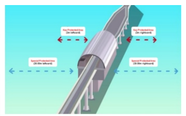
6TH GENERATION AS OPTION

Apart from tunnel diseases and structural deformation inspection, MS100 IV (6th generation) provides an additional absolute measurement solution for obtaining the tunnel mid-line/track mid-line data, which helps to scientifically define metro tunnel protected zones. By integrating a precision tactical-grade MEMS IMU and adding a 360° prism onto TrolleyAuto, the system may collaborate with a robotic total station setup nearby and continuously collect the readings used for computing the mid-line.

The tunnel damages or even collapses induced by earthwork projects nearby happen quite often especially in those fast-developing cities, and therefore the tunnel mid-line measurement in as-built survey is very critical.

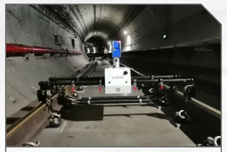
violated operations in earthwork projects



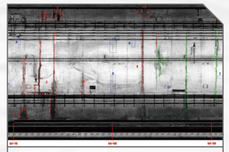
metro tunnel protected areas

protected area signs

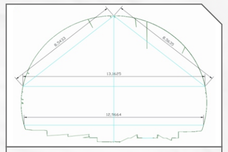
CASE STUDY



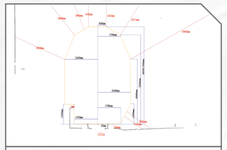
full inspection
@ Guangzhou Metro Line 4
(tunnel clearance, diseases, etc.)



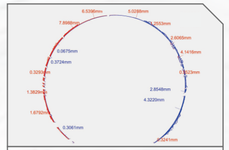
disease inspection
@ Shenzhen Metro Line 11
(2-way completed in 1 hour)



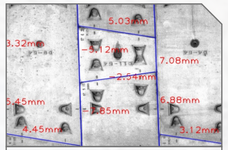
sectional inspection
@ Hunan High-speed Railway
(comparison with historical data)



platform gauge inspection
@ Guangzhou Metro Line 3
(1.8 km/h, results done on site)



segment faulting inspection
@ Shenzhen Metro Line 2
(sectional data display)



segment faulting inspection
@ Guangzhou Metro Line 1
(faulting display in orthophoto)

SPECIFICATION

System Performance
current version: 5th&6th generation (1st generation since 2016)
ground control: Bluetooth 2.0 for hardware datalink
trolley gear: 2WD, 2-direction movements (forward and reverse)
trolley speed: 50-5000 m/h, with adaptive cruise control function
scanning resolution: 0.5/1/2/3/5 mm optional
system overall accuracy: ±2 mm
distance measurement accuracy: ±1 mm
realtime output: circular orthophoto, tunnel clearance, tunnel limit, etc.
orthophoto output: up to 1 mm in resolution
mid-line absolute measurement accuracy: 3 cm
angle measurement accuracy: ±0.009°
application range: as-built survey, operation and maintenance stage of underground rail tunnels
output format: .doc (report); .tiff (orthophoto); .bin/.e57/.txt (point cloud)
auto detected: water seepages, moist portions,
lining cracks, segment faultings, concrete peeling, etc.

IMU (for 6th generation only)
type: 3 FOGs integrated with 3 MEMS accelerometers
input rate: ±490°/sec max.
bias instability (25°C): ≤0.1°/hr, 1σ max.; ≤0.05°/hr, 1σ typical
bias offset (25°C): ±2°/hr
initialization time (valid data): ≤1.5 sec
data rate: 1 to 1000 Hz, selectable

Physical
trolley material: carbon fiber reinforced composite
trolley dimension (LxWxH): 1600x550x350 mm
net weight: 27.5kg (w/o scanner)
packaging dimension (LxWxH): 750x430x370 mm/case
packaging weight: 41kg (w/o scanner), 2 cases
scanner interfacing: Faro series (as default)

Electrical
power supply: lithium battery group, 44800mAh in total, 16.8V
power endurance: max. 8 hours (after fully charged)

Environmental
operating temperature: -10℃ ~ +50℃
humidity: 80%, non-condensing

Inbuilt Computer Configuration
HDD: 1 TB
RAM: 32 GB
data export: USB 2.0, 2 ports available

Software Installation Requirement
CPU: Intel Core i7 or above
RAM: 32 GB or above
GPU: Nvidia GTX 960 or above

Note: all information above is subject to change without any prior notice.

SOUTH Target your success
E-mail: mail@southsurvey.com solutions@southsurvey.com
http://www.southinstrument.com http://www.southsurvey.com
SOUTH Surveying & Mapping

SOUTH
Target your success

AUTOMATED TUNNEL SCANNING & DETECTION SYSTEM MS100

A Tunnel Safeguard Exclusively Engineered for Rail Authorities

0 blind spot in computer vision

1 stop from survey to report

2 mm system overall accuracy

3 hours to submit for one-km mission

4 types of deliverable available

"This system package was specifically made to provide A One-stop Solution of underground rail tunnel scanning and detection for those metro or high-speed rail authorities. The scientific and revolutionized methodology featuring abundant outputs and amazing efficiency would definitely become your modern choice of tunnel safeguard. For example, for routine inspection of 1km metro tunnel, you may obtain plenty of data outcomes just within a few hours!"

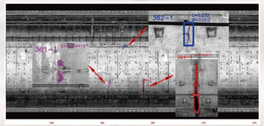
Engr. Hongwei Huang, a Chinese specialist dedicated to precise measurement technology for nearly 15 years.

RAIL AUTHORITIES EXCLUSIVE

REVOLUTIONARY SOLUTION. ABUNDANT OUTPUTS. AMAZING EFFICIENCY.

INTRODUCTION

To guarantee the operational safety, it's a must to inspect rail tunnel health conditions at regular intervals, otherwise the structural deformation and tunnel diseases might result in safety hazards and incalculable losses. MS100 was particularly designed to deal with those existing headaches (see below) and serve as a perfect trouble-shooter for the industry.



HEADACHES & REMEDIES

typically short stoppage time
harsh underground environment
movements restricted much
comparably low efficiency
long time to wait for results
limited outputs for reference

- automated scanning working mode
- big data captured by 3D laser scanning
- motorized trolley running on rail tracks
- cutting-edge mechanical and digitized solution
- data acquisition and process in one stop
- abundant analysis reports available

SYSTEM COMPONENTS

MS100 V (5th generation) includes 3 major components:

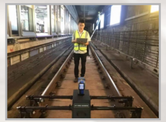
① TrolleyAuto (with industrial PC built in); ② All-in-One software Tunnel Scan&Go; ③ Faro laser scanner.

JOB ENVIRONMENTS


bored tunnel


shield tunnel

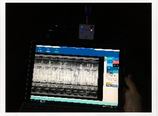

open-cut to shield structure part

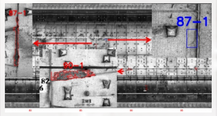

open-cut structure station

ALL-IN-ONE SOFTWARE

The All-in-One software Tunnel Scan&Go is the core of the system, which plays a vital role in the whole process. It enables the users to conduct automated scanning, data analysis, intelligent detection, report export, etc. and features largely in an A-to-Z solution. The deliverables include circular orthophoto, 3D point cloud, structural data analysis and detected inwall defects.

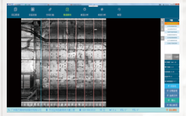
SOFTWARE FEATURES


realtime outputting to show basic results on site

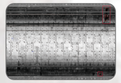


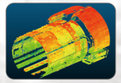
high identification capability of problematic portions up to 90%


quick results, ready for immediate response


independent R&D, customizations available

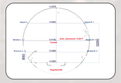
OUTPUTS DISPLAY


high-resolution circular orthophoto

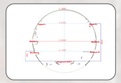

3D point cloud analysis

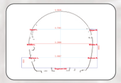

segment ovality analysis

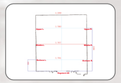

segment faulting analysis

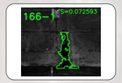

tunnel clearance analysis


tunnel gauge analysis

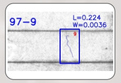

shield tunnel sectional data


bored tunnel sectional data


metro station sectional data



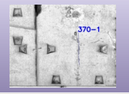
detected water seepage



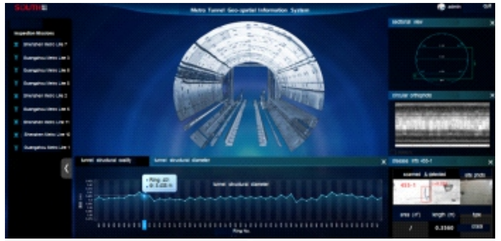
detected inwall crack


detected concrete peeling

RESULTS COMPARISON

example	photo taken by iPhone	software display: scanned result on site	software display: computed & detected result
1			
2			

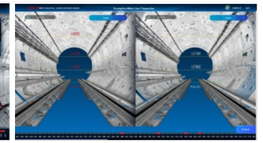
SYSTEM PLATFORM



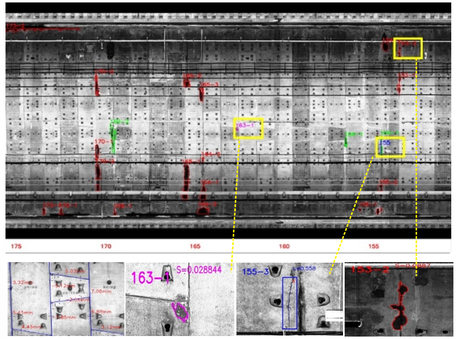
Metro Tunnel Geo-spatial Information System (MT-GIS)

The structural information, disease records and trends may be documented to serve the full life-cycle management for metro authorities, as such captured data is traceable and thus of great reference value. As the essence of entire solution, the Metro Tunnel Geo-spatial Information System (MT-GIS) is actually developed for this purpose, helping with statistics and analysis in the long run.


visualized tunnel diseases and troubles, easier for regular tracking


comparison of current and historical data, easier for monitoring

part of the circular orthophoto

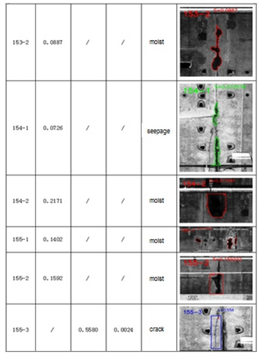


segment faulting analysis

detected concrete peeling-off

detected inwall crack

detected water seepage



part of the inspection report

The big data analysis based on machine learning techniques would help much to generate a quality inspection report clarifying all “what is where”, which is how artificial intelligence revolutionizes and benefits the industry.