DEEPRobotics 云深处科技

Dedicated to the ultimate combination of locomotion and intelligence to build a bright robotic future



To Reach Us

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• DIGITAL REVOLUTION

: Trends & Challenges

Speeding Digitalizing Transformation

The world is heading to the 4th industrial revolution, data and electricity are the foundation of industrial production.

The technological revolution and industrial revolution are on their way to a new era; digitalization and intelligenlization were becoming key factors in high-quality electric industry development. During the national fourteenth "Five-year" plan, our country is promoting digitalize power inspection. There are 60 thousand converting stations and 300 thousand power supply stations waiting for digitalizing transform.

Power grid, converting station and power supply station are one of the most important infrastructures in the country, its stable operation is the priority of the development of the economy and living, and there are many problems are needed to be solved in the process. of transforming traditional power inspection into smart management, unmanned inspection.



Current Issues

Manual Inspection

Repeated Work

Most of the power stations are still using manual inspection, which high repetitive and intense.

Inconsistency

Inspection outcome is easily affected by personal issues, mental state, and work experience; miss-inspections and errors often occur.

Safety Issue

Extreme conditions like storms, haze, and hail are threats to inspectors safety.

Employment

Inspection position hiring problems, shortage of personnel, aging problems.

Traditional Robotic Inspection

Limited Adaptability

Unable to operate on unstructured terrains, difficult to suit to the complex environment in power stations like stairwells, grassland, and muddy ground. Traditional robotics inspection cannot deploy flexibly due to lots of blind spots in the inspection area.

Cost

It is a huge cost to modify the environment for using wheeled or tracked robots.

Technology to be optimized

Old methods are difficult to adapt to the requirements of the new situation.

Complicated system

Unable to work in & outdoor at the same time; too many types of robotic deployment out there, huge workload.

Comparisons

	Wheel	Track	Rail	Quadruped
Stair	×	×	×	~
Cobbled Road	×	~	×	~
Grassland	×	~	×	~
Inspection pathway	Limited	Limited	Unchangedable	Flexible
In & Out door	×	×	~	~
Falls Auto- Recover	×	×	×	~
Environmental Modification	Needed	Needed	Needed	No Needed

X20

Smart Power Patrol Inspection

Net.Weight	57.3kg	Ingress Protection	IP66 (Power on)
Standing Size	850mm	Inspect Speed	1m/s
Range	12km	Mini.Traffic Width	1m
Duration	2-4h	Mini.Traffic Hight	1m



Auto-Charging (-+)

Auto-Navigation 🔍



Industrial 🖂 Protection [¬]



Functional Module

Module 16 Laser-beam LiDAR

Indicators Range: 150m

Vertical FoV: -15° ~ +15° Frame Rate: 5Hz ~ 20Hz

Points Per Second: 300,000pts/s(Single Return)

600,000pts/s(Dual Return)

Module

T-shape Thermography PTZ Bi-Spectrum Camera

Indicators

Visible Light: 55-160mm 32x optical zoom, 16X digital zoom, Max.image resolution 2506×1440

Infrared:

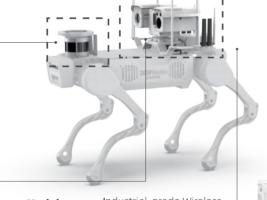
Resolution 384×288, thermography focal length 15mm, Field of view 24.55 ° (H)×18.54 ° (V), precision of thermal detection ±2 °C , Rang of thermal detection (-20 C~150 C, 0 C~550 C)

Camera:

Horizontal range 360° vertical range -90°~+90°, preset precision ±0.1, IP67 protection level

features

- Fully meet the needs of shock absorbing and lock-in to ensure stabilization during the operation with target precision of ±0.1°.
- Support auto-aperture, auto-focus, auto-color balance, black light compensation, noise balance, day-night lighting shift, behavior analysis, fire detection, fire faults alarm, etc.
- Provide SDK for secondary development, meet the needs of image transmission, smart sensing, faults alarm, and other required patrol inspection functions.



Module

Industrial-grade Wireless Roaming Router

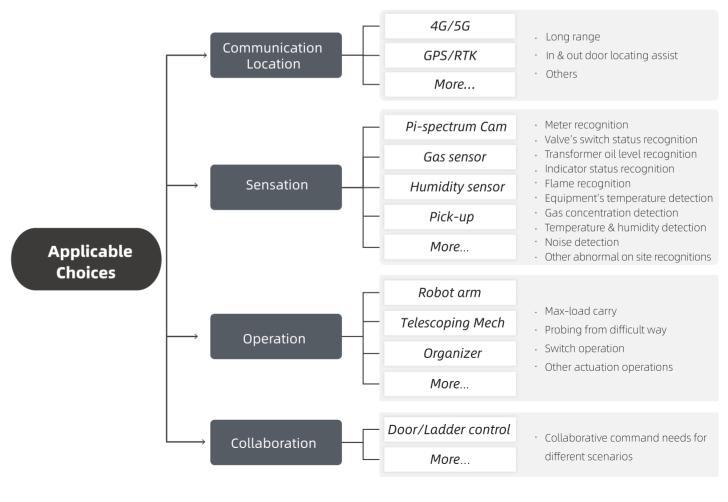
Indicators •

- Fast Roaming < 50ms
- Support various transmitting functions such as VLAN, route, NAT, Qos, VPN, firewall. Support work mods such as AP, Bridge, Station, and MESH.
- 300Mbps physical layer, MIMO 2T2R, dual-polarized
- Support WB 4920MHz-6100MHz, support plenty of countries' frequencies (IEEE802.11d)
- Max 30dBm transmitting power, receiving sensitivity -96dBm
- Effective transmission distance more than 1km when combined with antenna
- Range of functional temp -40~75°C

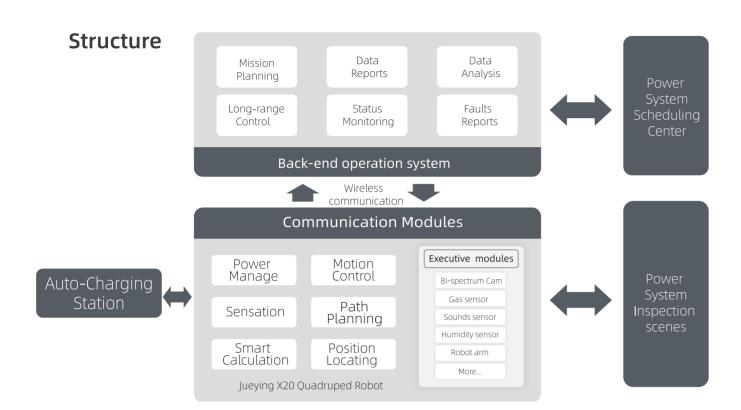
features

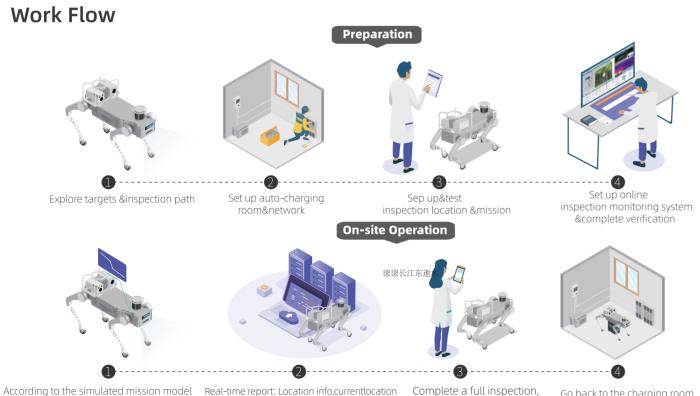
For industrial revolution 4.0, logistics and warehousing, intelligent manufacturing, intelligent robots, and other industrial characteristics can soon be deployed and establish a high-speed, stable, safe, and reliable wireless network; which can improve automation and smart management, and meet all kinds of smart robot long-range control, images transmission and other industrial application scenarios needs.

Modules Structure



• Smart Power Inspection Solution





Autoinspection to particular location on preset timing Replan inspection path based on unexpected situations, and prior to abnormal location

to achieve path-planning navigation
Inspection result: Abnormalinfo, real-time image generate reports Go back to the charging room &auto-charge by itself

"Digital Twins"





Hi-Precision Point Cloud Data Collecting



1:1 Replicated Real Site Environment



"Digital Twins"

Quick Deployment



Inspection In Details



Stimulation **Prediction Analysis**



map creation software connection combined with real-world scenes and structural point clouds mapping to set various planning and design schemes in a virtual 3D reality environment.examine the elementsin dynamic and interactive way,

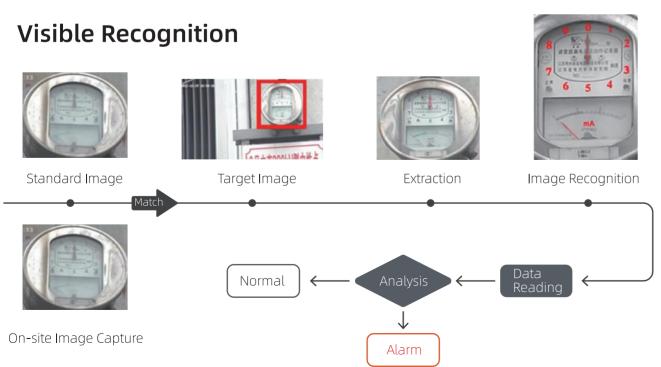


Upload real-time visible & infrared images, gas detection, device status & target detection result Two-way wireless hage &Video Provide high-precision replicated model communication → Using feature extraction and thematic connection Server and quickly extract building models. 3D building &scanning system Equipped two LiDAR horizontally and vertically, high-precision GNSS device and high-resolution panoramic camera Provide digitalized inspection path planning tool or inspection , building elevation mea-

- INTELLIGENT PATROL INSPECTION
- Smart Inspection Platform

System & Functions

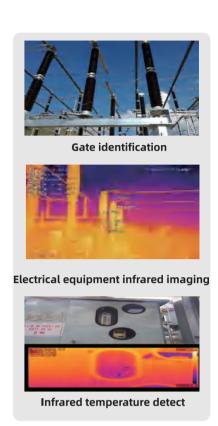




Visible Recognition

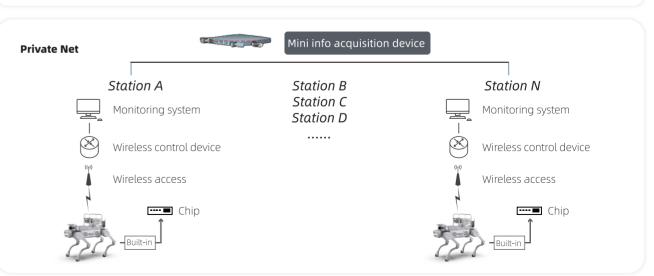






Network





Application Case

Inspection in Zhejiang State Grid Power Station



Background

The space at the inspection point of the substation is narrow and the environment is complex, It is necessary to climb stairs, across various obstacles to enter the indoor area; the outdoor area has different surfaces such as stone, grass, and mud. Manual inspection is difficult to fully meet the requirements of safe operation of modern substations, and the traditional inspection robots are mostly wheeled, which can not continuously work on irregular ground. If the environment is modified, the cost is huge.

Outcome

A converter station in Zhejiang used X20 intelligent quadruped robot for power inspection. As a smart machine that shows strong mobility like walking, running, jumping, and climbing, and being able to operate inspections without changing the original environment. After long-term testing, X20 showed high adaptability to cobblestones, grass, slopes, and other unstructured outdoor terrains. For the first time in 2022, X20 has completed the full process of robot dog inspection with data uploads, data analysis, generating results & reports, and defect warnings.

Significantly Improve Efficiency

Unmanned/Less manned

Only 1 robot dog for ±800kv EHV converter station

In & Out Door Inspection

1 robot dog full-scene coverage

Shorten Inspection Distance

Boots efficiency, reduce workload

Reduce Operators' workload

Inspection under hash condition like storm, hail, low temp



Improve Level of Digitalization

Full access to the central control system, upload real-time data

24h All-Weather Operation

Operator can know all situation in house (from far distance)

All-Terrian Full-Scene Coverage

Detect defects in time, prevent accident, and ensure safe operation of all devices

Other Application Cases



A customized integrated robot base on Jueying. Until the end of Jan 2022, the robot has conducted power station inspection 87 times, a total reduce manual inspection work time by 380h, and participated in remoted emergency treatment 5 times, reducing manual handling 35h.

Through the secondary development of Jueying X20, the device now has been deployed in a power station in the XiongAn district, which effectively achieves full-scene coverage auto-inspection.





A secondary developed robot base on Jueying with a robot arm, the robot has been deployed in Stat Grid in Hebei province, and the new X20 upgrade will soon be used.









in Zhejiang

in Yunnan

in Yunnan

in Shanxi