PLUG-INS FOR SOFT CITY

PLUXITY Product Introduction
Company Overview
Products
Business Results

Platform Introduction
Solution Introduction
Introduction Cases
Company Introduction

Company Overview

<table>
<thead>
<tr>
<th>Company name</th>
<th>PLUXITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO</td>
<td>Yoon Jaemin</td>
</tr>
</tbody>
</table>

Business area
Software development and supply (Digital twin based smart city/building integrated operation solution)

Address
2F, 70, Dongho-ro 10-gil, Junggu, Seoul, Korea (Shindangdong Woodang Building)

Tel/Fax
+82-2-332-9002 / +82-2-332-9005

Foundation Date
Jan. 2015

Year | Classification | Details |
--- | --- | --- |
2015. 01. 07 | - | Establishment of the company |
2015. 03. 09 | Certification /confirmation | Establishment of the company research center (No. 2015111048) |
2015. 07. 07 | Certification /confirmation | Venture company confirmation (No. 20150107171) |
2015. 07. 07 | Certification /confirmation | Software business registration (registration no.: B15-105555) |
2015. 07. 13 | Certification /confirmation | Confirmed as SME (publication, imaging, broadcasting and information and service business) |
2015. 11. 12 | Certification /confirmation | Certification of software direct producer (No. 2015-32947) |

Career of the CEO
(Present) PLUXITY (CEO/CTO)
Connectors (CTO)

(Previous) Virtual Builders, Director of the smart building business division, global business division
Researcher at advanced information technology research center, KAIST

Organization

Personnel composition of each job (20)

(Unit:%)

- Development: 40%
- Research/planning: Pluxity 40%
- Sales: 10%
- Administration: 10%
Company Introduction

Company Overview_ Patent and Awards

7 patents (4 registered, 2 applied, 1 license)

Award winning and media coverage

- Won the best award in the private business model sector at the smart city service idea competition on the occasion of the first World Smart City Week.
- Selected as one of the 10 top companies at the smart city business fair on the occasion of the 2nd World Smart City Week (award from the Minister of Land, Infrastructure and Transport).
Digital twin based smart city/smart building integrated operation solution package

- PLUG City: Integrated city operation solution
- PLUG Security: Convergence security control solution
- PLUG Energy: Energy control solution
- PLUG Factory: Smart factory control solution
- PLUG Data: Data center control solution
- PLUG Kiosk: Kiosk solution
Company Introduction
Scalability of Our Products (applicable markets)

Digital Twin
Smart City Platform

- Smart city
- Smart factory
- Smart energy
- Smart building
- Autonomous driving
- New and renewable energy
- Airport
- Subway/railway
- Ground railway
- Logistics
Company Introduction

Major Customers for Each Product

Secured about 30 customers for each application solution (2015-2019)

- **Convergence security control solution**
  - Incheon International Airport, Seoul Metro, Daemyung Resort, Seoul Grand Park, Korea South-East Power

- **Smart factory control solution**
  - Samsung Display, SK Petrochem, Hanwha Techwin, LIG Nex 1, Haesung DS

- **Integrated city operation solution**
  - Busan global smart city, Seoul City, Suwon City, Busan Echo Delta City

- **Data center control solution**
  - SK Innovation Daedeok Data Center, Institute for Basic Science

- **Kiosk solution**
  - Incheon International Airport Terminal 2, Seoul Metropolitan Facilities Management Corporation

- **Energy control solution**
  - KT photovoltaic energy, Seoul Seodaemun-gu light pollution zero village, KEIT system light 2.0

**Samsung smart Factory partner**
- Ministry of Land, Infrastructure and Transport smart city convergence alliance member
- Ministry of Land, Infrastructure and Transport, excellent company in terms of smart city

**KOTRA global procurement company**
Company Introduction

Platform Introduction

Solution Introduction

Introduction Cases

(1) Purpose of introduction
(2) Overview
(3) Composition
(4) Utilization
(5) Spread of contents
(6) Technological competitiveness
Establishment of integrated 3D GIS DB for spaces subject to control such as city, large complex, building and underground railroad

Management of integrated spatial information of the multi-purpose large space

Digital Twin Database

Service Application
Purpose of Adopting the Platform

2 Evolution of Control method

Matrix $\rightarrow$ Virtual View (2D/3D)
The non-intuitive control information is combined with 3D spatial information to make it possible to provide a control system to respond in a more prompt and accurate manner.

3 Integrated management of real-time issues that arise in the space

Separated control monitoring system $\rightarrow$ one solution
Manage all issues in an intuitive and integrated manner in real time by integrating all systems related to CCTV, fire, facilities and access control which were managed separately.
PLUG Platform
Platform Overview

1. Virtualization (Builder)
   - Using CAD and image drawings
   - Making 2D/3D indoor and outdoor space based on components
   - Navigation for the general public and the mobility handicapped
   - Evacuation route guide and network design
   - Rich components and texture library
   - Making 4 types (Real/Semi Real/Wall/Flat) of space

2. Informatization (Manager)
   - Spatial information (drawing) management
   - Spatial attribute/POI management
   - LOD (Level of Detail) management

3. Service (Viewer)
   - C/S Application
     - PLUG Security

   - Mobile (SDK)
   - Web (SDK)
   - Kiosk
PLUXITY’s 3D map producing SW was adopted officially by Seoul City in 2015, converting into 3D of public buildings across Seoul (City office/gu office/underground mall/traditional market/museum/subway station).

Establishment of the 3D contents across Seoul, spread of the contents and verification of technology

- 3D spatial information for indoor and outdoor of the public buildings in Seoul is under establishment utilizing PLUXITY’s 3D SW (2015~)

- Utilization in many areas such as disaster/fire/environment and energy
- Providing indoor spatial information for the socially vulnerable people
- Pursuing business planning with VR/AR related companies
- Pursuing the link it with cultural and tourism business of Seoul City

<table>
<thead>
<tr>
<th>Contents Type</th>
<th>3D Contents</th>
<th>2D Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subway station</td>
<td>237</td>
<td>235</td>
</tr>
<tr>
<td>Public building</td>
<td>94</td>
<td>92</td>
</tr>
<tr>
<td>Underground mall</td>
<td>23</td>
<td>23</td>
</tr>
</tbody>
</table>

Total: 354 / 350

※ As of Nov. 30, 2018
PLUG Platform

Technological Competitiveness of the Platform

Advantage of the 3D spatial information establishment technology

- **Gong Builder**
- **PLUXITY 3D making SW**
- **OGC 3D spatial information international standard compliance**
  - GML, CityGML, IndoorGML, KML
  - Designate as official tool for indoor spatial information DB establishment by Seoul
  - Possible to make 3D map easily by providing abundant components, texture library
  - Better service performance and processing speed than competition by making data light
  - 3DS, KML, CityGML and other industrial and international standards support

Compatibility with global commercial tools

- **Seoul City holds public business rights**
- **Self-developed engine**
- **HTM5 standard language base engine**
- **WebGL**
- **ActiveX, Plug-in not installed**
- **Compatible with all web browsers**
- **Compatible with mobile web**

Expandability to other systems as GIS engine

- **Traffic**, **Facility**, **Citizen’s safety**, **Energy**
- **PLUXITY 3D engine**

3D loading and control service actuation speed

- **3D loading and control service actuation speed**
- **3D map subject to control is loaded within 3 seconds (once/for the first time)**
- **CCTV, sensing Data simultaneous working**
- **Parallel processing using multicore**
- **Instant processing to process multiple information on 3D**
- **High performance utilizing shader and other rendering technology**

Various 3D control viewer

- **Tablet, mobile based control system**
- **VR, AR**

Expandable to other areas

- **Possible to expand to other areas such as security, fire, disaster prevention, energy and facility management**
- **Possible to expand 3D drawing depending on users and service purpose (OSMU)**

PLUXITY control SW
Company Introduction

Platform Introduction

Solution Introduction

(1) 3D map making software
(2) Integrated city operation solution
(3) Convergence security control solution
(4) Smart factory control solution
(5) Subway/railway security control solution
(6) Data center control solution
(7) Logistics center control solution
(8) New and renewable energy control solution
(9) Airport integrated control solution
(10) Kiosk solution

Introduction Cases
3D map making software

Anyone can make 3D space easily as abundant components and material libraries are provided. It is easy and convenient interface for making space simply.

- Official tool for indoor 3D map of Seoul
- 300 maps and 100 maps are made for subway stations and public offices respectively
- Indoor space modeling
- Material mapping based on field inspection (synchronization)
- Easy placement using object (door, window, pillar, etc.) drag & drop method
- Web-based 3D object management (registration, X/Y/Z axis movement, rotation, scale manipulation)
- 3D standard format support, LOD4 technology compliance web-based spatial information management

Screen for major functions

- CAD and image drawings are automatically converted into 3D indoor space conveniently
- 3D indoor space making based on components, which is easy for beginners
- Various network design function to guide route for the general public and the mobility handicapped
- Abundant components and texture library to make high quality indoor space
- Making four kinds of space (Real/Semi Real/Wall/Flat)
III Solution Introduction
2) PLUG City

Integrated city operation solution based on digital twin

3D GIS-based smart city control platform. It applies IoT technology to 3D city space model to provide smart service. It identifies issues in the city efficiently and automatically and IoT technology and services a user wants are visualized in lien with 3D GIS map.

- Integrated monitoring linked with MOLIT 3D map/public data
- Urban energy monitoring
- CCTV intelligent monitoring
- Monitoring of socially vulnerable people
- Urban facility management
- Urban map management

Screen for major functions

Urban energy monitoring
- Energy facility mark on 3D map
- Smart streetlight status display (on/off)
- Noise/air quality and other environmental monitoring

CCTV intelligent monitoring
- Marking CCTV location on 3D map
- Automatic detection of crime/accident
- Tracking criminals based on video analysis

Monitoring socially vulnerable people
- Receiving location information of the socially vulnerable people
- Indicating environment/health condition of the monitoring target
- Risk situation monitoring

City facility management
- Facility status/history management
- Facility real-time status and event situation monitoring

Urban map management
- Inquiring urban administrative district and visualization
- Linking it with indoor 3D map
- Urban 3D map management (linking with MOLIT map)
Digital twin-based convergence security control solution

Providing an integrated control environment in a virtual 3D smart space. In 3D spatial map, various security systems such as CCTV, access control system, detection alarm system, fire system can be linked and integrated to provide intuitive space management and respond to events immediately.

- 3D GIS management (indoor, outdoor 3D map)
- Integrated monitoring of security equipment (CCTV, access control, detection sensor, security equipment)
- 3D automatic patrol of security area
- Optimized placement of CCTV, and sensor simulation
- CCTV PTZ, Playback, matrix view (7*7)
- Integrated security event 3D alarm

Screen for major function

- 3D based CCTV monitoring/control(PTZ)
- Access control
- CCTV optimized placement simulation
- 3D automatic patrol
- Emergency evacuation route information

3D based CCTV screen check
Access control, detection sensor, people counting sensor integrated management, entrance/leaving, illegal access real-time display
Minimizing installation cost, predicting monitoring scope through CTV spec input and virtual PTZ function
3D automatic patrol according to equipment and space security hierarchy
3D map based information on evacuation route, simulation from the first person view
Digital twin-based smart factory control solution

Providing integrated control environment for equipment and facilities in 3D based smart factory and plant.
It is possible to identify information, current status and problem of plant and facilities by linking with sensors and monitoring.

- Plant and equipment/facility 3D modeling and visualization
- Upon abnormal condition in the plant or facility, event alarm popup and location are displayed on the map.
- Status monitoring regarding equipment, safety, fire and access.
- Management of layout information of the plant equipment (new placement, movement, editing, deletion) and visualization
- 3D virtual patrol for security area and areas where direct patrol is difficult.
- Evacuation route upon emergency, integrated SOP information

#Samsung Display  #SK Petrochemical  #Hanhwa Techwin  #LIG Nex 1  #Haesung DS

Screen for major function

3D virtualization of plant and facility
Inquiring the list of equipment placed for each business place/line
Visualizing plant equipment name and location based on 3D

3D-based equipment placement management and virtualization
Drag & Drop or simple value manipulation make it possible to change equipment location, size and rotate x, y, z axis.

New equipment placement and history inquiry
3D-made equipment can be relocated individually/ in whole with simple manipulation
Each equipment placement history inquiry
Digital twin-based subway/railway control solution

It is possible to identify spatial information in case of emergency by visualizing subway station based on 3D map. In case of emergency, it is possible to make quick judgment and response by station personnel as it is possible to secure location of the field and direction information on the monitor.

- All/zone-level station 3D modeling and visualization
- Upon abnormal situation in the station, event alarm popup and location is displayed on the map and nearby CCTV image is automatically displayed.
- Status and control for PSD, CCTV, access control, shutter, intrusion detection, SOS, fire facilities
- Visualizing train operation information (approaching/stop/departure)
- Virtual patrol for route designated by the operator
- Evacuation route upon emergency, SOP information

Screen for major function

Real-time station monitoring through CCTV
Visualizing equipment installation status and status information
Subway operation status real-time monitoring
Digital twin-based data center control solution

It supports intuitive status analysis and prompt decision making by integrating the management of space and asset information in one system.

It is possible to solve problems such as facility expansion and building expansion due to lack of space by predicting spatial demand through identification of equipment and intuitive spatial management.

- Monitoring network traffic
- Monitoring sub/network equipment control element (temperature/humidity, power inlet, distribution panel, equipment load, etc.)
- Error/event alarm, notice to administrator
- Server/network equipment history management (equipment setting date, model name, system specifications, back-up equipment, core occupancy rate, equipment volume, calorific value, etc.)
- Realtime monitoring of server room (access/security access management)

Screen for major function

- Equipment-level real time data analysis, event occurrence trend analysis
- Visualizing event upon error occurrence
- Visualizing building/floor level management status
Digital twin-based logistics center control solution

It visualizes the location and operation status including personnel, equipment and facility in the logistics center based on 3D and provides real-time monitoring service. Efficient logistics management is possible through logistics center warehouse area automatic calculation and placement, visualization of logistics goods receipt and issue, inventory status.

- Visualizing 3D based logistics center warehouse placement
- Automatic calculation of each area of warehouse
- Visualizing the current state of warehouse, equipment and worker status in the logistics center
- Visualizing environmental information (temperature/humidity) in logistics center
- Visualizing goods receipt and issue, inventory information
- Visualizing individual logistics status and detailed information

Screen for major function

Logistics center space (warehouse) and equipment status management
Visualizing the logistics center environmental information (temperature/humidity)
Visualization of individual logistics status and detailed information
Digital twin based new and renewable energy control solution

Efficient energy management is possible by measuring new and renewable energy power generation amount. For example, the process of absorption, storage and conversion of solar energy into electricity energy is visualized and simulated in 3D image and analysis and statistics of power generation amount of each facility are reported.

- Visualizing 3D-based new and renewable energy facility installation location, number and actuation
- Status and statistics of energy use for each facility
- 3D visualization and simulation of process of solar energy absorption, storage/transition to electricity/heat.
- Power generation amount for each photovoltaic energy facility (today, previous day, accumulated), power generation time (today, previous day, this year’s average) and cost (current month, previous month, annual) analysis and statistics information visualization
- Visualization of real-time power generation amount, consumption amount analysis and statistics

Screen for major function

- Visualization of energy facility installation location and information
- Visualization of building-level real-time power generation amount and consumption amount analysis and statistics
- Visualization of facility-level power generation, power generation time, cost analysis and statistics
Airport Integrated Control Solution based on digital twin

Integrated operation and real time monitoring system is established by providing integrated management and information based on 3D digital twin-based service for airport operators and visitors, virtualizing all airport space and facilities into 3D image, and linking CCTV and sensors. Comprehensive information is provided such as shopping information, navigation, event, evacuation route upon emergency is provided through kiosk and mobile for visitors to airport.

- 3D virtualization (digital twin) for all spaces of airport (including equipment/facilities)
- Providing integrated operation management system by linking detection/control sensors for each equipment/facility.
- Establishment of the airport information (navigation, event, evacuation route) service through kiosk and mobile service
- Efficient airport operation and management through simulation functions

Screen for major function

- Entrance door control in the airport
- 3D virtualization of all facilities including airport, entrance door and sensor
- 3D map based indoor map navigation mobile service
Digital twin-based kiosk solution

Various services are provided to visitors to the space based on a 3D indoor space map. This is a 3D spatial information-based interactive kiosk. It visualizes major facility and commercial store information on a 3D map and total routes are introduced when departure, destination, and stopover making it possible for anyone to find their route.

- Navigation based on 3D for each purpose
- Information on stores in the space
- Administrator manages space and facility information (registration, editing, deletion, inquiry)
- Providing information on commercial facilities and real-time event
- Supporting multi-browsing based on web standard

Screen for major function

- Providing information on commercial facilities and real-time event
- 3D-based spatial information and location guidance
- Web-based 3D drawing and facility information manager (administrator)
Introduction Cases

1. Integrated city operation solution
2. Convergence security control solution
3. Smart factory control solution
Busan Global Smart City

Establishment of the integrated city monitoring system based on digital twin
Overseas project (Turkmenistan)

Establishment of the integrated guard and security system based on digital twin for Ashgabat new airport

Establishment of the integrated guard and security system based on digital twin in the Ashgabat Olympic Complex
Seoul City

Project to establish/upgrade indoor spatial information system
Incheon Airport

Digital twin–based three phase guard and security system

Digital twin based mobile application

Digital twin based kiosk
Introduction Cases– Convergence Security Control Solution

Seoul Grand Park
Development of digital twin based monitoring system

Daemyung Resort
Development of digital twin-based guard and security control system
Gileum, Jangwi traditional Markets in Seongbuk, Seoul

Digital twin-based disaster evacuation platform
Establishment of Smart Station 3D integrated control system

Establishment of the in IoT Comprehensive information system
Samsung Display A5 Tangjeong

Construction based on digital twin and establishment of the integrated safety management system
SK Daedeok Data Center

Development of digital twin-based data center control system

Samcheok Green Power Plant

Development of digital twin-based integrated control system
Introduction Cases – Smart Factory Control Solution

LG Display
Development of monitoring system based on digital twin

International Nuclear Security Academy
Development of integrated control system based on digital twin