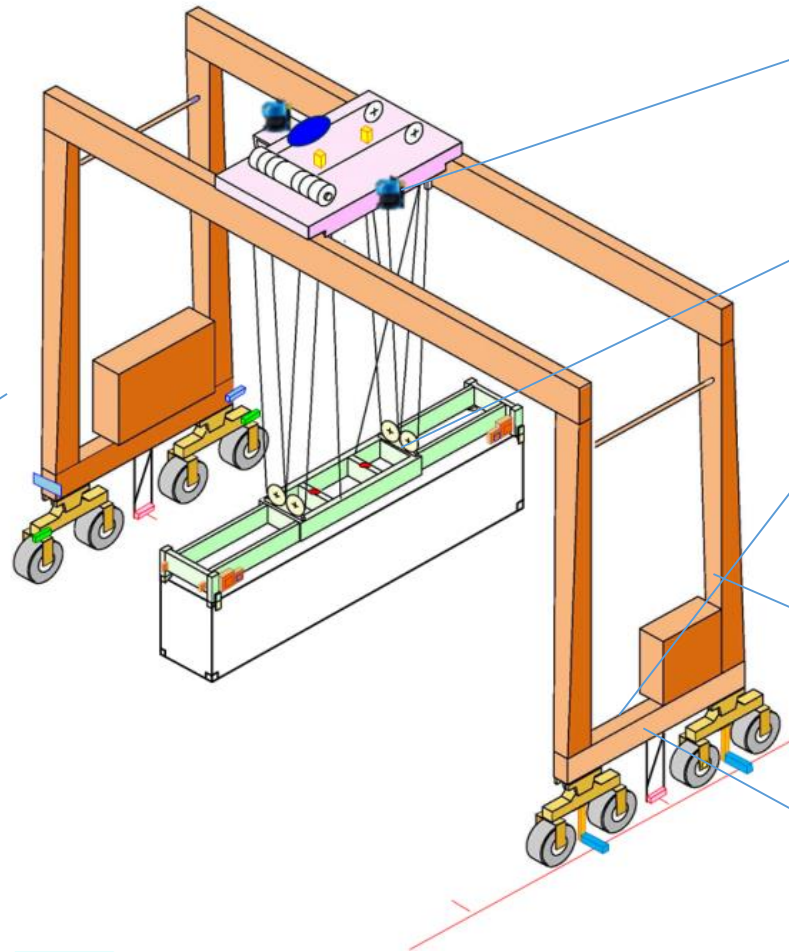
We have a wide range of products utilizing GPS, laser scanning and AI-VRS for various equipment in ports and terminals.

Major products



- Vessel Profiling System (VPS)
- AI Vision Recognition System (AI-VRS)
- Chassis Positioning System (CPS)

Major products



- Auto Gantry Move (AGM)
- Object Positioning System(OPS)
- Load Positioning System(LPS)
- AI Vision Recognition System (AI-VRS)
- Chassis Positioning System (CPS)
- Chassis Lift Prevention System (CLPS)

Qualifications

All products are in-house developed and patented.

Up to date Cathay Nebula has:

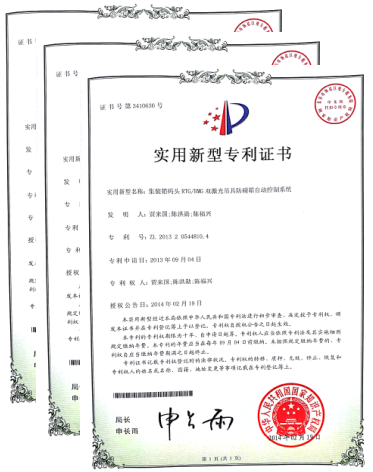
15 patents for invention

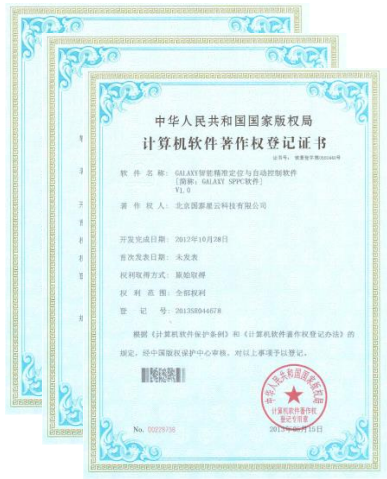
20 patents for utility model

27 software copyright

For international market, Cathay Nebula has obtained multiple certificates such as CE, UL(AGSS/CLPS)，CA

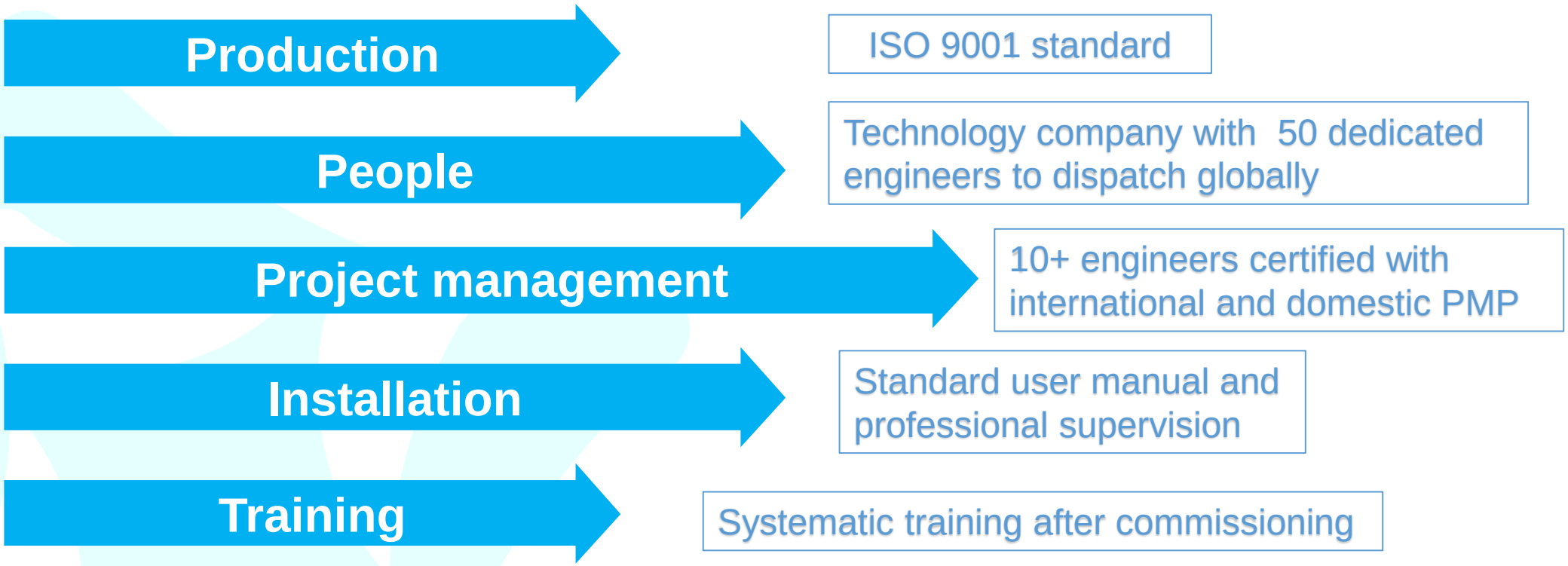




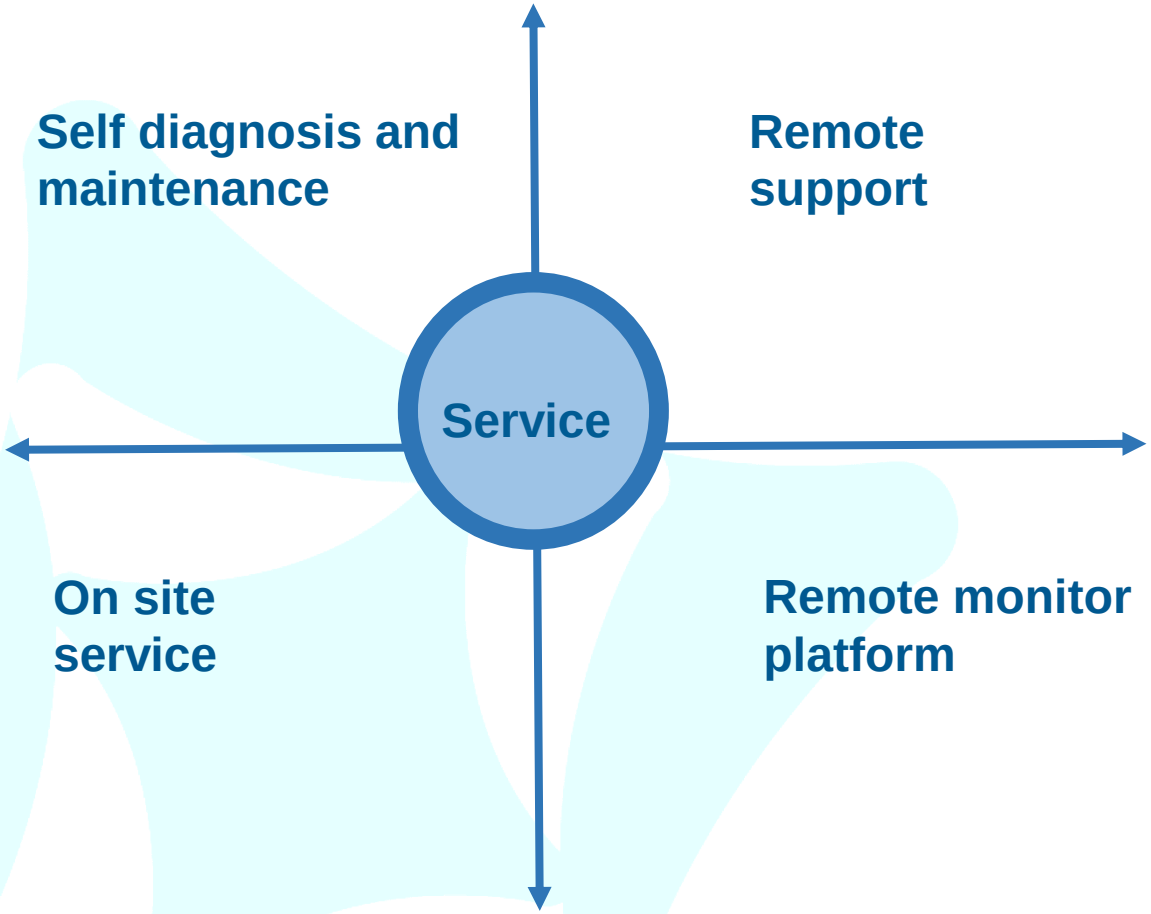


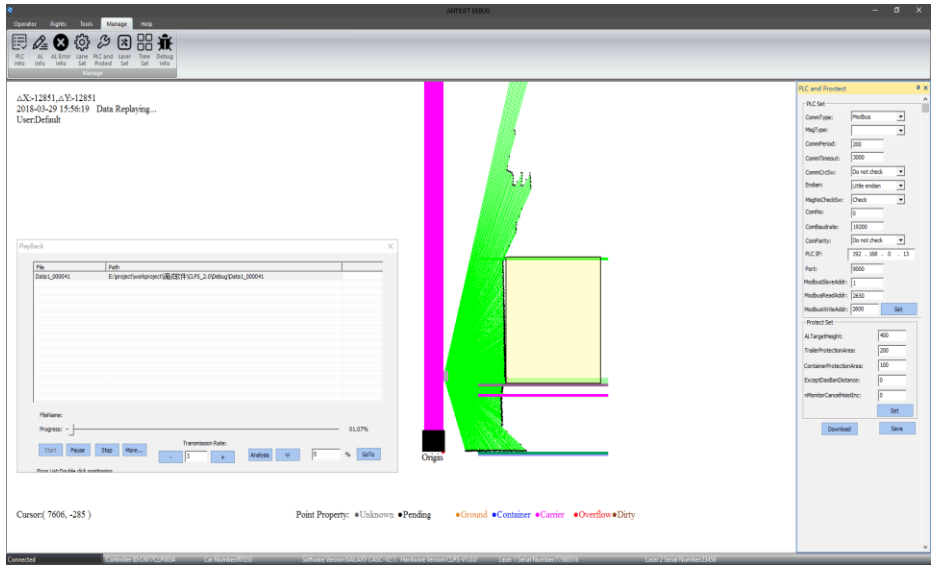


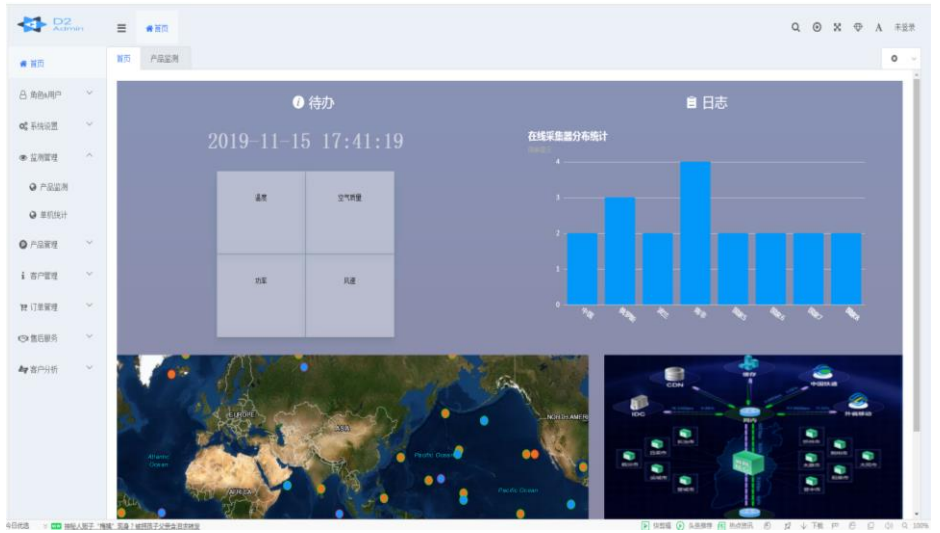
Project implementation and management



After-sales support

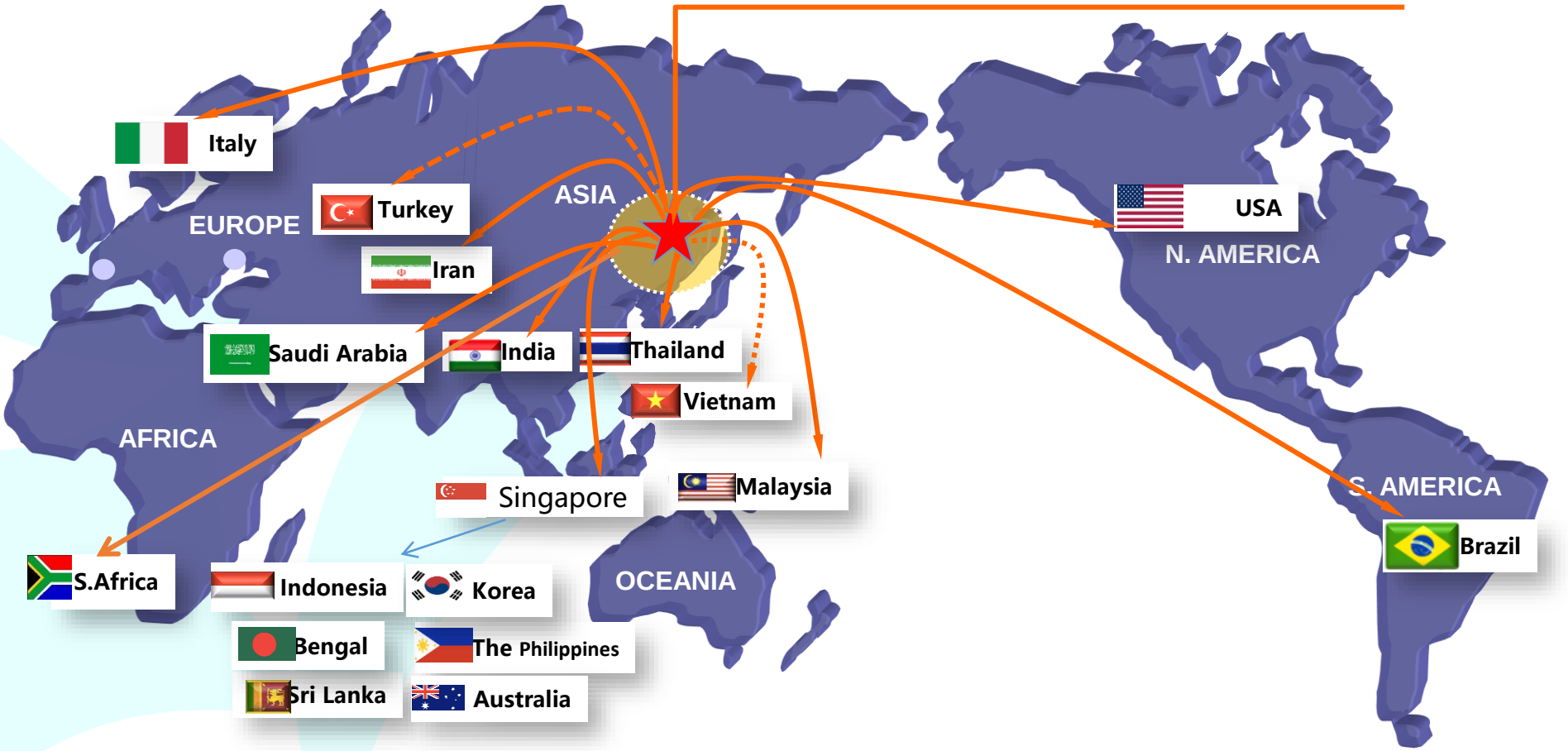




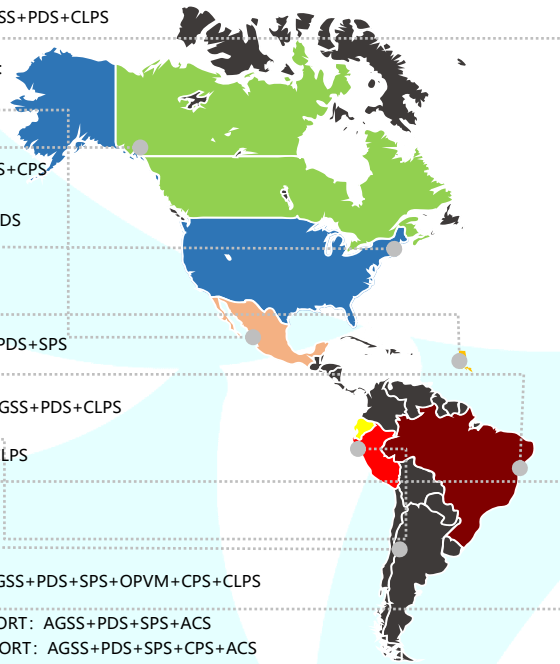


Global partners

China: ShangHai, GuangZhou, NingBo,ZhuHai,XiaMen
QingDao, RiZhao,QinHuangdao



Global projects



ES Bilbao2: CPS

PL DCT :CPS+CLPS

IT
① LASPEZIA : ACS
② VTE : AGSS+PDS+CLPS

MX MANZANILLO: AGSS+PDS

CA PRINCE RUPERT: AGSS+PDS+SPS+CPS

US PNCT:AGSS+PDS

DM ZFMC:CLPS

BR LIBRA:AGSS+PDS+SPS

EC ECUADOR: AGSS+PDS+CLPS

PK PAKISTAN: CLPS

AR ECT:CLPS

LK COLOMBO:AGSS+PDS+SPS+OPVM+CPS+CLPS

TR
① MARPORT: AGSS+PDS+SPS+ACS
② ASYAPORT: AGSS+PDS+SPS+CPS+ACS
③ KUMPORT: AGSS+CPS+CLPS

KE Mombasa: CLPS+SPS+CPS+AI-VRS+ANTI-SWAY

MU LOUIS: AI-VRS

IL ISRAEL: CLPS

CIV Abidjan: AGSS+PDS

PER Callao : AGSS+PDS+CPS+CLPS

ZA Durban : CPS+CLPS

MR Nouakchott : CPS

EG
① AICT: SPS
② SOKHNA: CPS

AE
① Jebel Ali T1: GNSS
② ABU DHABI: AGS+PDS

SA
① IPS DCT: AGSS+PDS
② Jeddah :AGSS+PDS+SPS+CPS+CLPS
③ RSGT: AI-VRS

KHM Sihanoukville: AGSS

OM OICT : CLPS

RU HESSEN : 3D-OPVM

VN
① HAIPHONE:AGSS+PDS
② TICT:AGSS+CPS

MM MITT : CLPS

PH TEFASCO : AGSS

TH
① PAT:AGSS+PDS+SPS
② LCIT:AGSS+PDS
③ HLT: SPS+CLPS

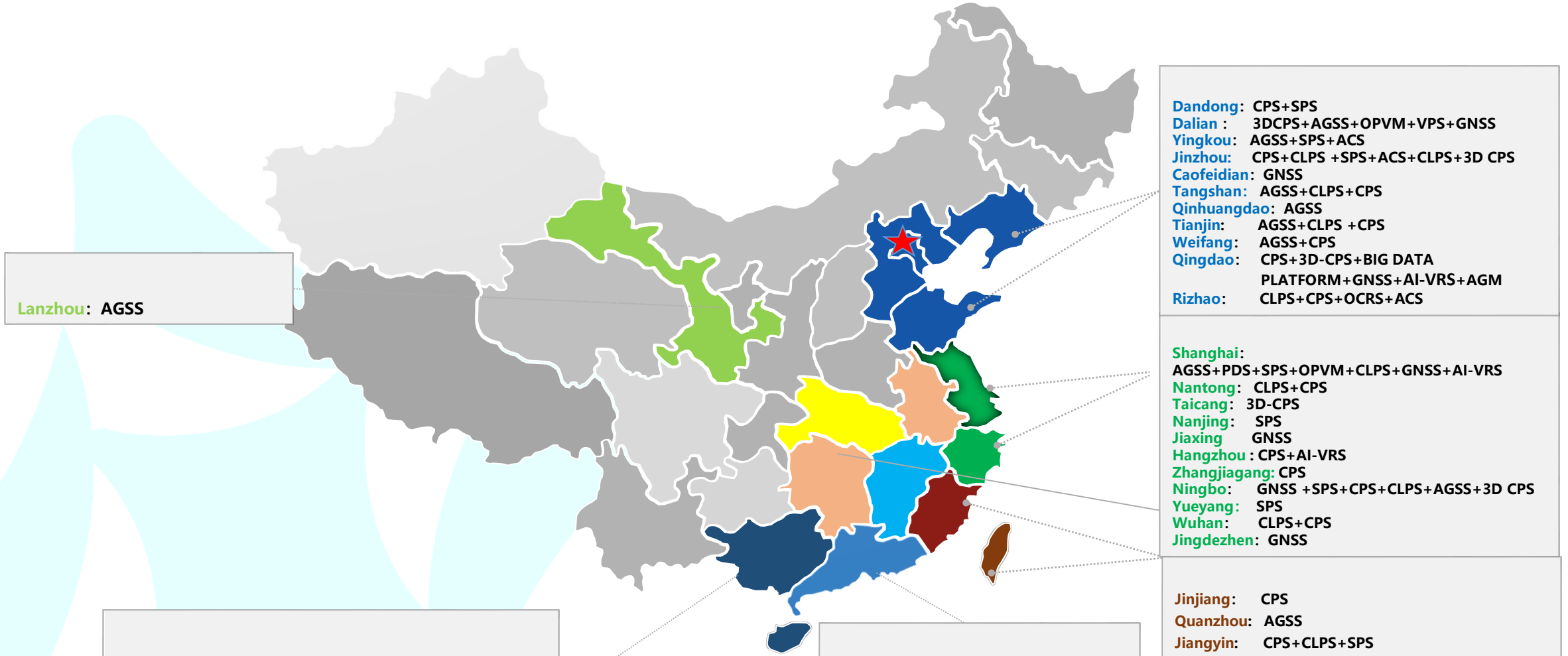
ID
① JAKARTA: AGSS+PDS
② SURABAYA: AGSS+PDS
③ PT MHE-DEMAG: AGSS
④ NPCT: AGSS+SPS+CLPS
⑤ OKI: AGSS

QA QATAR : AGSS+SPS+CPS+CLPS+AI-VRS+AOS

MY
① PTP: AGSS+PDS+SPS+CLPS
② SABAH: AGSS+PDS
③ BINTULU: AGSS

IN
① KICT: VPS GTI: CLPS
② KPCT: AGSS BMCT: AGSS+PDS+SPS
③ PIPAVAV: AGSS+PDS
④ MUNDRA CT3&CT4: CPS+SPS+CLPS
⑤ NSIGT: AGSS+PDS+SPS+CPS+CLPS+ACS
⑥ VCT: AGSS+PDS+SPS+CPS+CLPS+AI-VRS+VPS
⑦ VIZHINJAM: CLPS
⑧ ADANI T2: AGSS+3D-SPS+CPS+CLPS+AI-VRS+VPS

Domestic Project



Lanzhou: AGSS

Qinzhou: AGSS+PDS+SPS+CPS+AOS
Zhanjiang : AGSS+PDS+CLPS+OPVM
Beihai: CPS
Fangchen: CPS
Yangpu: AGSS+PDS

Shantou: AGSS+PDS+SPS+CPS
Guangzhou: SPS+CLPS
Shenzhen: OPS+LPS+CLPS
Zhuhai: CLPS+SPS+CPS
Dongguan: AGSS+CPS+AI-VRS
Hongkong: CPS+CLPS+AI-VRS

Dandong: CPS+SPS
Dalian : 3DCPS+AGSS+OPVM+VPS+GNSS
Yingkou: AGSS+SPS+ACS
Jinzhou: CPS+CLPS +SPS+ACS+CLPS+3D CPS
Caofeidian: GNSS
Tangshan: AGSS+CLPS+CPS
Qinhuangdao: AGSS
Tianjin: AGSS+CLPS +CPS
Weifang: AGSS+CPS
Qingdao: CPS+3D-CPS+BIG DATA PLATFORM+GNSS+AI-VRS+AGM
Rizhao: CLPS+CPS+OCRS+ACS

Shanghai: AGSS+PDS+SPS+OPVM+CLPS+GNSS+AI-VRS
Nantong: CLPS+CPS
Taicang: 3D-CPS
Nanjing: SPS
Jiaxing GNSS
Hangzhou : CPS+AI-VRS
Zhangjiagang: CPS
Ningbo: GNSS +SPS+CPS+CLPS+AGSS+3D CPS
Yueyang: SPS
Wuhan: CLPS+CPS
Jingdezhen: GNSS

Jinjiang: CPS
Quanzhou: AGSS
Jiangyin: CPS+CLPS+SPS
Xiamen: AGSS+CPS+SPS+3D-CPS+CLPS
Zhangzhou: AGM
Taiwan: VPS+CPS+AI-VRS

Contents

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Yard Crane

Driver assistance

Automated Crane

Gantry move

Steering

Auto Gantry Steering System

Auto Gantry Move System

Prevention

Anti-Collision System

trolley move

Trolley to Block

Stack Profiling System

3D Stack Profiling System

Object Positioning System

Auto landing in stack

Spreader Auto Landing

On Stack

On Lane

Chassis Positioning System

Load Positioning System

3D Chassis Positioning System

Auto landing on lane

Chassis Lift Prevention System

Crane Auto Stacking

Truck and container management

AI Vision Recognition System

Auto Gantry Move (AGM)

System Introduction

AGM combines GNSS and INS (Inertia Navigation System) for RTG to achieve auto-moving, auto-steering and auto-stop at object bay, therefore improves the reliability of gantry location.



System Functions

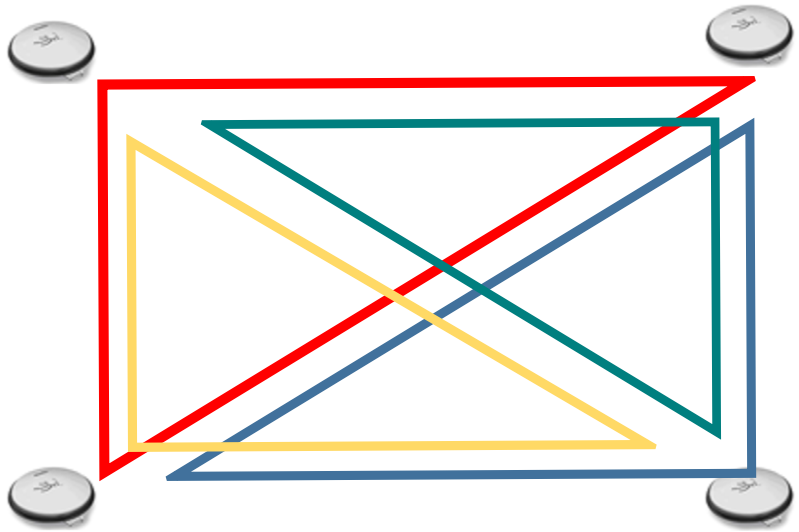
- Real-time detect RTG position and posture
- Auto-move
- Auto-steering
- Precisely stopping at object bay

Auto Gantry Move (AGM)

Technical Specifications

- Position accuracy of GNSS: 0.8cm + 1ppm(RMS)
- The accuracy of position detection: <=±2cm
- The accuracy of gantry spin: $\pm 1.0^{\circ}$
- Parking deviation : ≤±5cm
- INS compensations time: 10s
- A variety of interfaces: Ethernet, ProfiBus , Serial port





Auto Gantry Move (AGM)

Benefits

- Automated steering even under GPS signal loss or blocked
- Auto-move to object position with remote or automated cranes
- Automatically adjusted to yard undulation

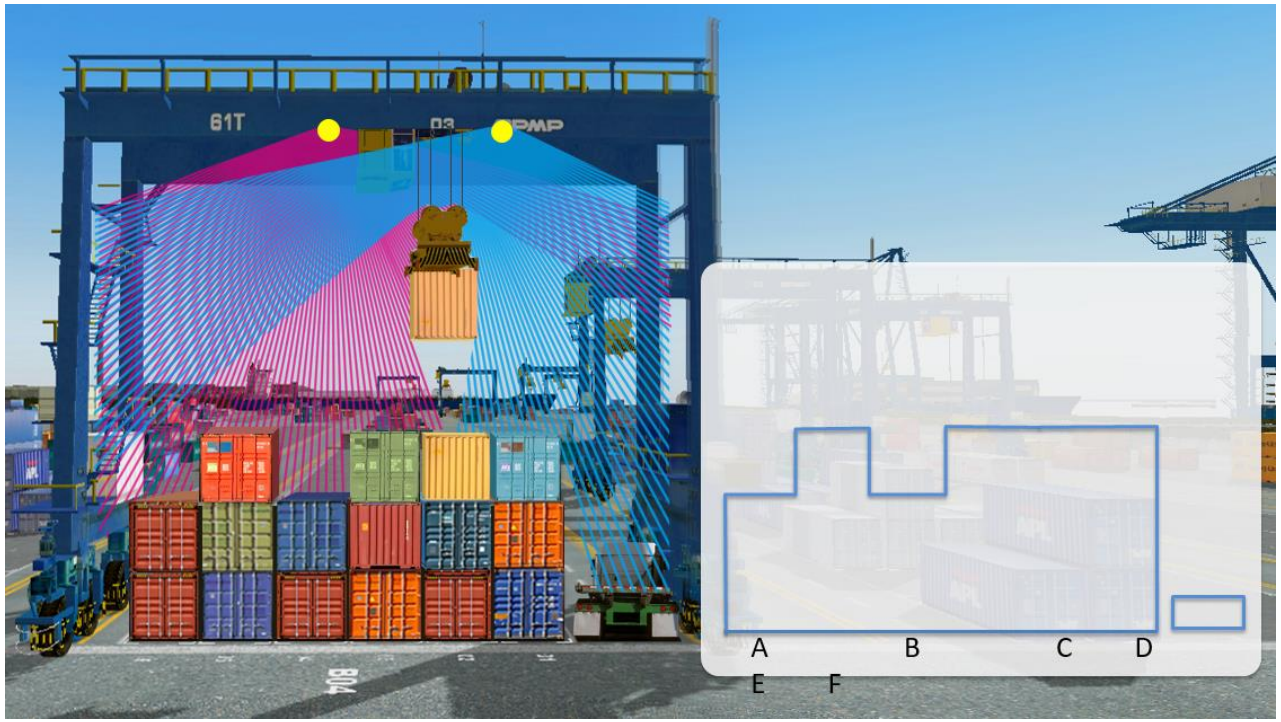


*18x cranes implemented and counting

Stack Profiling System (SPS)

System Principle

- Detect container profile by real-time laser scanning
- Detect spreader position through lasers and encoders
- Calculate slow-down and stop distance
- Anti-collision control



Technical Feature

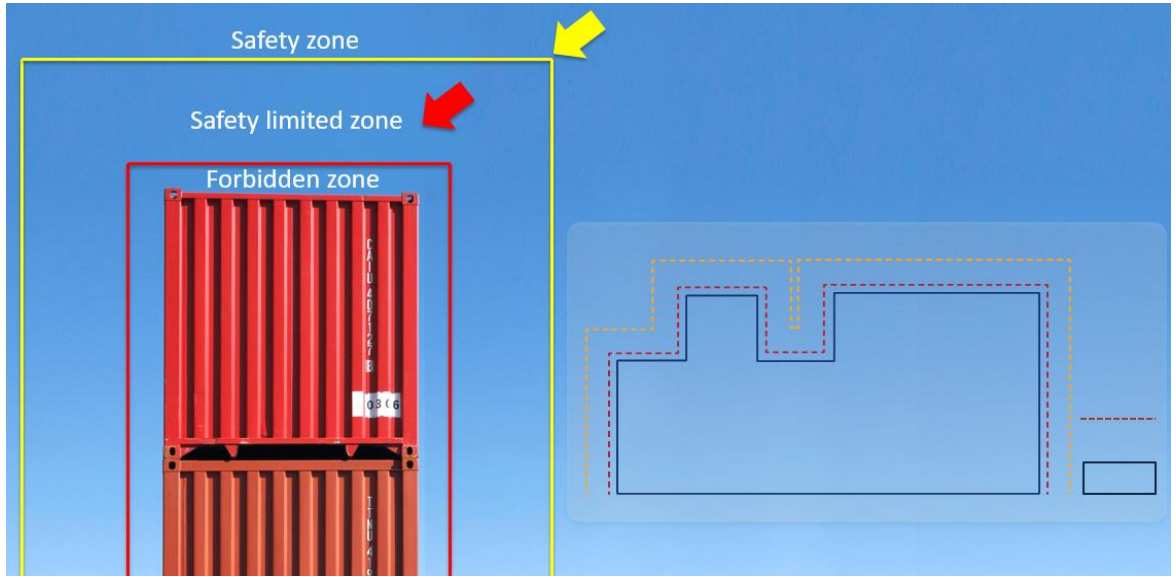
- Dual sensor without shadow zone
- Smooth control
- Self-diagnosis function

*593x cranes implemented globally

Stack Profiling System (SPS)

Technical Specifications

- Detection accuracy: 5cm
- Control accuracy: ±10cm
- A variety of interfaces: Ethernet, ProfiBus , Serial port



3D Stack Profiling System (3D SPS)

System Introduction

System effectively prevents the collision between the load and the container in working bay and adjacent bay when trolley moving.



System Functions

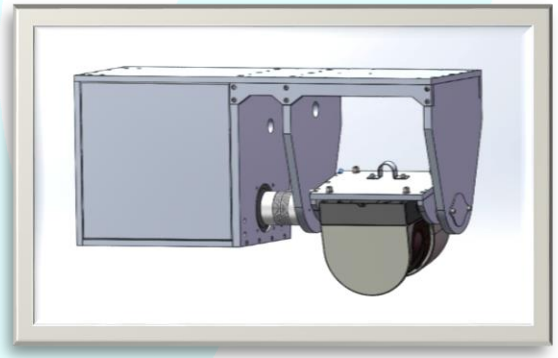
- Profiling stack in working bay and adjacent bay
- Anti spreader collision（Trolley direction）
- Soft-landing

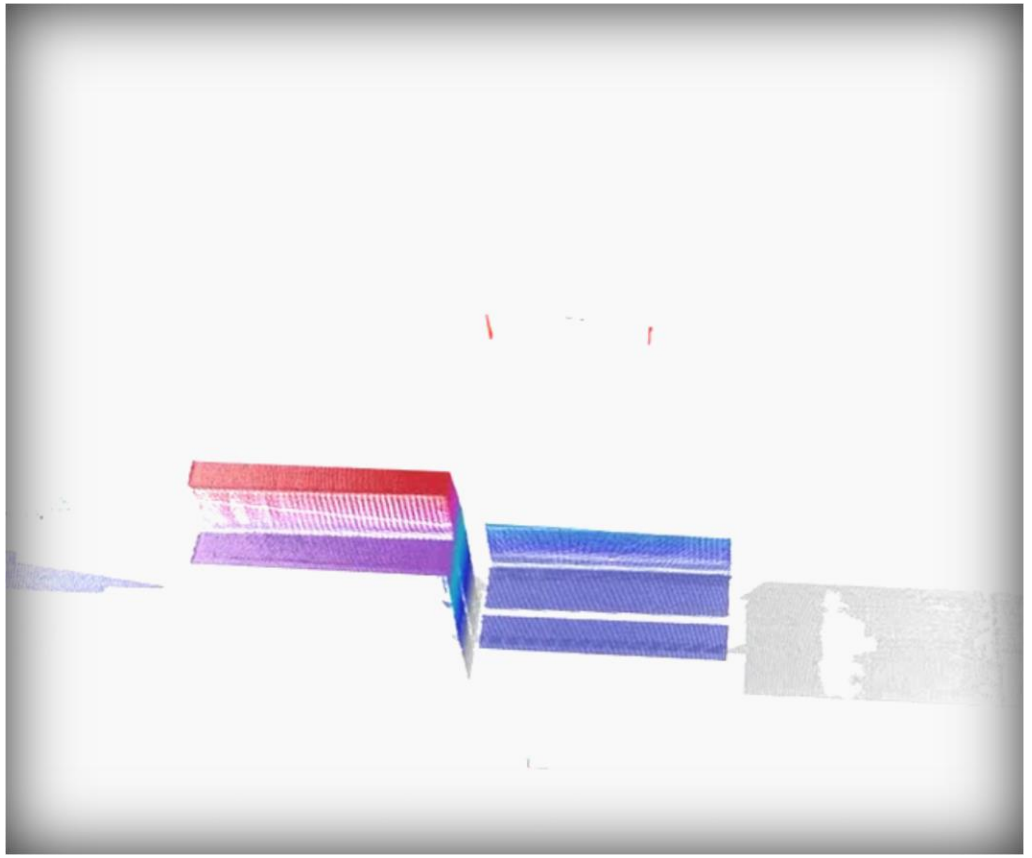
*31x cranes being implemented

3D Stack Profiling System (3D SPS)

Technical Specifications

- 3D container stack profiling accuracy: 5cm
- Control accuracy: ±10cm
- A variety of interfaces: Ethernet, ProfiBus , Serial port





Chassis Positioning System (CPS)

System Functions

- Chassis Alignment
- Truck cabin anti crash
- Spreader anti dragging
- Adapting to various container configuration
- Adapting to different types of chassis





*270x cranes implemented globally

Chassis Positioning System (CPS)

Technical Specifications

- CPS Accuracy: < ±5cm

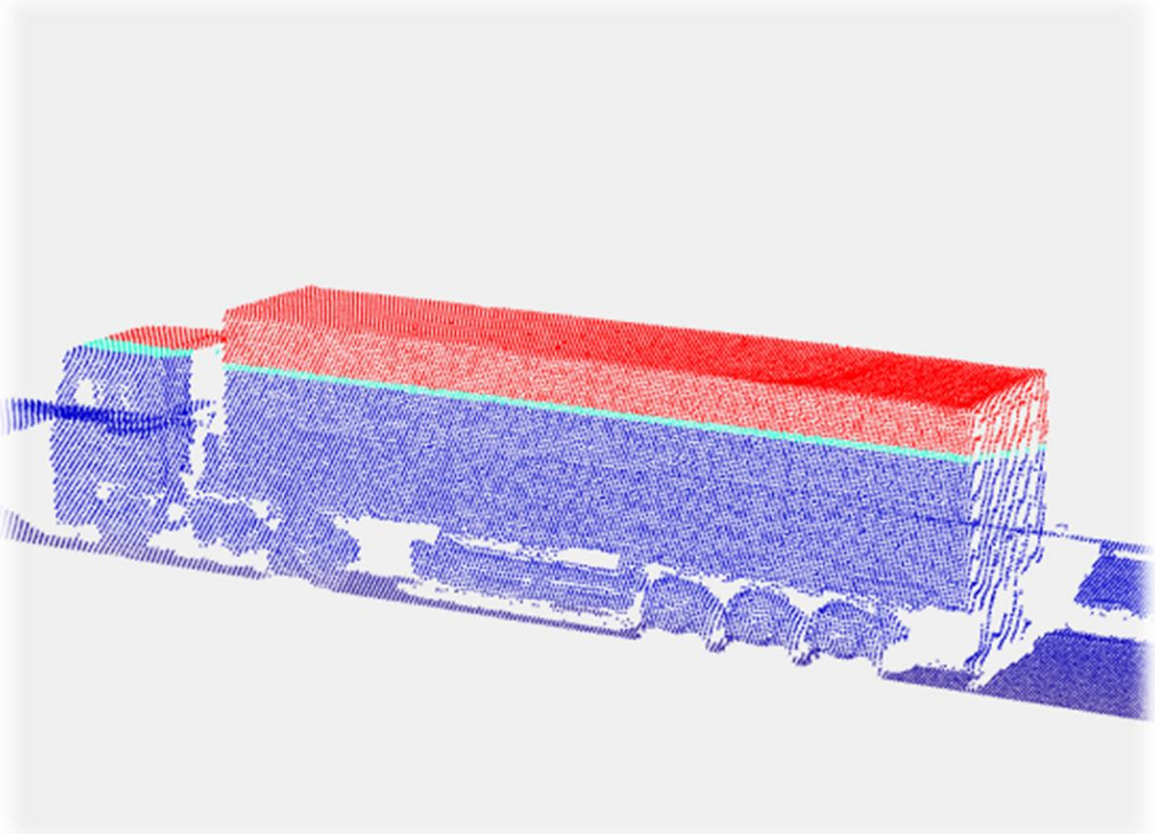




3D Chassis Positioning System

System Introduction

CPS-3D support full functions of CPS-2D. Meanwhile it detects chassis and container 3D profile. CPS-3D can guide spreader to container or chassis automatically on the truck lane for RTG/RMG.



System Functions

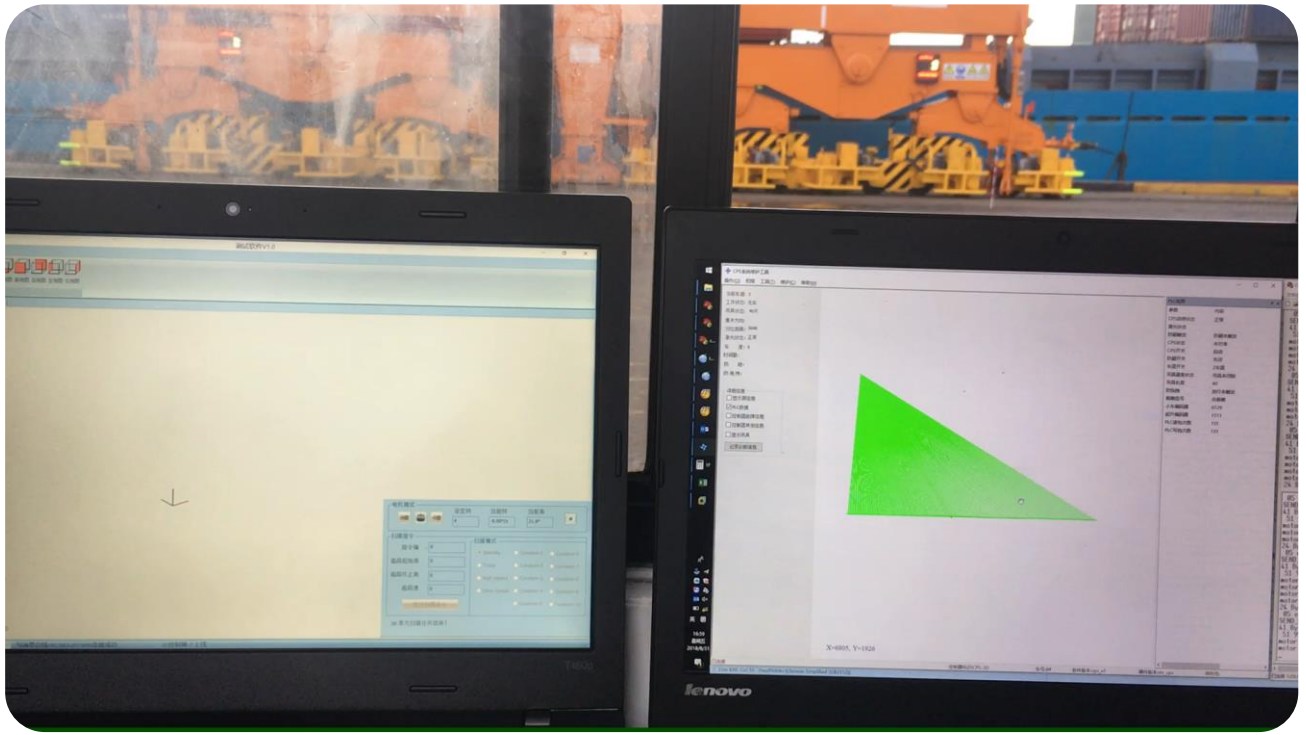
- Support full functions of CPS
- Detect 3D position and posture of chassis and container

*21x cranes implemented in total

3D Chassis Positioning System (CPS-3D)

System Principle

- Align chassis to correct position
- Detect position and posture of chassis with 3D laser scanning
- Auto Landing: CPS-3D will compare spreader’s position and posture and guide spreader adjusting until spreader align with the container.

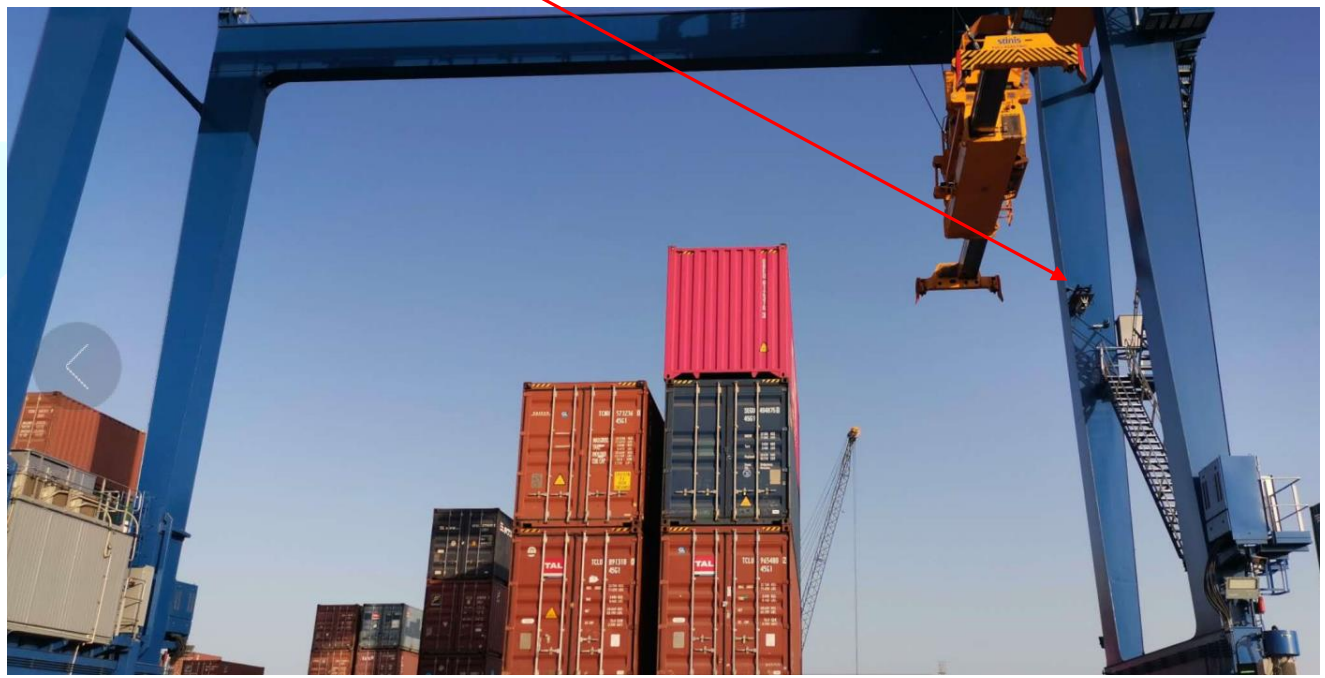


3D Chassis Positioning System (CPS-3D)

Technical Specifications

- Detection distance:40m
- Chassis alignment accuracy: ±5cm
- Trolley alignment accuracy:±5cm
- Chassis posture accuracy: 0.5°
- A variety of interfaces: Ethernet, ProfiBus , Serial port





Chassis Lift Prevention System (laser-based)

System Introduction

CLPS is designed to detect chassis lift when twistlocks are not released employing laser scanning technology, therefore prevent truck lifting accidents.



System Functions

Security control for chassis being lift with container.

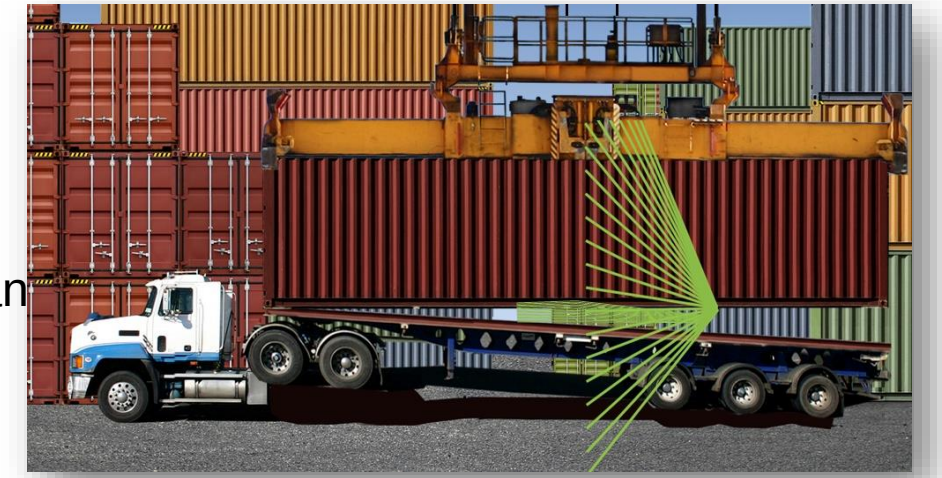
*683x cranes implemented globally

Chassis Lift Prevention System (laser based)



System Principle

CLPS detects chassis and container loaded on the chassis by laser, real time traces the relative position of container and chassis. When chassis lifting is occurring, CLPS immediately send protection signal to PLC, forbidden spreader hoisting.



Technical Specifications

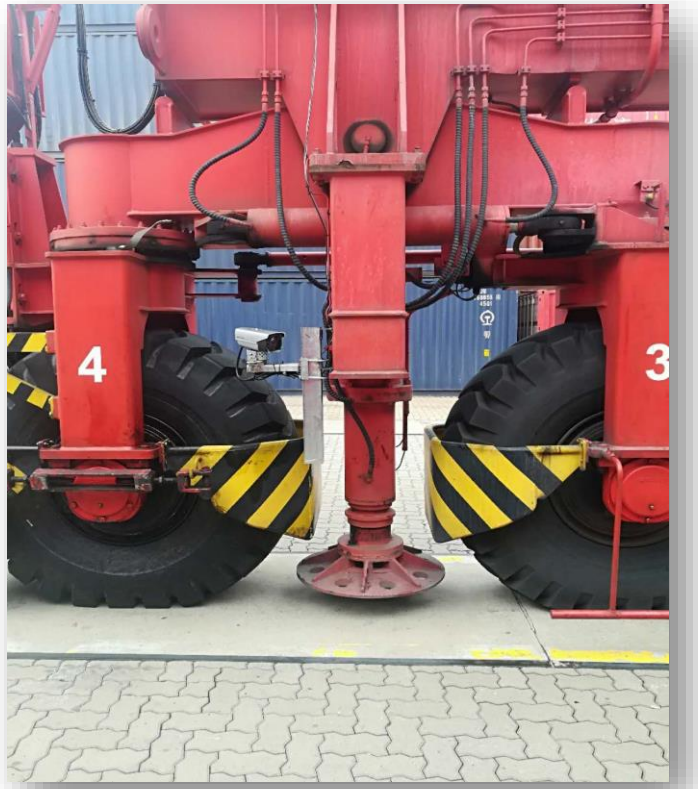
- Lift prevention distance: ≤40cm (hoist speed less than 20% rated speed)
- A variety of interfaces: Ethernet, ProfiBus , Serial port

Chassis Lift Prevention System (Vision based)

Advantages

- Vision based for higher accuracy and more adaptable to all kinds of situation.
- AI deep learning for self-improvement with accumulated samples





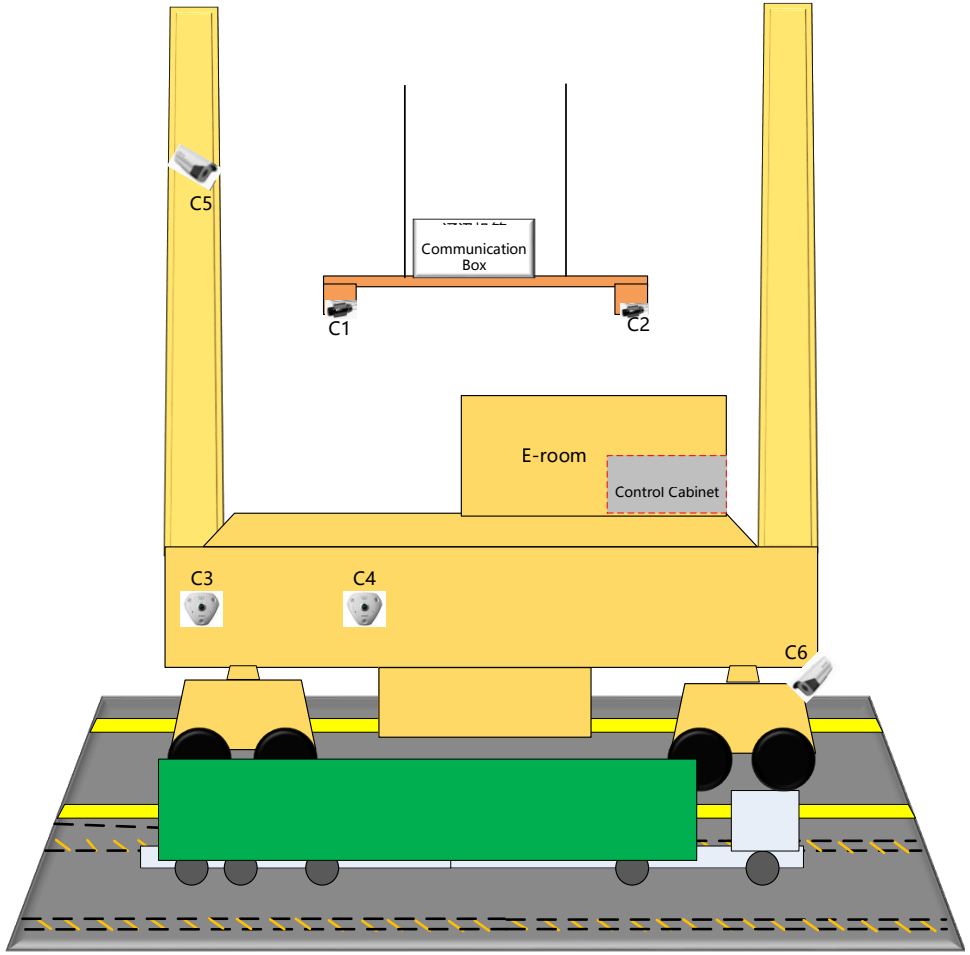
Extensions function:

- ✓ Truck cabin anti crash
- ✓ Truck moving detection

AI Vision Recognition System (AI VRS)

System Introduction

AI Vision Recognition System is based on AI technology, greatly reducing man power, which can improve the safety and efficiency of crane



System Functions

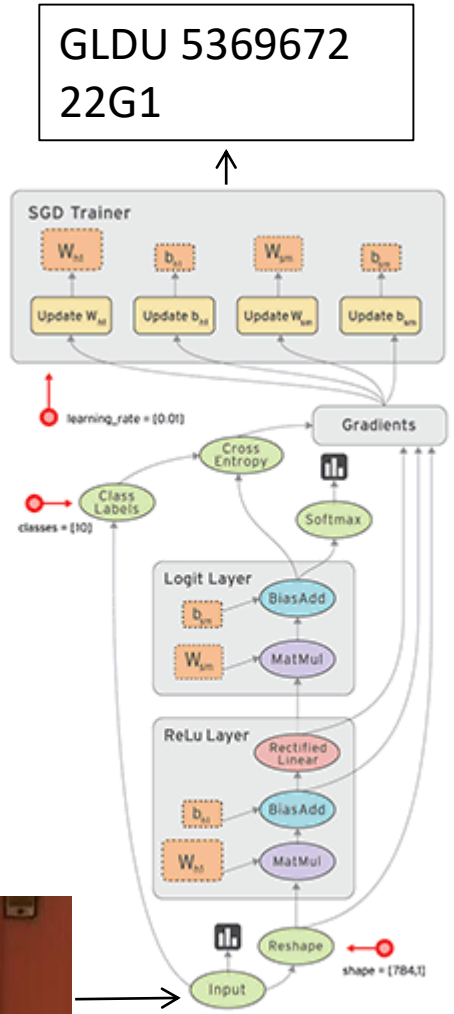
- Container number and ISO
- PM number

*66x cranes implemented in total

AI Vision Recognition System (AI VRS)

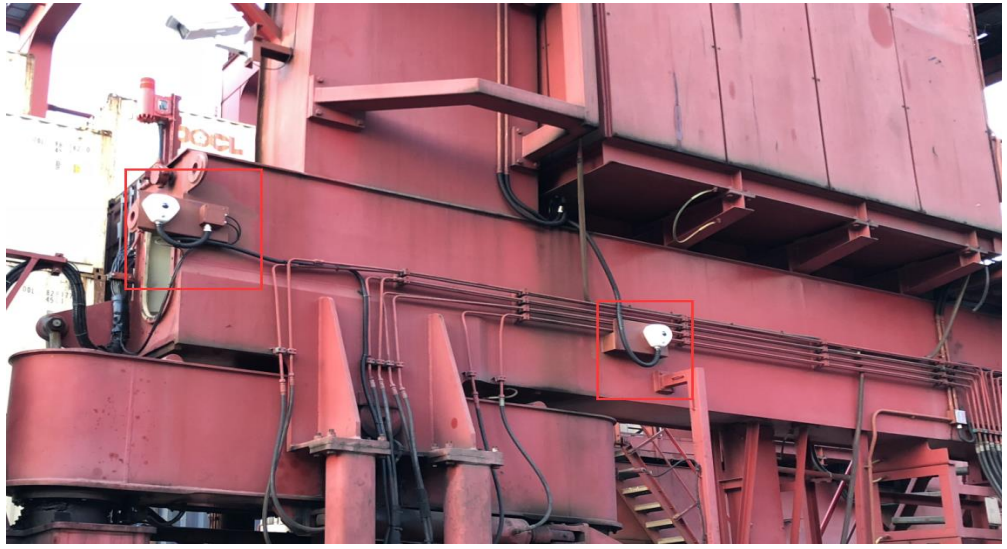
System Feature

- Advanced deep learning algorithm has self-learning ability and can improve recognition rate continuously
- All weather operation with built-in lighting
- Automatic cleaning with wiper





AI Vision Recognition System (AI VRS)



Technical Specifications

- Container number detection rate: ≥98%
- PM number detection rate: ≥98%



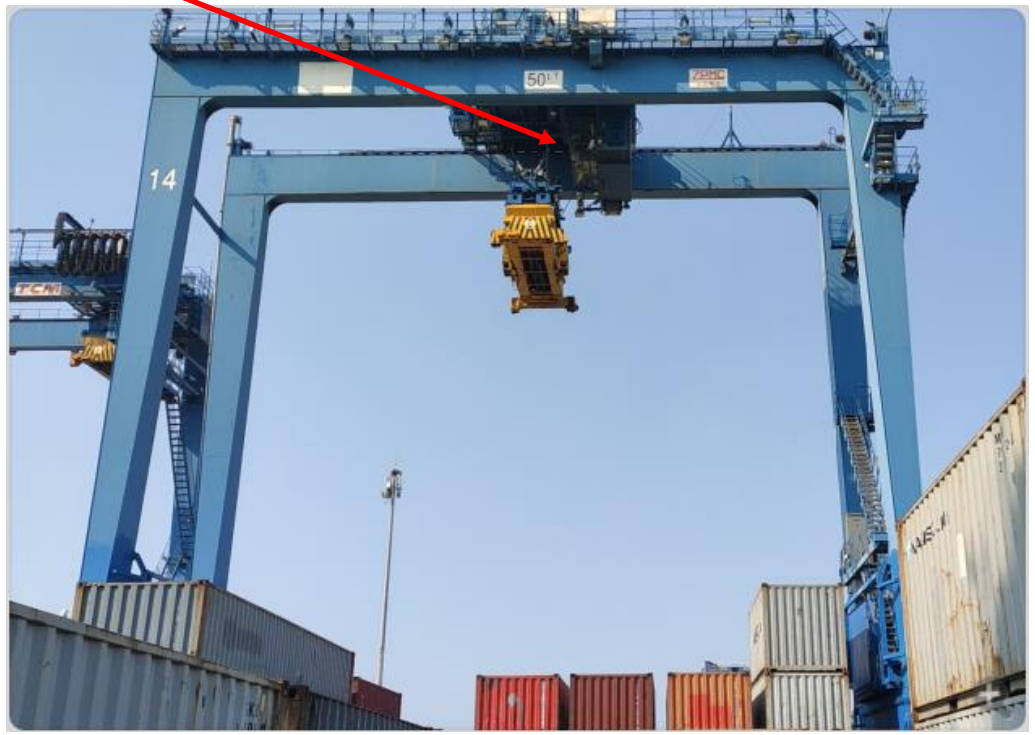
Interfaced TOS: Navis N4, TSB, TBA

Object Positioning System (OPS)

System Introduction

For automated terminal, OPS is designed to precisely position the target container and calculates it’s position and posture. Combined with LPS, fully auto-landing will be realized.





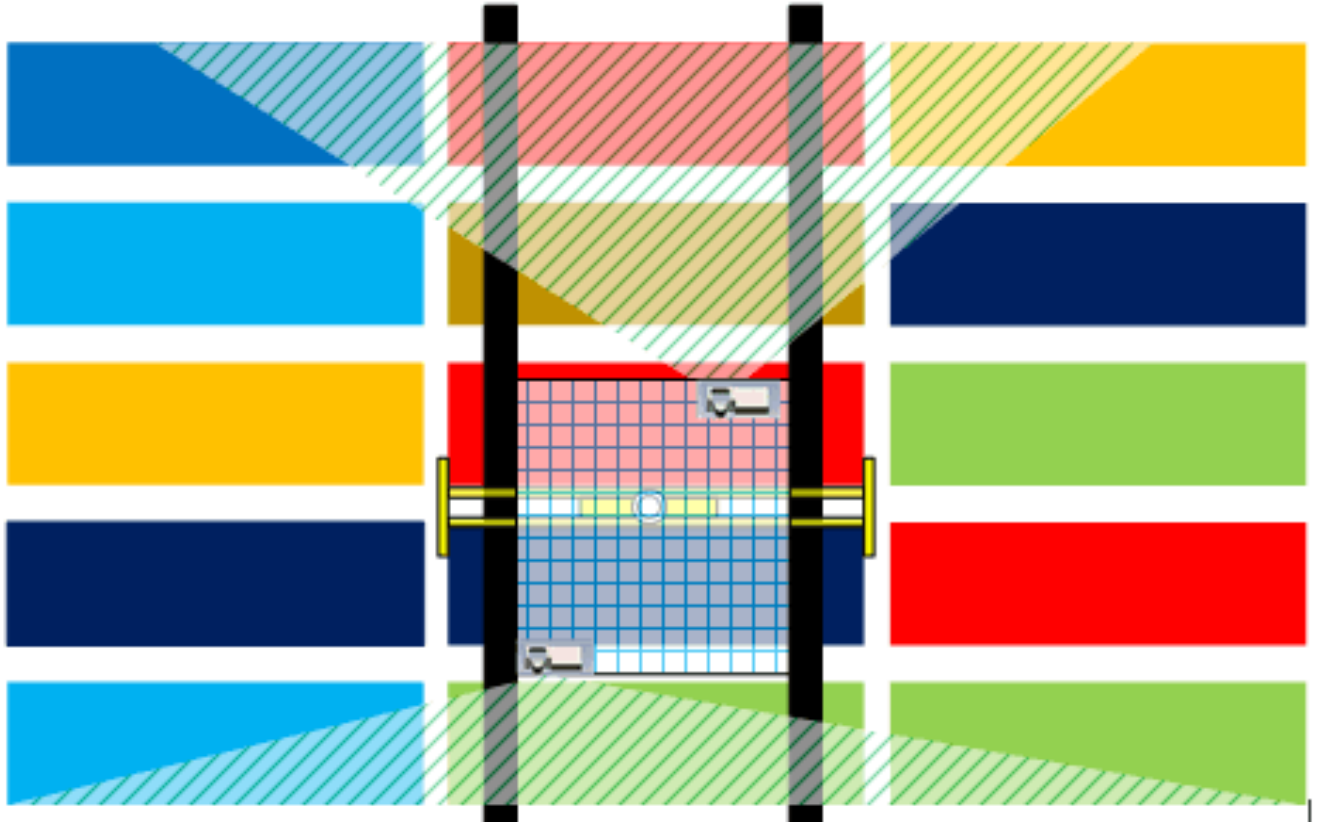
System Functions

- Object Container Positioning
- Prevent spreader collision in stack
- Auto-Landing

Object Positioning System (OPS)

Technical Feature

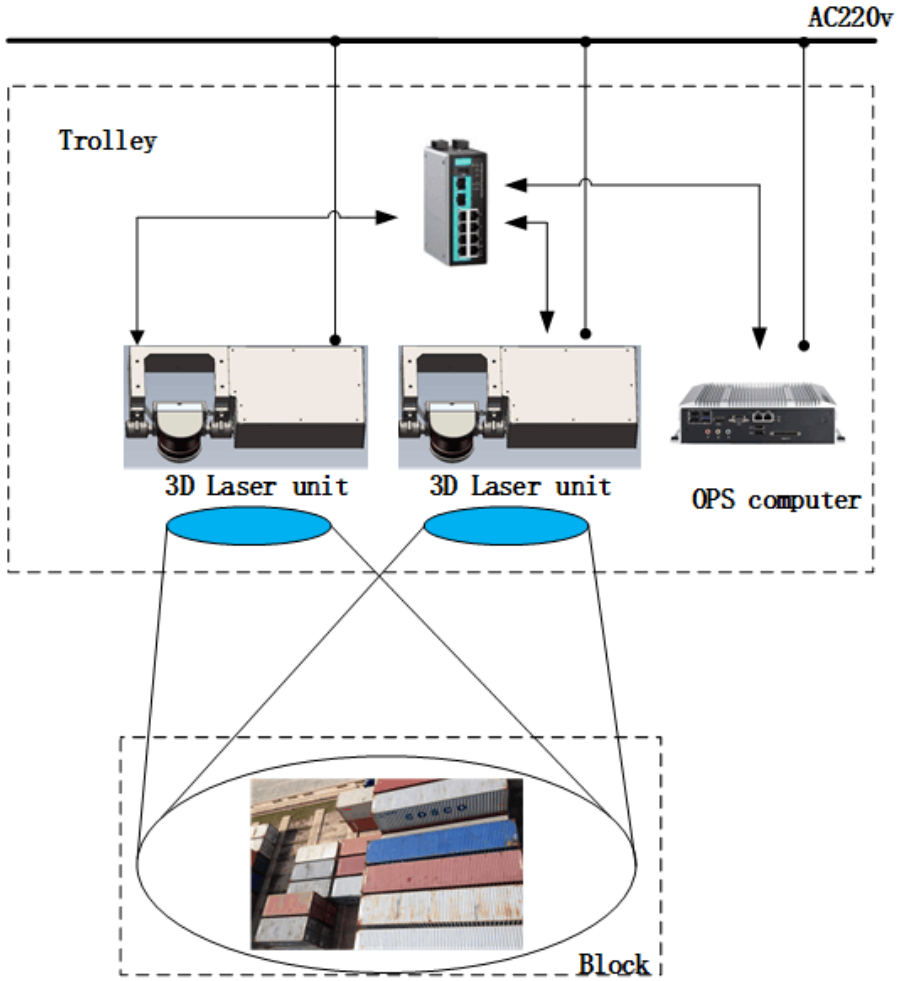
- 3D Laser point cloud data processing
- 3D locating x, y, z position and skew posture
- Automatically adapting yard undulation



Object Positioning System (OPS)

Technical Specifications

- Object position accuracy :±4cm
- Object posture accuracy: 0.2°
- A variety of interfaces: Ethernet, ProfiBus , Serial port



Load Positioning System (LPS)

System Introduction

LPS is a necessary part for auto-landing. The LPS system obtains the real time position of spreader and its load, which makes it possible for auto-landing and accurately prevent collision.



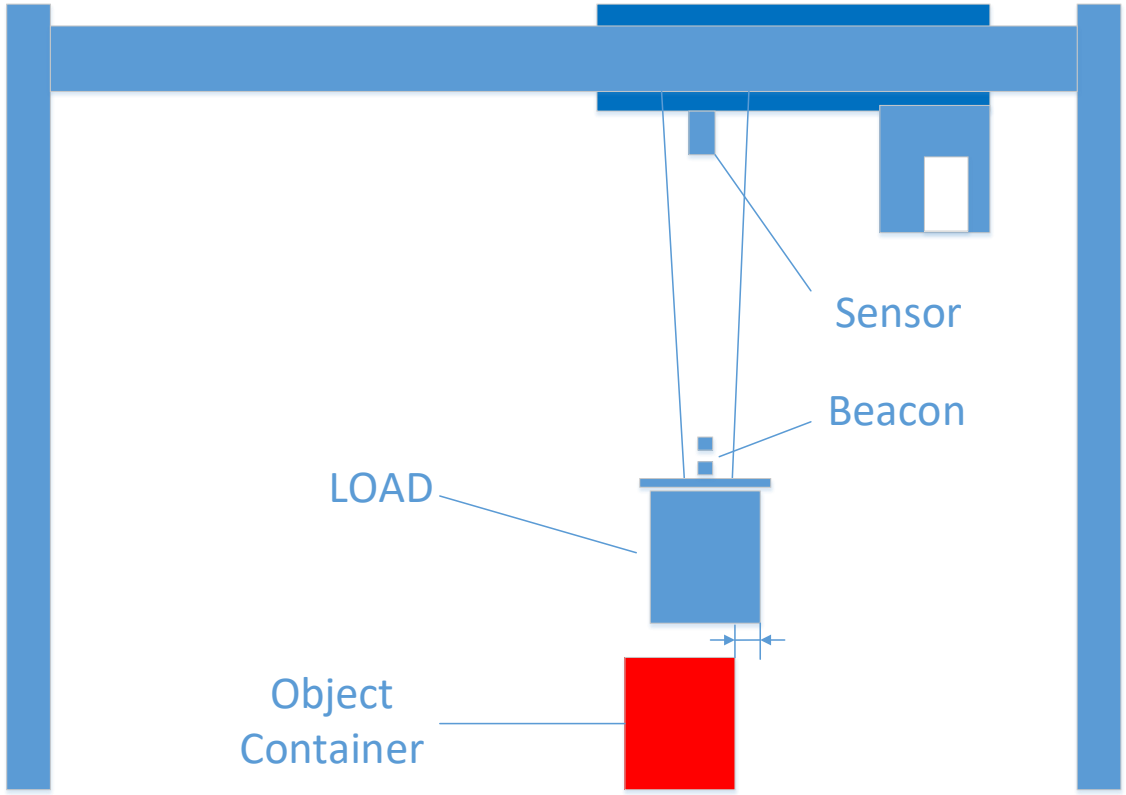
System Functions

- Load Positioning
- Load Posture Measurement

Load Positioning System (LPS)

System Principle

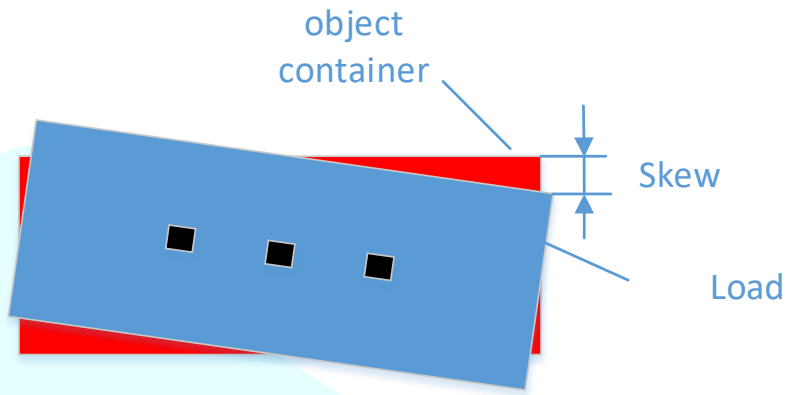
- Detect IR-beacons' position in the images which are acquired at the frequency of 10Hz.
- According to IR-beacons' position of image coordinate, the spreader's position and posture of space coordinate is calculated.

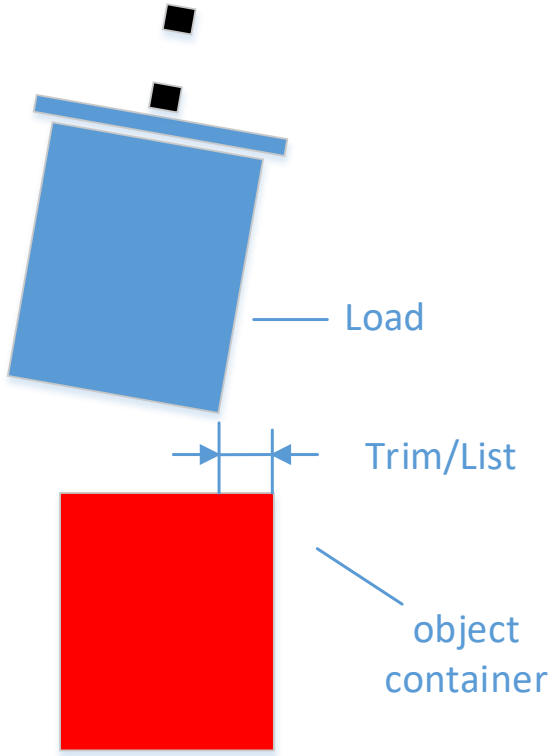


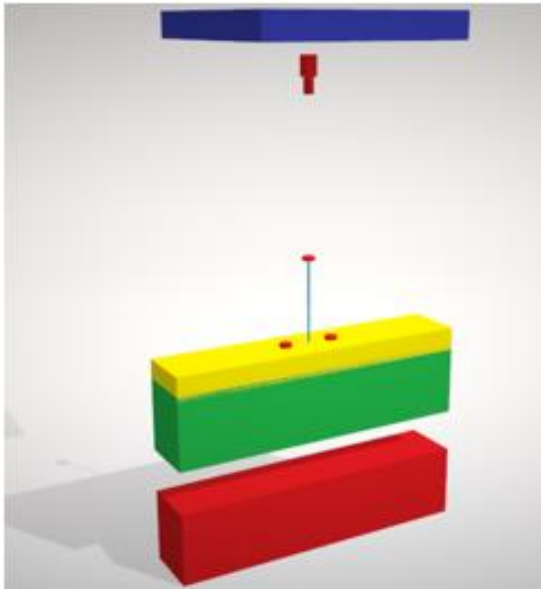
Technical Feature

- Intelligent image recognition
- IR technology, reducing interference from external light.

Load Positioning System (LPS)







Technical Specifications

- Position accuracy of LPS in x, y: ±4cm
- Skew accuracy of LPS: ±0.1°
- Trim/List accuracy of LPS: ±0.1°
- A variety of interfaces: Ethernet, ProfiBus , Serial port

Contents

Company Profile

YC Product Portfolio

QC Product Portfolio

QC Product Portfolio



Quay Crane

		Driver assistance	Automated Crane
Gantry move	Prevention	Anti-Collision system	
		Boom anti-collision system	
trolley move	Trolley to Block	Vessel Profiling System	
Spreader Auto Landing	On Lane	Chassis Positioning System	3D Chassis Positioning System
Crane Auto Stacking	Truck and container management	AI Vision Recognition System	

Vessel Profiling System (VPS)

System Functions

- Prevent collision spreader with working and adjacent bay stack containers
- Soft landing in hoist direction with smooth deceleration

Optional Functions

- Spreader track visualization: reference for operating track
- Operator efficiency calculation

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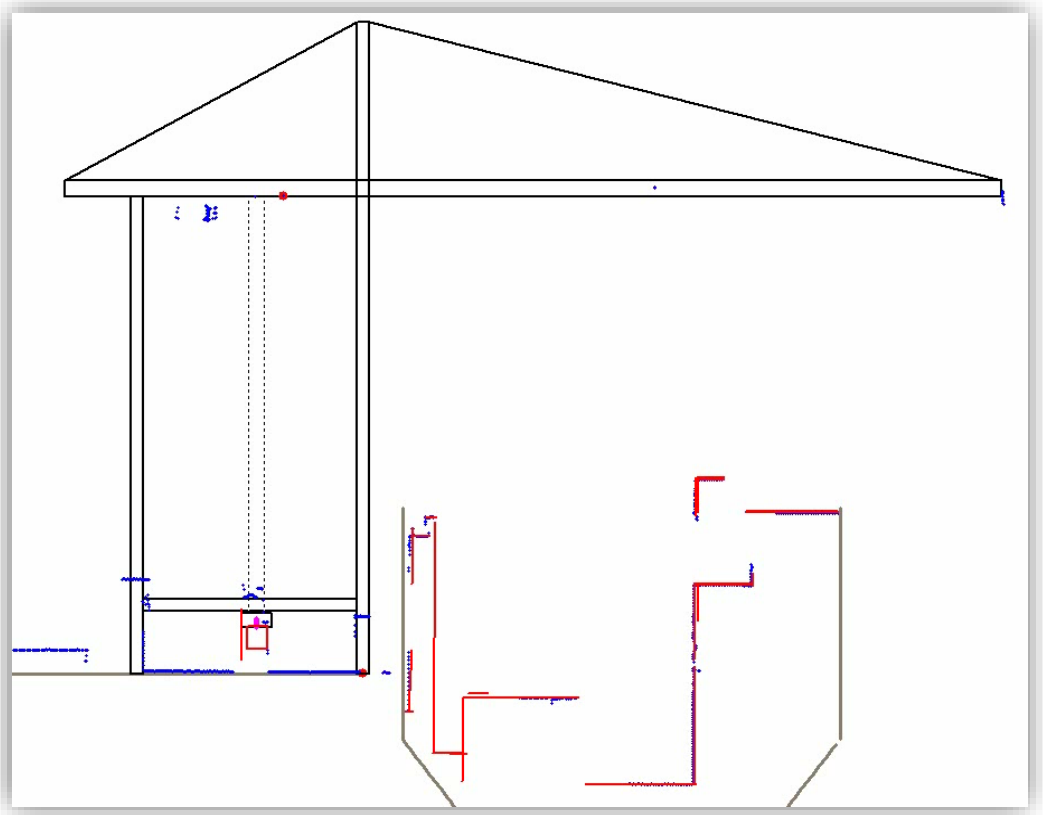


*21x cranes implemented globally

Vessel Profiling System (VPS)

Technical Specifications

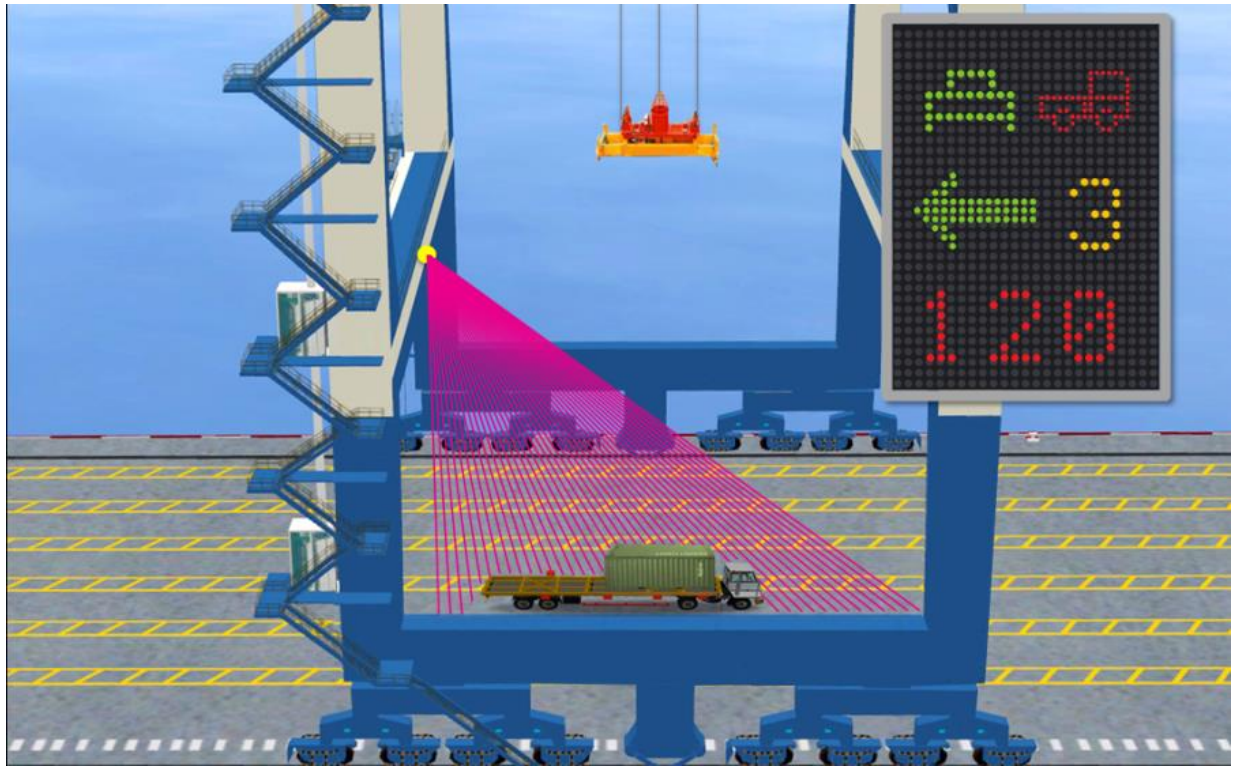
- Detection distance（Trolley direction): >=80m (10% reflectivity)
- Detection distance（Gantry direction): >=40m (10% reflectivity)
- Detection accuracy: ±10cm
- A variety of interfaces: Ethernet, ProfiBus , Serial port



Chassis Positioning System (CPS)

System Functions

- Alignment function
- Active safety protection function
- Traffic Safety Instructions
- Suitable for various operation
- Adapting to different types of chassis (except flat cabin)



Optional function:

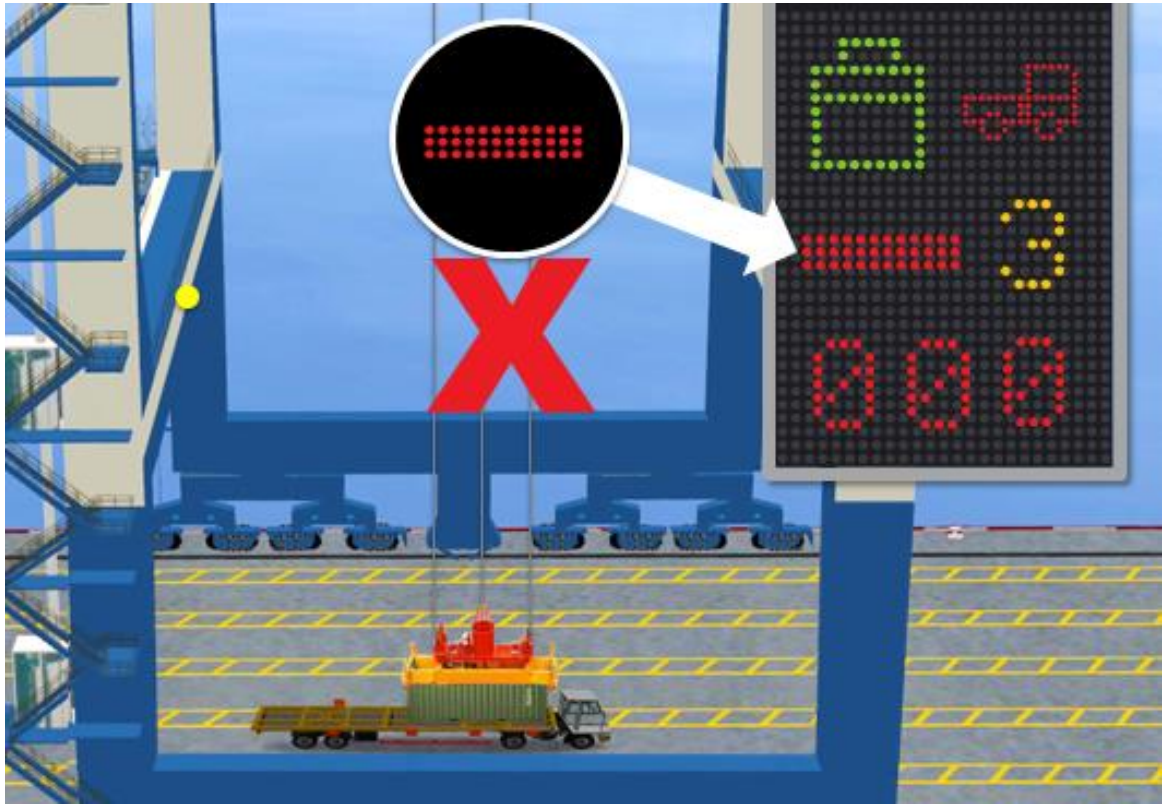
1. Suitable for back reach operation(additional hardware)
2. Suitable for twins-spreader operation(additional hardware)

*198x cranes implemented globally

Chassis Positioning System (CPS)

Technical Specifications

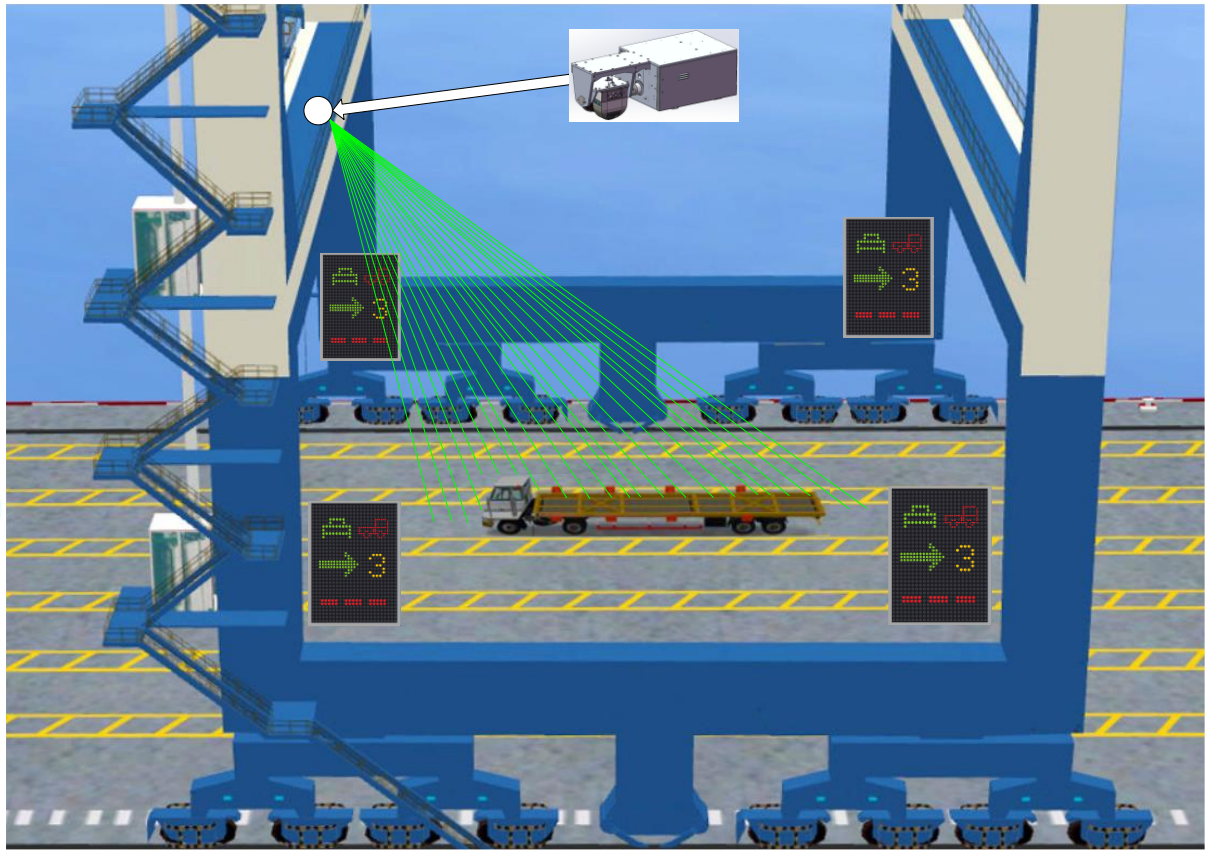
- CPS Accuracy: < ±5cm
- Detection distance:40m(10% reflectivity)
- LED displays: all-weather operation, 7X24 all-day-around;



3D Chassis Positioning System (CPS-3D)

System Introduction

A 3D Laser Unit instead of 2D laser scanner, CPS-3D support fully function of CPS. Meanwhile it detect chassis and container point cloud of 3D profile, output position and posture of chassis and container. It's necessary component to land automatically on the lane for STS.



*45x cranes implemented in total

3D Chassis Positioning System (CPS-3D)

Technical Specifications

- Detection distance:40m(10% reflectivity)
- Chassis alignment accuracy: ±5cm
- Trolley alignment accuracy:±5cm
- Chassis posture accuracy: 0.5°
- A variety of interfaces: Ethernet, ProfiBus , Serial port

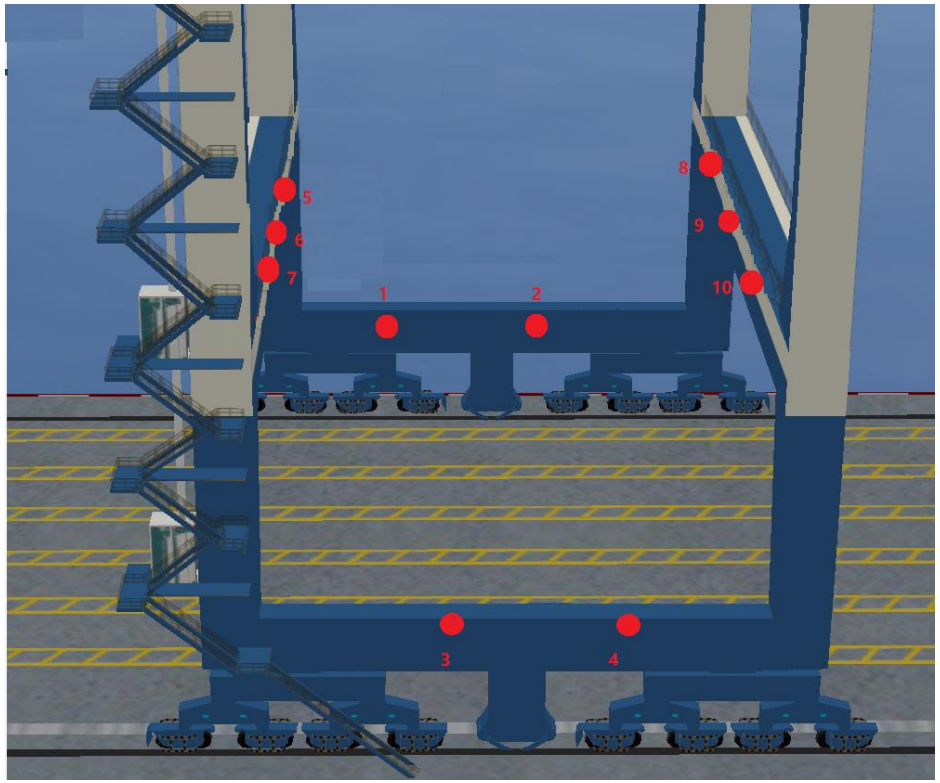


STS AI Vision Recognition System (STS-AI VRS)

System Introduction

STS-AI VRS is based on AI technology, Greatly reducing man power, which can improve the safety and efficiency.

It can automatically recognizes container number and ISO code, container door direction, seal label, IMDG presence, PM number and assists in container damage claim.



*22x cranes implemented in total

STS AI Vision Recognition System (STS-AI VRS)

System Functions

- Container number and ISO code
- Container door direction
- Seal presence
- IMDG label
- PM number
- Damage survey view (5 surface)



STS AI Vision Recognition System (STS-AI VRS)

Technical Specifications

- Container number and ISO code detection rate: ≥98%
- PM number detection rate: ≥98%
- Container door direction detection rate : ≥ 98%
- Seal presence detection rate: ≥ 90%
- IMDG presence detection rate: ≥ 90%

Interfaced TOS: Navis N4, TSB



Thank you!

Cathay Nebula Science & Technology Co., Ltd.