



**PilotGaea**

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# ***PilotGaea*** 2024 ***Enterprise Brochure***

*3D Spatial technology leader*

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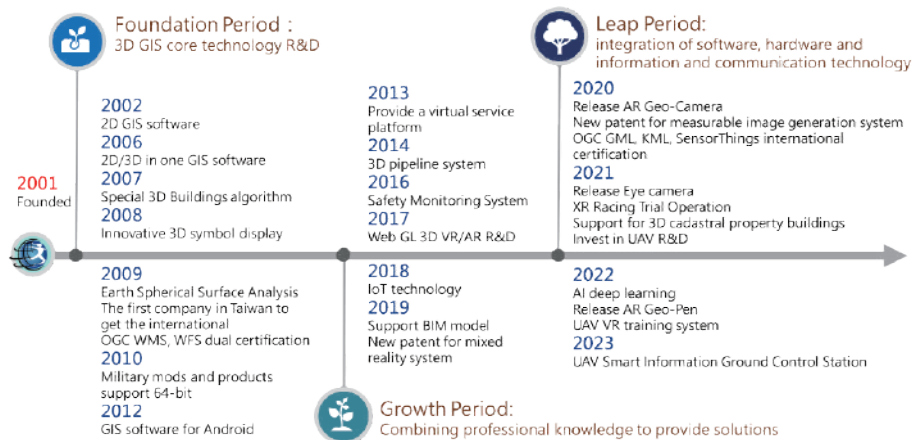
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# Company Brochure

## Innovation is our only way !

PilotGaea Technologies Co., Ltd. was established in 2001, dedicated to geometric computing, 2D/3D computer graphics, and spatial analysis. In 2004, it developed the world's first 3D Geographic Information System (GIS) development tool, positioning itself as a pioneer in the spatial information platform field. Since its inception, it has assisted numerous domestic and international enterprises and government agencies in building various GIS applications, while also securing an OGC international certification and numerous prestigious awards in the information field.



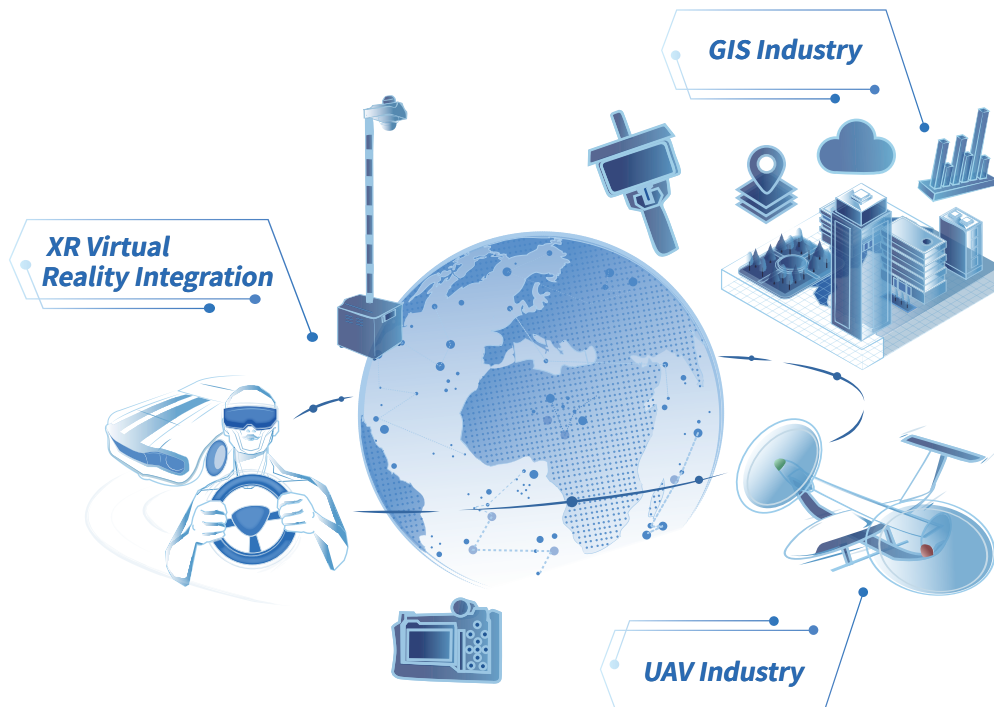
the development of Digital Twins applications, where related systems aim to integrate various types of data, such as maps, Internet of Things (IoT), and big data. PilotGaea Technologies, boasting independently developed GIS core technology and years of hardware and software integration experience, adheres to an innovative philosophy. It has developed professional and high-performance hardware devices, maximizing the application value of the system and readying itself to meet the global market demand.

In recent years, the use of UAV (Unmanned Aerial Vehicle) has become increasingly vibrant. The outbreak of the Ukraine-Russia conflict has underscored the importance of autonomous UAV in national defense. PilotGaea Technologies, with its unique nationally developed GIS core technology, combines AI image recognition, virtual and physical integration, and automatic control technologies. Along with its custom-designed tilt-rotor and variable pitch mechanism, it has produced Taiwan's exclusive twin-rotor tilt UAV. Besides combining the advantages of fixed-wing and rotary-wing aircraft, it features visual automatic takeoff and landing, smart flight route planning, wind resistance, and energy-saving capabilities. In the future, it will offer UAVs with

With the rise of smart cities, many are moving towards

different payload characteristics, including all-electric, light-oil electric, and fuel models, to cater to application areas such as engineering inspections, logistics transportation, disaster prevention and rescue, security monitoring, and intelligent defense.

PilotGaea Technologies Co., Ltd. analyzes future smart city development trends and has developed three main business bodies: **spatial information**, **XR virtual-real integration**, and **UAV**. The real core is the application of independently developed 3D GIS technology to integrate information and communication technologies, laying the foundation for sustainable business operations.



## Spatial Utilization of Geographical Information

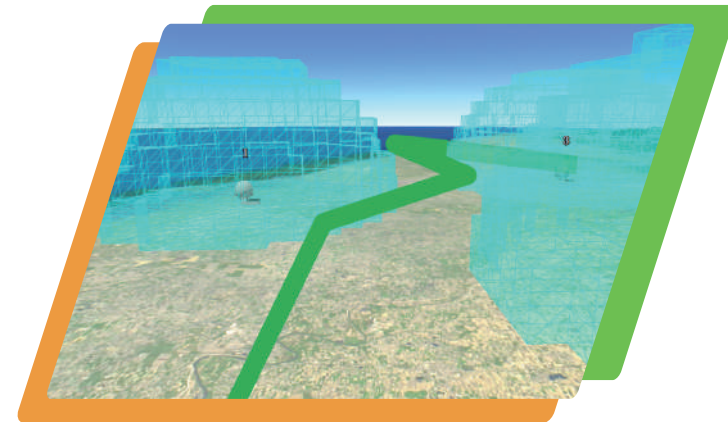
# O'View MapServer



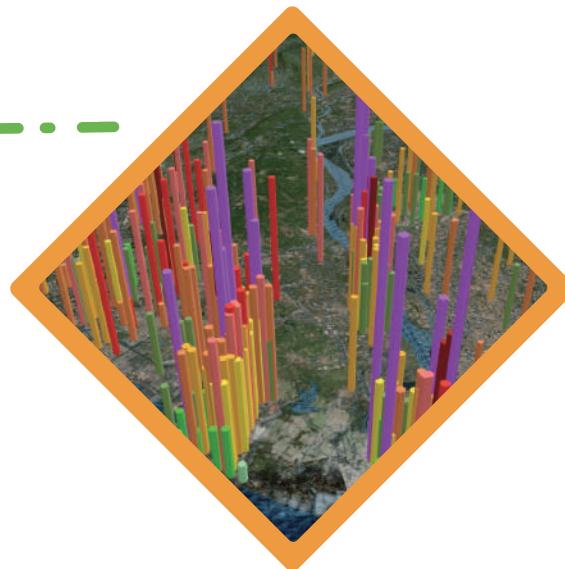
- Map servers used in professional fields.
- Locate, query, measure, calculate, analyze and visualize geographic data.
- Display huge amounts of data simultaneously.
- Support BIM building information model.
- Accept requirements to develop customized functions.
- Has variety of functions, including pipelines, virtual reality integration, augmented reality, Internet of Things, military use.
- Support PC applications, mobile device applications, web applications.

# Aerial Path Planning

- Pass OGC international standard certification, SensorThings, WMTS, KML, WMS.
- Support dual international 3D transmission service standards.
- Integrate government data. Various map data are integrated and stored to achieve cross-departmental and historical preservation purposes.
- Apply to urban planning, disaster prevention and response, project management, cultural guide in the government.
- Manage multi-site construction, industrial areas, and port areas, and assist enterprises to strengthen management efficiency.



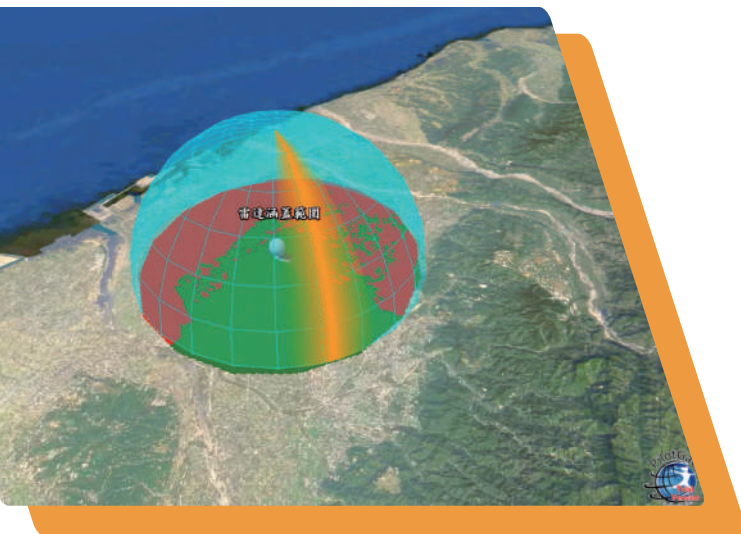
- Use exclusive algorithm to plan the best aerial path.
- Consider terrain relief, earth curvature, obstacles, radar position, radar range, aircraft performance, and visual range analysis.
- Calculate the shortest path, the most energy-saving, and the most time-saving solutions.
- Present aerial path planning in 3D simulation, providing the most intuitive visual information.



# Radar Simulation

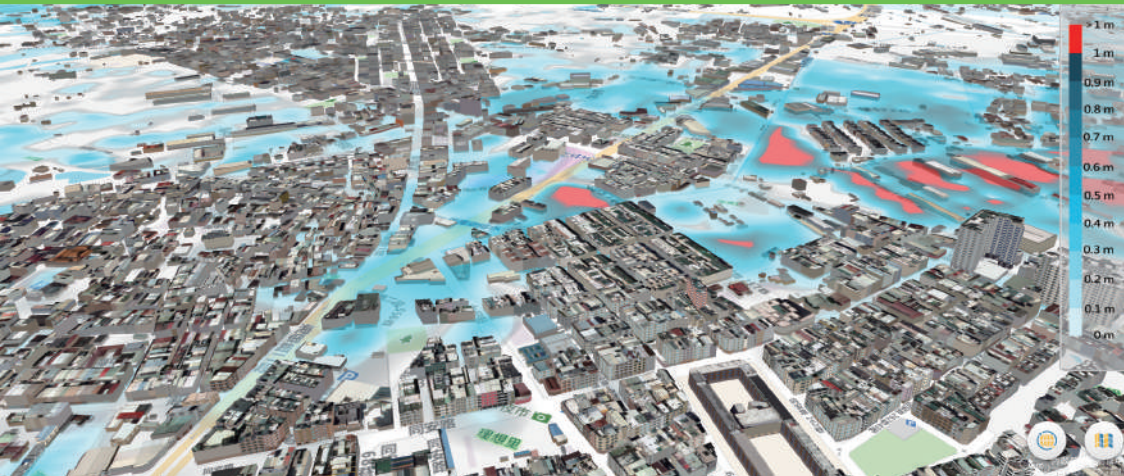
## Land Administration and Map Management

- Cooperate with the radar specification and use 3D GIS technology to simulate the radar detection range.
- Simulate radar detection scan speed according to radar performance specifications.
- Simulate radar detection range based on actual terrain and elevation information.



- Integrate and display various GIS map data to improve the efficiency of land management operations.
- Analyze and display the 3D analysis results, then open the information to the public.
- Conforms to the international image data transmission standard and exerts the benefits of data sharing.
- Integrate topography, aerial photos, cadastral maps, and 3D cadastral models to assist the government in intelligently managing land use, ownership space, and asset management.

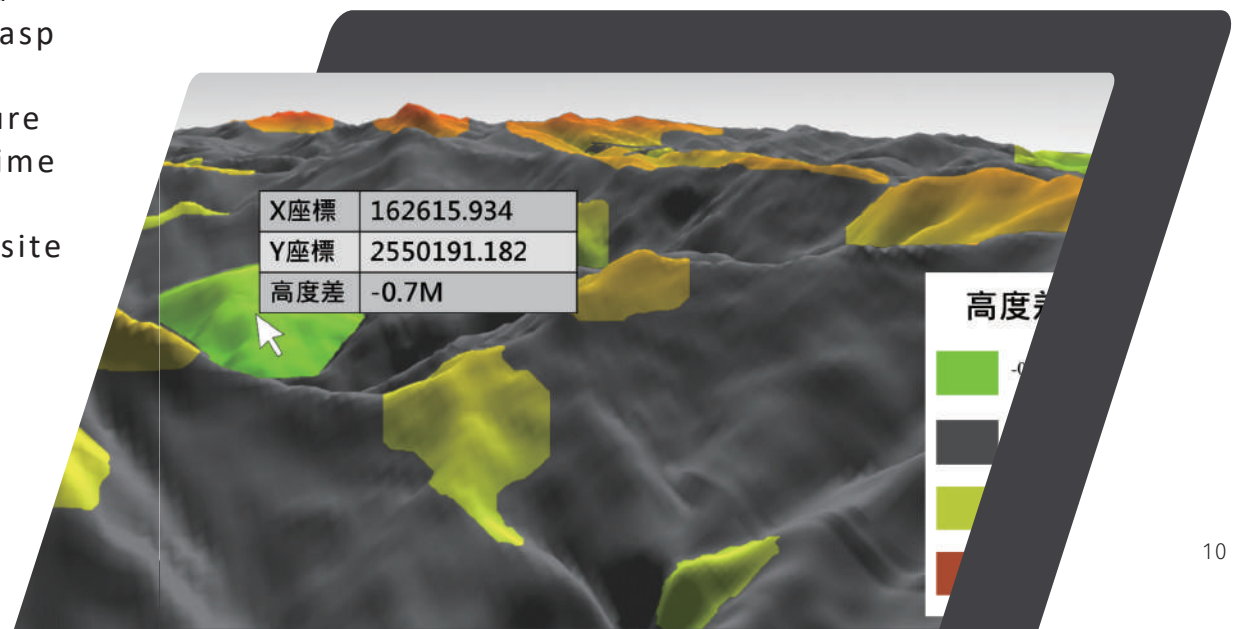
# Disaster Prevention



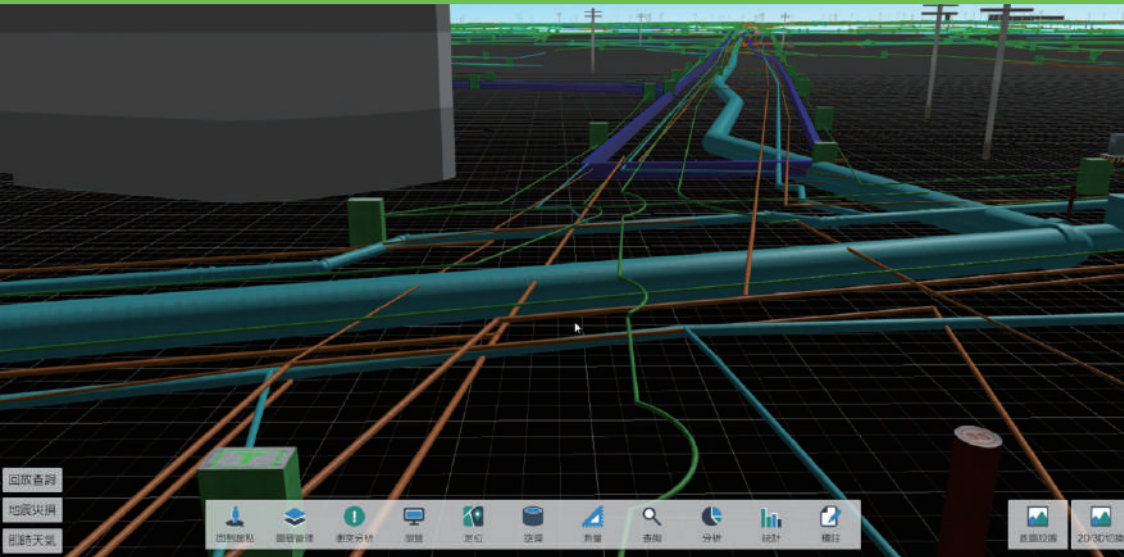
- Integrate various spatial information, including aerial photos, electronic maps, buildings, road networks, regional drainage, pipelines, and grasp the current situation in one stop.
- Use IoT real-time sensing information and future weather forecasts to simulate future rainfall time and range with 3D visualization technology.
- Organize historical data and combine with on-site observation data to predict high-risk areas.
- Plan evacuation and refuge maps to reduce losses.
- Integrate CCTV real-time images, watch live images immediately.

# Terrain Analysis

- Check the rationality of the existing urban planning.
- Use multi-windows to compare and change images.
- Support 3D simulation check.
- Support earthwork calculation.
- Support 3D seabed terrain change.



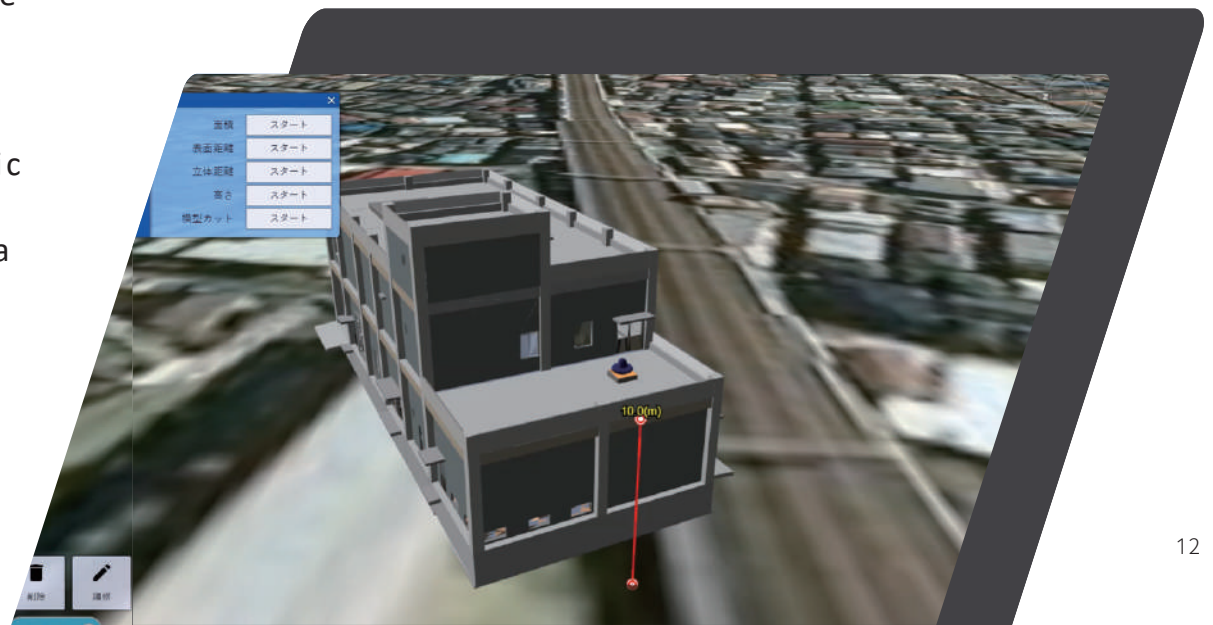
# Underground Pipelines



- Present 3D visualization of underground pipeline distribution, in line with national policies and regulations.
- Create many 3D models automatically based on the database data. Achieve the goal of automatic update, time saving and cost saving.
- Provide intelligent conflict analysis and hot area analysis tools to assist the government in supplementing and correcting maps and data.
- Management of underground pipelines can be applied in cities, airports, port areas, science parks and industrial areas, etc.

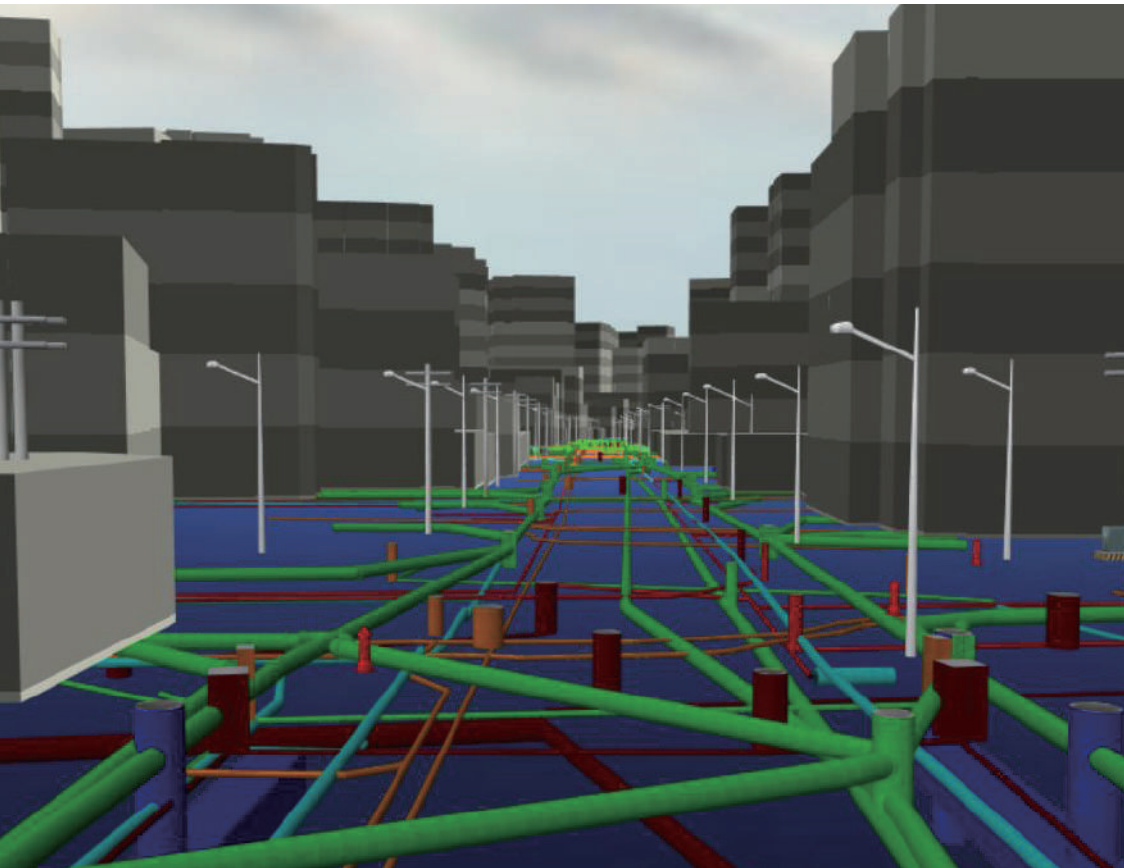
# Virtual and Real Integrated Park Management

- Use oblique photography technology and 3D GIS technology to quickly build 3D models of the park.
- Query and view the status of buildings and equipment by combining the building information model.
- Stack various maps and data for land planning and management.
- Analyze the impact of pipelines and skylines, which is conducive to park management planning.
- Integrate IoT to help managers control park environment data in real time.





- Integrate CCTVs, with image recognition and artificial intelligence, to assist in the management and monitoring of park security.



## Smart Device

### AR Geo-Pen



- Record positioning data, recording speed is fast and position is accurate.
- Achieve low error, measurement accuracy error  $\pm 1\%$
- Support multiple people, collaborative mark fast return.
- Inspect construction sites and conduct fieldwork.
- Support Android mobile devices. (iOS in development)



# AR Geo-Camera



- Integrate spatial information and actual camera images, and to provide visual information integrating virtual and real using Augmented Reality (AR).
- Mount various sensors to monitor the on-site environment.
- Manage construction sites, parks, and road safety by integrating multiple camera images on the monitoring screen.



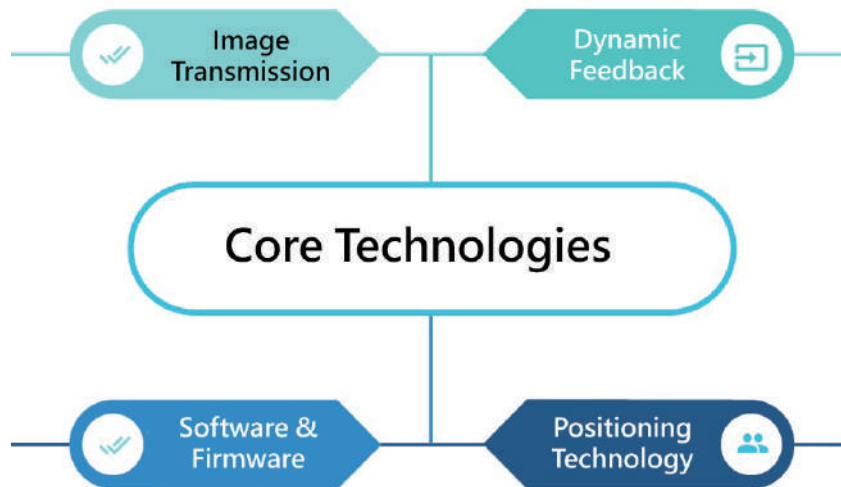
# Eye Cam

- The usage is the same as that of a general camera.
- The photos can measure the distance and area of the specified location to improve work efficiency.
- Record engineering geographic coordinates.
- Upload photos to the cloud and access them at any time.



# XR Entertainment – Racing

Pilotgaea always lead in high quality image integration and algorithm technology innovation. In order to enter the market of entertainment industry, we have developed XR racing, which set up the latest somatosensory chairs, best processors and fast network speeds. We also used physics engines, image algorithm, positioning technology to make it like real drive.



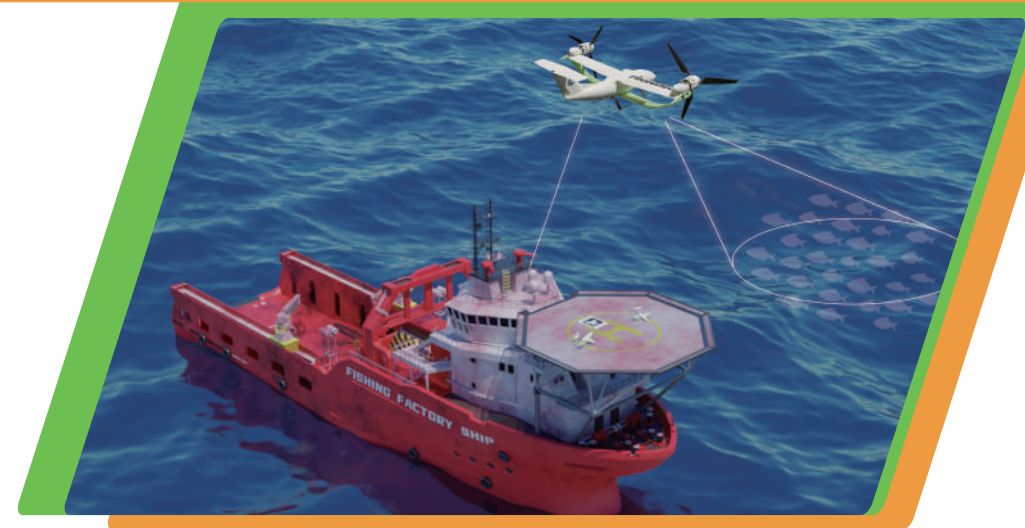
In 2020, we hosted the show, from 1st Dec to 28th Feb, 2021, and built a racing track model at the Pier-2 Art Center in Kaohsiung, as real simulation. When you put VR helmet on, you could see the real scene on the screen synchronized with camera on the car. Also, a virtual driving dashboard been created to show current speed, position, gear and more. With sound of engine, brake and selected music, it brought you impressive experience coming with your shaking body by somatarysensory chair at



## XR Entertainment - Ecology Adventure

## Origin

**President Ren** was inspired from Jurassic Park, and dreamed about that user could observe and interact with animals as closer as movie. To achieve this dream, **PilotGaea** based on our leading image integration technology and the finest XR interactive technology, we believe **PilotGaea** will bring people a novel experience never been.



Capture fisheries are often paired with helicopters, help to confirm the location of fish schools. However, it is difficult to train and find a helicopter pilot who is willing to stay on boat for a half year or longer.

- Cost \$500,000~600,000 per year to hire the helicopter.
- Need the operate radius up to 50km.
- Overcome the severe sea condition: strong gust, billow, return positioning, etc.



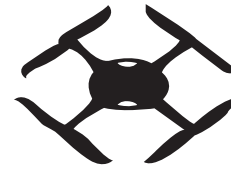
Under water



On land

In order to lower the risk and cost, and overcome the hard flight condition, we choose the concept of Bell Boeing V-22 Osprey, start to develop the NEW Generation AI Twin-Axis Tilt Rotor UAV.

MV-22 MAGTF demo Miramar air station 2014  
 (By FOX 52 - Own work, CC BY-SA 4.0,  
<https://commons.wikimedia.org/w/index.php?curid=35908368>)



**Multicopter**



**Fixed-Wing**



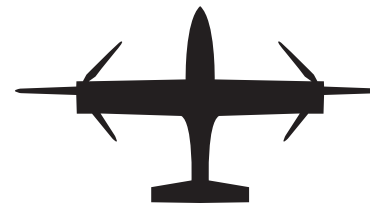
**Compound Aircraft**

**Advantage**

- |  |   |  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• High maneuverability</li> <li>• VTOL</li> </ul> | <ul style="list-style-type: none"> <li>• High cruise speed</li> <li>• High endurance</li> </ul> | <ul style="list-style-type: none"> <li>• VTOL</li> <li>• Easy to design</li> </ul> |
|--|---|--|

**Disadvantage**

- |  |   |  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• Low speed</li> <li>• Bad endurance</li> </ul> | <ul style="list-style-type: none"> <li>• Poor maneuverability</li> <li>• Runway needed</li> </ul> | <ul style="list-style-type: none"> <li>• Poor wind resistant</li> <li>• Inefficient structure</li> </ul> |
|--|---|--|



**Tilt Rotor UAV**

- Hoverable
- Automatic VTOL on moving vehicle
- High flight efficiency
- Different from the compound aircraft on the market
- Self-balanced in strong wind

# Features



There are three danger stages during flight: Take off, Transition, and Landing.

To against the billow while take off and landing, the existence of tilt rotor is very important. As shown on the picture below, two tilt rotors can provide the enough force to against side wind; The larger the wing-propeller ratio is, the better wind resistance it has.

The stage of transition is that the UAV fly from copter mode to plane mode. During this stage, the lift force will provide from propeller to wing. In order to transform smoothly, a proper control program is needed: When can the transform start? How to transform? How fast should it transform? There are a lot of details influence flight.

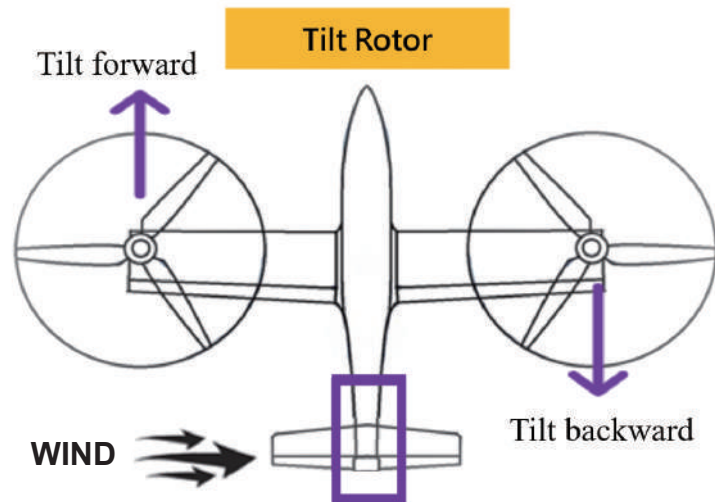


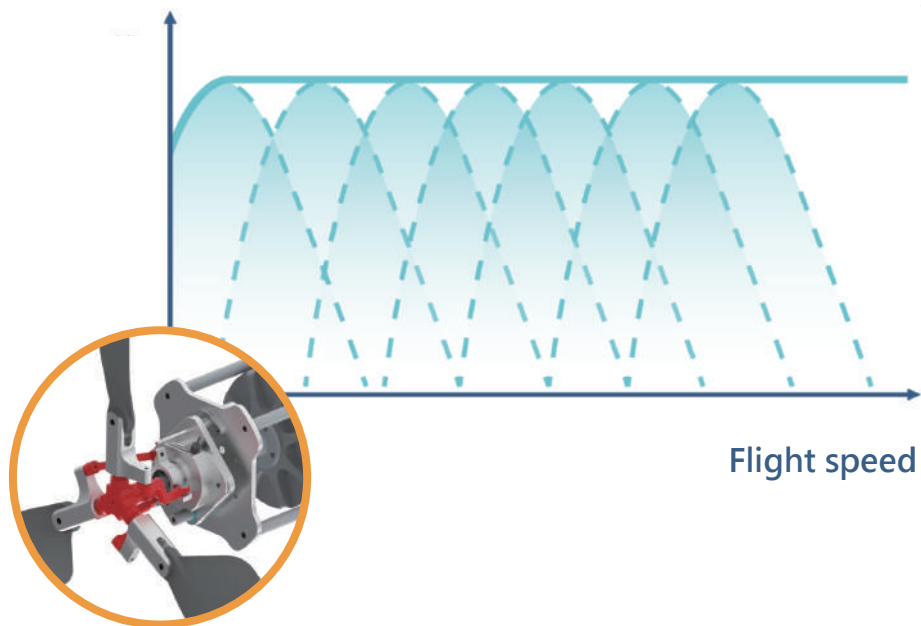
Fig. How tilt rotor against the side wind



The use of variable pitch is very helpful to increase the flight efficiency, and lower the consumption of energy. Also, it provides extra control power, which is very helpful to fly in a hard condition, such as severe sea condition.



Boost efficiency



The most important thing is how UAVs locate between itself and the moving vehicle on the sea.

- GPS trace from far place
- Approach a moving target by the automatic tracking algorithm
- Visual recognize for Auto-landing from near

Our UAV can trace the vehicle from far place by GPS, and auto land on the platform by visual identity technology.

To simplify the control method, lower the difficulty of flight control of the owner, not only provide the automatic TOL and tracking, we also provide the control method refer to the operation method of video games.



**Happy training, easy learning!**

# DragonFly



## Specifications

Length / Wing Span (m)	1.2/1.5
Maximum Takeoff Weight (kg)	13
Range (km)	150
Cruise/ Maximum Speed (km/hr)	80/140
Service Ceiling (m)	1500
Operate Radius (km)	50
Endurance (hr)	1.8
Head/Side Wind Resistance Performance (Beaufort scale)	8/6
Power by electric	



## Black Kite



### Specifications

Length / Wing Span (m)	1.6/2.5
Maximum Takeoff Weight (kg)	40
Range (km)	1,000
Cruise/ Maximum Speed (km/hr)	110/160
Service Ceiling (m)	1,500
Operate Radius (km)	50
Endurance (hr)	9.4
Head/Side Wind Resistance Performance (Beaufort scale)	8/6
Power by electric and fuel	

## R & D schedule

Electric



Electric & Fuel



Fuel



DragonFly



Black Kite



*Power by fuel, higher payload and higher flight speed*

# Flight Simulator

In order to build a real-liked simulator, we consider the aerodynamic:

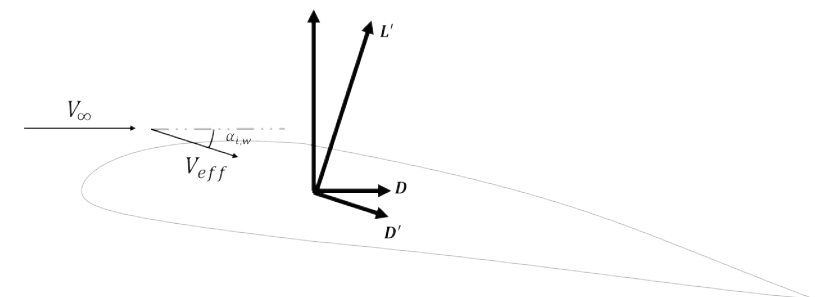
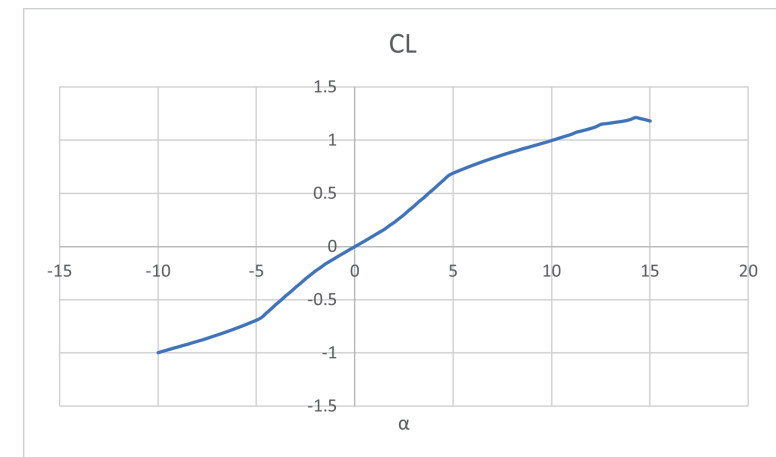
- Real-liked physics model
- Virtual flight controller
- VR device

We build a flight simulator which includes real-liked physics model and the aerodynamic model of our UAVs.

- Test control programs and algorithms
- Train UAV operators



- Air density
- Airfoil
- Airspeed
- Angle of attack
- UAV attitude
- Wet area
- Wing geometry
- ...etc.



This simulator provides an excellent training condition for user to learn the method of UAV's position and movement control.

## Flight Simulator

Real-liked physics model

Smart flight control

AI visual identity



VR flight training



## Ground Control Station (GCS) The Link between Drones (UAV) and Geomatics

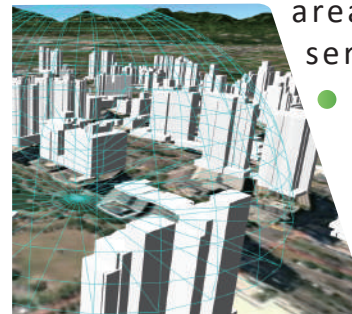
UAV collect Geomatics.

- Rapidly scan the target zone to efficiently improve information collection.
- Specifically collect special information (multispectral and agricultural analysis, electromagnetic induction, and radar detection)
- Immediately provide critical information for decision-making (disaster response)
- Save costs due to inconvenient terrain (Mountains, Seas, Forests, High Buildings)



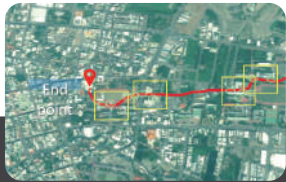
Geomatics boost UAV

- Accurately provide flight paths (precision agriculture, land monitoring)
- Carefully provide hazard information to flying vehicles for safe path planning (no-flight areas, areas with serious interference, areas with serious control signal shadowing)
- Greatly enhance the applications of GIS information supply (Agricultural application, Coastline monitoring, Resource detection)

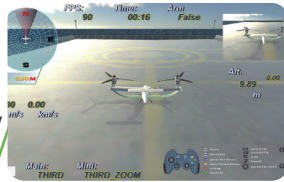


# The advantage of PilotGaea Ground Control Station(GCS)

-  **SUPPORT** for more layer formats and types
-  **PLAN** better routes and waypoint tasks
-  **ANALYZE** more detailed flight logs
-  **MONITOR** real-time flight status(AR)  
(combined with real-time images)



**ASSIST** in navigating with aerial or satellite photos



**ACCURATE** landing through AI vision

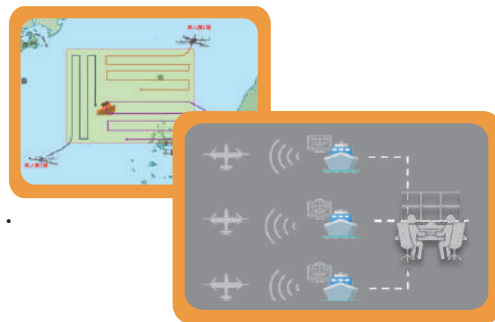


**ACHIEVE** multi-UAVs joint operation by back-end map servers

## Function and Technical Description

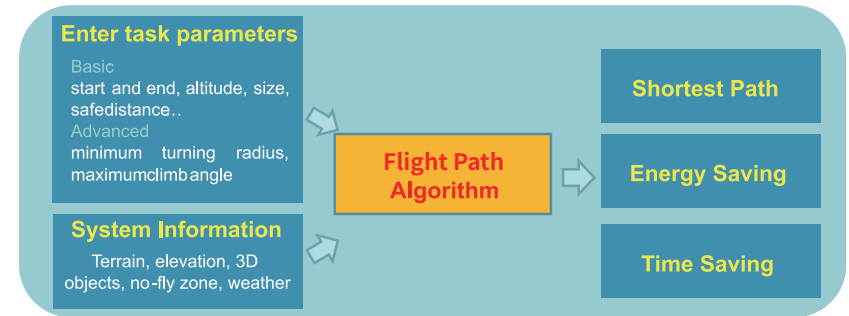
### Mission Planning

The GCS facilitates safe UAV flights in mountainous areas and high-density urban zones.

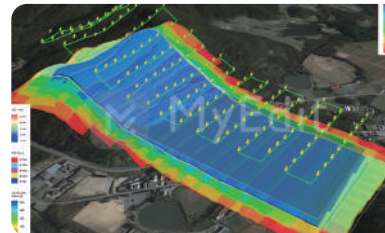


## Path Planning – Algorithms

Users can input various factors to calculate the shortest and most efficient flight path, saving energy and time.



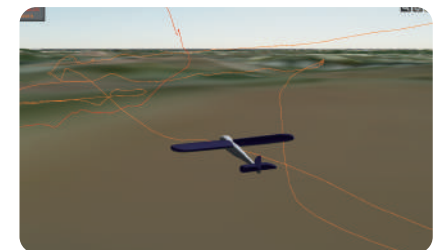
## Circuit Cruise Planning

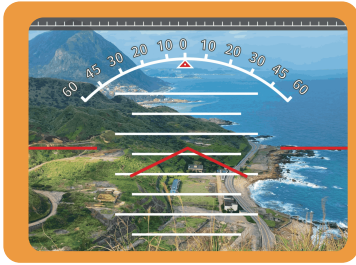


By utilizing the elevation data from the 3D map platform, routes can be planned to minimize climbing and save energy.

## Flight Log Analysis

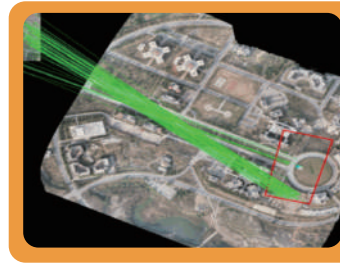
Through 3D image demonstrations, users can visually analyze the flight attitude of the drone and interpret the flight results effectively.





## Augmented Reality (AR)

Integration of images and map platforms enables the provision of different applications through augmented reality technology.



## Image Navigation Landing

UAVs can navigate using image-based methods, which is particularly valuable in the logistics industry for object delivery.

## 3D Route Navigator

The display of 3D auxiliary frame lines assists users in judging aircraft attitude skew and distance effectively.



## AI Vision Landing

Advanced landing capabilities utilizing AI technology for precise and reliable landing operations.



## Realistic Map Scene

Users can gain a more accurate understanding of the actual situation through the simulation screen.

## Various Display Type

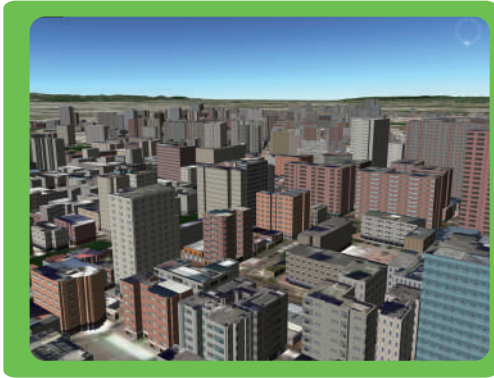
Users can choose between satellite photos, frames, frame lines, or slope coloring types of images as the background.



## Multi-UAVs Joint Operation

Back-end server integration and data sharing enable coordinated operations among multiple UAVs, incorporating radar or Internet of Things technologies.





In summary, the PilotGaea Ground Control Station offers a comprehensive range of functions and technical features that enhance the capabilities and performance of UAVs in geomatics applications.

With mission planning, path algorithms, circuit cruise planning, flight log analysis, augmented reality, 3D route navigation, realistic map scenes, various display options, image navigation, AI vision landing, and multi-UAV joint operations, PilotGaea empowers users with powerful tools for efficient and effective UAV operations.

Geomatics (GIS) enhances the capabilities of UAVs. It enables accurate flight path planning for applications like precision agriculture and land monitoring. Geomatics also helps in providing hazard information to ensure safe path planning for flying vehicles, considering no-flight areas, areas with serious interference, and areas with significant control signal shadowing. Additionally, it greatly enhances the applications of GIS information supply in various areas such as agricultural applications, coastline monitoring, and resource detection.

