What is a Digital Twin?

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Sanborn – Mapping Leader Since 1866

- Creating digital twins since 1866
- Optical imagery mapping since 1966
- Aerial lidar mapping since 1999
Company Overview

• **Data Map Production**
  – Lidar, Digital Oblique & Orthophotography, Photogrammetric, Topographical Maps

• **Value-Added Services**
  – Master Addressing Repository
  – Change detection
  – Other imagery analysis services/viewers
  – Land use and land cover analyses

• **Decision Support Systems**
  – Wildfire Management
  – Forestry and Ecosystem Management
  – Emergency Response

• **Visualization Systems**
  – 2D
  – 3D
  – Prism 4D
  – Common Operating Picture

• **Software Applications**
  – GIS Software Development (Enterprise/Desktop/Web)
  – Cloud Services
  – Portals and Distribution Tools

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WHAT IS DIGITAL TWIN?
• The digital twin combines different assets and their information in one place, enabling improvement of operational efficiency.

• Centralized and visual asset information allows easy utilization of data and ensures the data is always available to all relevant stakeholders of the asset.

• Common elements include:
  – Connectivity: A device (camera, sensor, mobile phone etc) must be enabled by some level of Internet connection.
    – Real time transit information
    – Facilitate the movement of goods
    – Optimizing traffic flow
    – Streamline systems such as waste management and transportation
    – Automatous vehicles
  – Data: Without data generation, connected devices deliver limited value. A device on a pole means next to nothing unless it is exchanging and generating information (data, video, etc).
Digital Twin Geospatial Source Data

- Santa Clara County has collected multiple types of geospatial data over the years, which can be used as the source for creating a digital twin
  - **Imagery**
    - Orthoimagery: 4-band 3inch in urban areas and 6inch in rural areas
    - Oblique imagery- Urban area collection of 3-band 3inch in 2015, 6inch in 2020 and 3inch in 2021
  - **Aerial Lidar**
    - Collected QL2 (2ppm) lidar in 2016
    - Collected QL1 (8ppm) lidar in 2020
Sanborn Multi-VIEW Sensors

Standard 60% Stereo overlap

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Sanborn Multi-VIEW Imagery

With HI-RESOLUTION Optical Imagery approaching the 3cm GSD Range

Sanborn Ultra High Resolution Imagery
• Sanborn can use multiple technique to extract our both 2D and 3D features
• Features can be attributed with multiple points of information including real time sensor data
Oblique Imagery and 3D Visualization

- Sanborn generates AT for all views allowing measurement within any view within 3-pixel
- Sanborn oblique imagery allows for high accuracy processing within all 5 views
- Allows for the creation of 3D data like 3D web mesh products
Ability to edit the DSM

Ability to edit the texture

Ability to remove/edit objects

Denver Digital Twin
Adding Additional Content

• Level of detail tailored to business need
  – Can add attribution and detail at the street level to a place on the building such as entrance point, direct location of address, etc.
Light Detection and Ranging

- Sanborn has been operating lidar since it was commercially introduced in 1998.
- Lidar uses lasers, GPS technology to enable direct georeferencing of billions of point.
- Lidar provides high resolution, high accuracy elevation models.
- Vegetation, utilities and structures can be extracted from the data.
- Lidar allows for 3D feature extraction.

Aerial sensor
Collects/scans data, either photons (reflected light) or laser pulses.

Aerial GPS (Global Positioning System)
Based on GPS satellite triangulation, measures the location of the aircraft up to 0.1 second.

IMU (Inertial Measurement Unit)
Measures attitude (pitch/yaw/roll) of aircraft every .002 second.

Ground GPS
Measures the location of the aircraft up to 0.1 second relative to a known ground position.
Extracting Features from Lidar

- Examples of using lidar to extract features such as utility lines and painted road features
Using ArcPro to view a Digital Twin
Mapping Digital Twin data for Autonomous Driving

- Digital twin of road network and assets in 3D
  - Roads and road markings, Lanes
  - Signs and poles, Buildings
  - Sidewalks/crosswalks
  - Parking spots, Park benches
  - Overpass, Barriers
  - Vegetation, Signal vectors
  - Street Landmarks

- Add intelligence to the data
  - Direction of traffic flow
  - Color of painted lanes
  - Type of sign (speed, turn, restriction, warning, etc)
Utility Asset Mapping Digital Twin

Sanborn created a digital twin for the Country of Qatar
Digital Twin Use Cases

- Virtual Environment allows Real Estate transactions to occur without an onsite visit.
- Digital Twins -3D- provides x,y,z for NG911
- Assessment record interface
- Water/Sewer/Electric analysis
- Supports facility management
- Resource Management
- Modeling and Tracking Change
- Construction
- Emergency Response
- Damage Assessment
Thank You

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