
GÉO-3D
INC.

FIG2006
Automated Road Sign Inventory Solution

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Director of R&D

PRESENTATION OVERVIEW

- Geo-3D Introduction
- System components
- Data Extraction
  - Detection
  - Recognition
  - Results
- Applications & Benefits
- Conclusion

GEO-3D OVERVIEW

Geo-3D's mission - develop and commercialize worldwide, highly productive land and aerial data collection solutions as applied to linear infrastructure assets over large territories.

- **Created: 1995**
- **ISO 9001 (2000)**
- **20 employees**

CYCLOP-3D

TRIDENT-3D

GEO-3D OVERVIEW

- Mobile Mapping Markets:
  - Public Sector (Train, Bus, etc.)
  - Transportation (Road, Rail, Maritime, etc.)
  - Utilities (Telecom, Electric, Cable, Gas, etc.)
  - Public Works (Municipalities, Counties, etc.)
  - Real Estate (Addressing, Property Assessment, etc.)
  - Public Safety (Homeland Security, Emergency Services, etc.)

- Our Priority:
  - Roadside Assets

GEO-3D OVERVIEW

- Over 100 Customers
- Spread Across More Than 12 Countries
- 27 Installed Vehicles
  - USA (9), Including 3 DOTs (New Jersey, Montana, Louisiana) **Ensco, (July 2006)**
  - Canada (9) most recent **NB DOT (March 2006); Associated Engineering (April 2006)**
  - Europe (8): Belgium (2), France(3), Portugal(2), UK(1)
  - South Africa (1)
  - China (1)

  - …And many indirect customers (Municipalities, counties)

TRIDENT-3D SOLUTION

Variable Vehicle Configurations

TRIDENT-3D

TRIDENT-3D - KRONOS

Hardware components

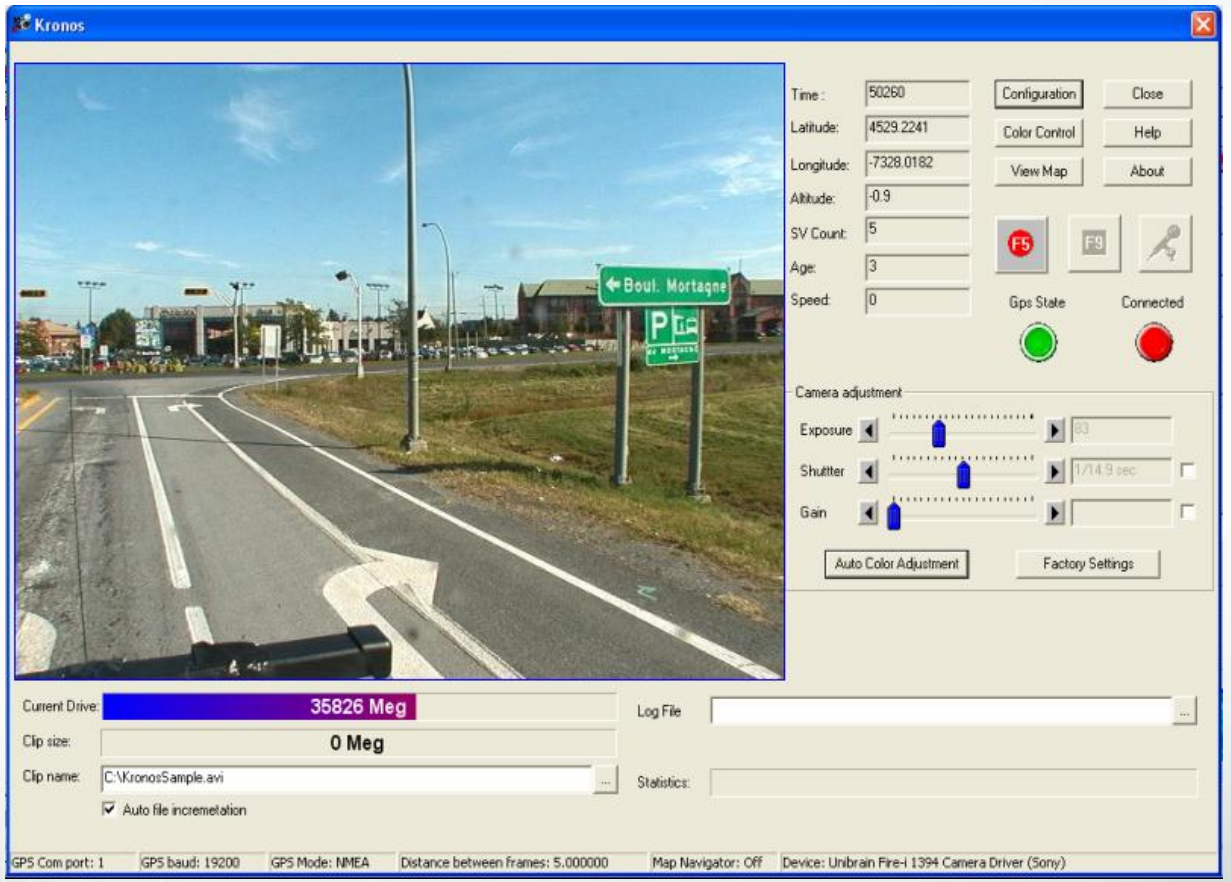
- Digital camera and other sensors
- Inertial measurement unit
- Differential GPS receiver
- Data acquisition software - Kronos
- Rack mount industrial computers
- 2-D scanning laser (for automated detection)

TRIDENT-3D - KRONOS

Vehicle Set-Up

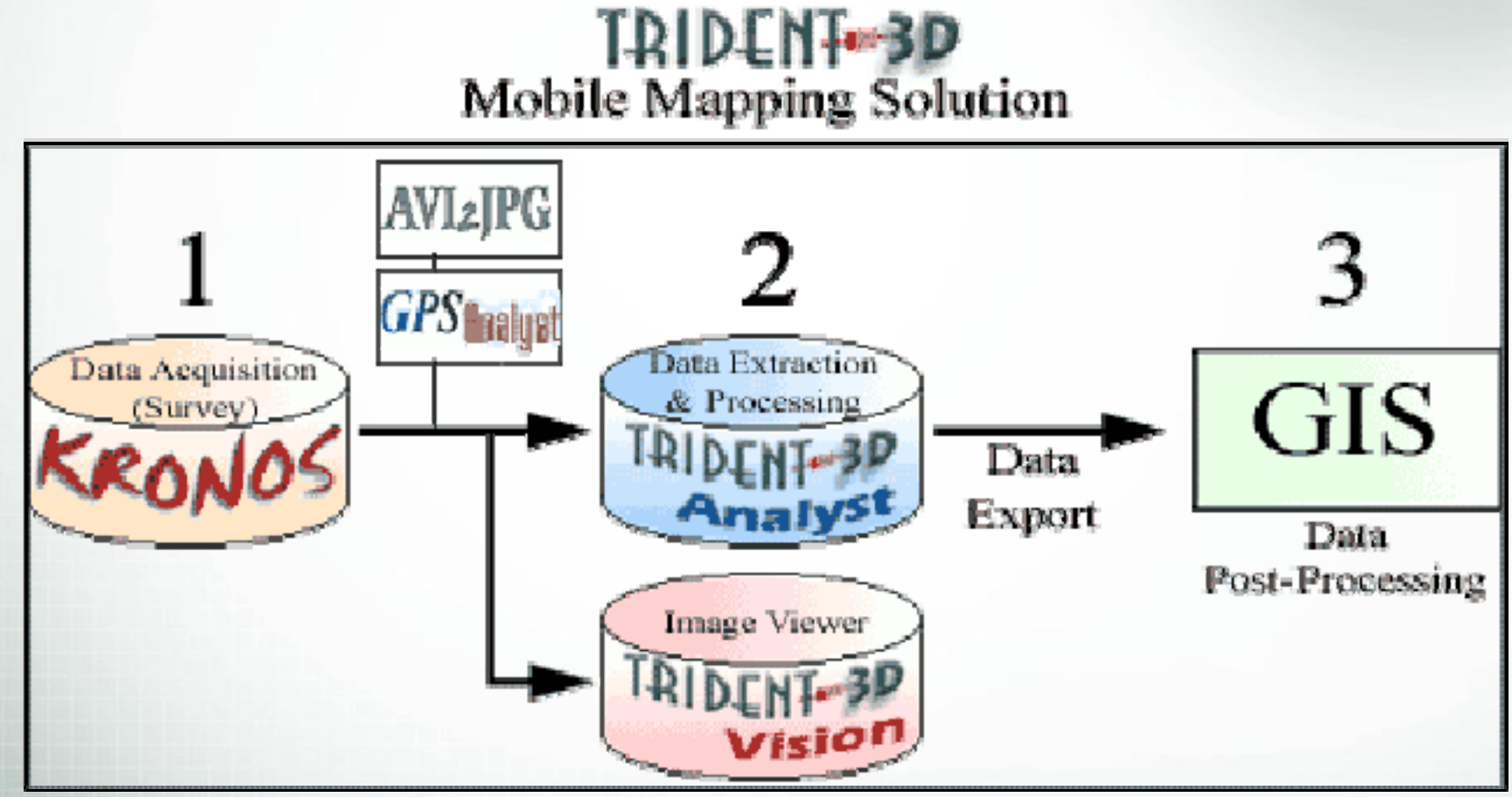
TRIDENT-3D - KRONOS

Kronos™: Data Acquisition (Video Logging)



TRIDENT-3D SOLUTION

Software Architecture



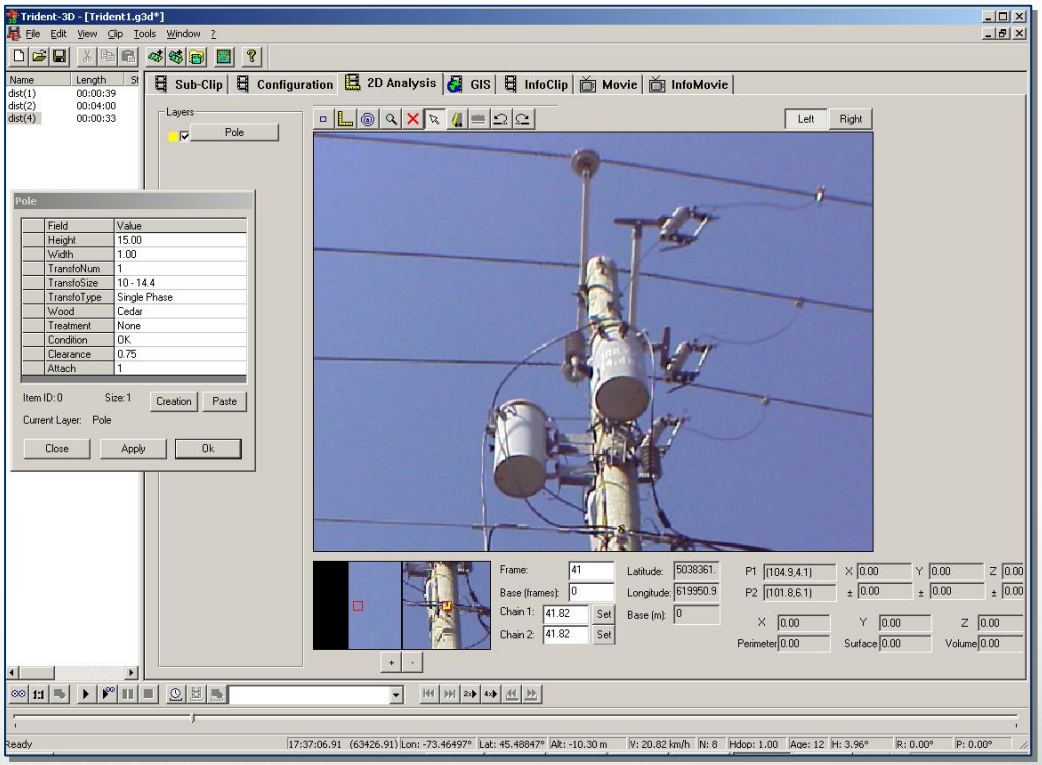
TRIDENT-3D SOLUTION

Data extraction based on photogrammetric principles using only one camera (US Patent Pending)

TRIDENT-3D - ANALYST

Data Extraction Software Interface

- Position in X, Y & Z; sub-metric
- Length, height, area measurements
- Zoom function
- 3D Map interface
- Integrated GIS functions
- ODBC connectivity
- And more...

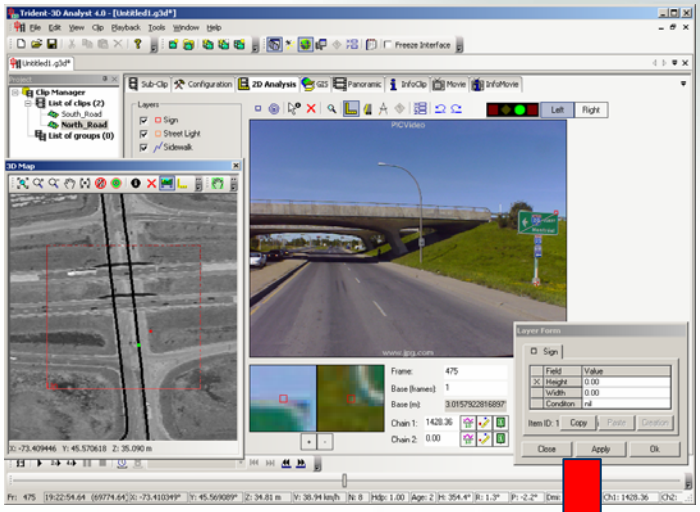


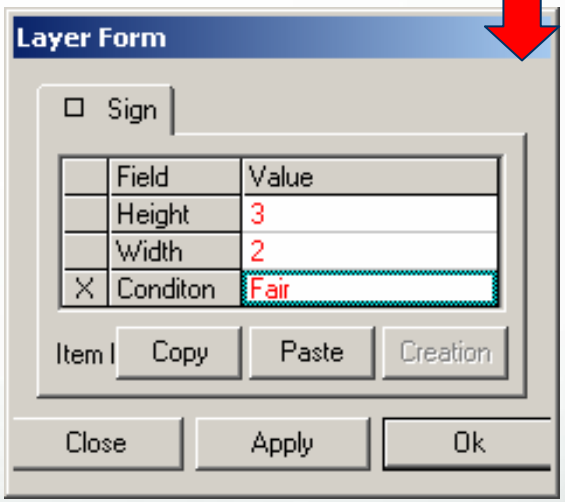
GIS Connection

- ESRI Shape file export (SHP, SHX, DBF)
- ODBC connectivity
  - Connects layers to any ODBC data source (SQL server, Oracle, Access, DB2, etc.)
- Support for Relations
  - E.g. one support with traffic signals and multiple signs
- API to connect to Asset Management, GIS Clients, etc.

Manual Asset Extraction

- Approximately 2 minutes per asset
- Location extraction from user manipulation
- Measurements from user manipulation (high level)
- Human error creates possibility of mistakes





AUTOMATION

- Market pressure dictates need to reduce time and economic resources required for surveys
- 2 Dimensional laser scanning device is mounted on survey vehicle
- Collects a wealth of data
- Automation of:
  - **Detection**
  - **Location**
  - **Recognition**
  - **Measurements**

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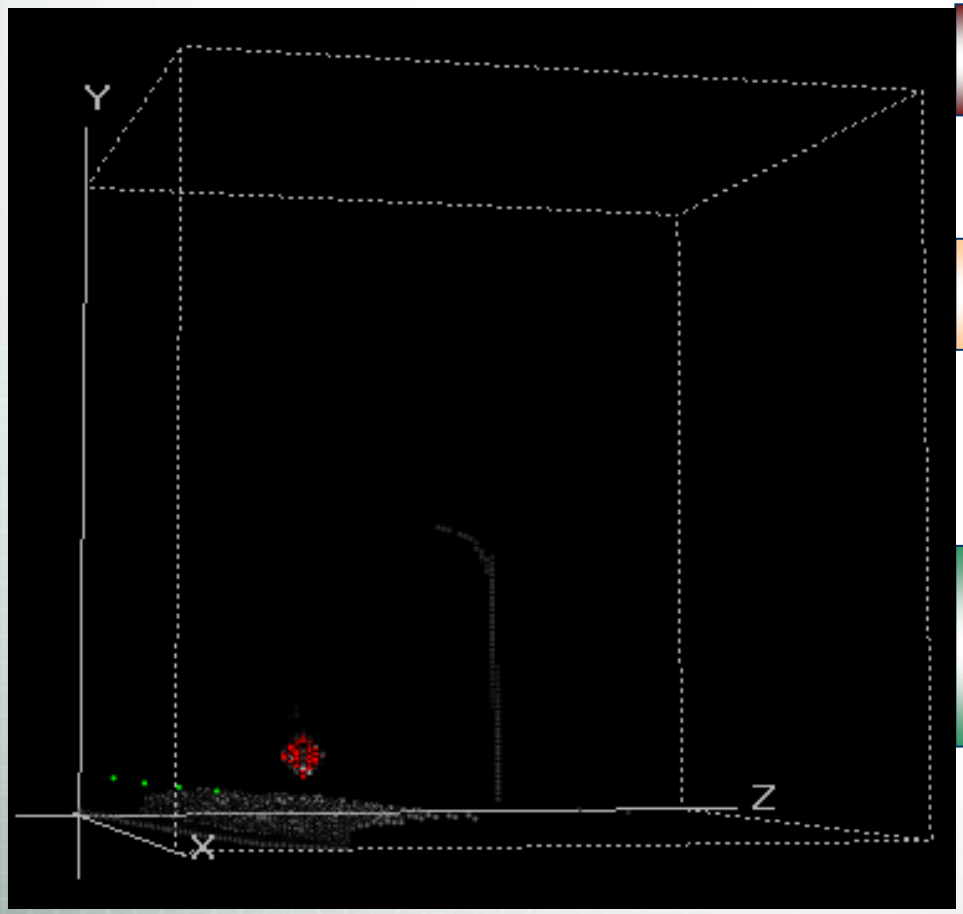
Automatic Asset Detection



- Generate a 3D point cloud
- 3D objects are distinct
- Agglomeration of points are objects

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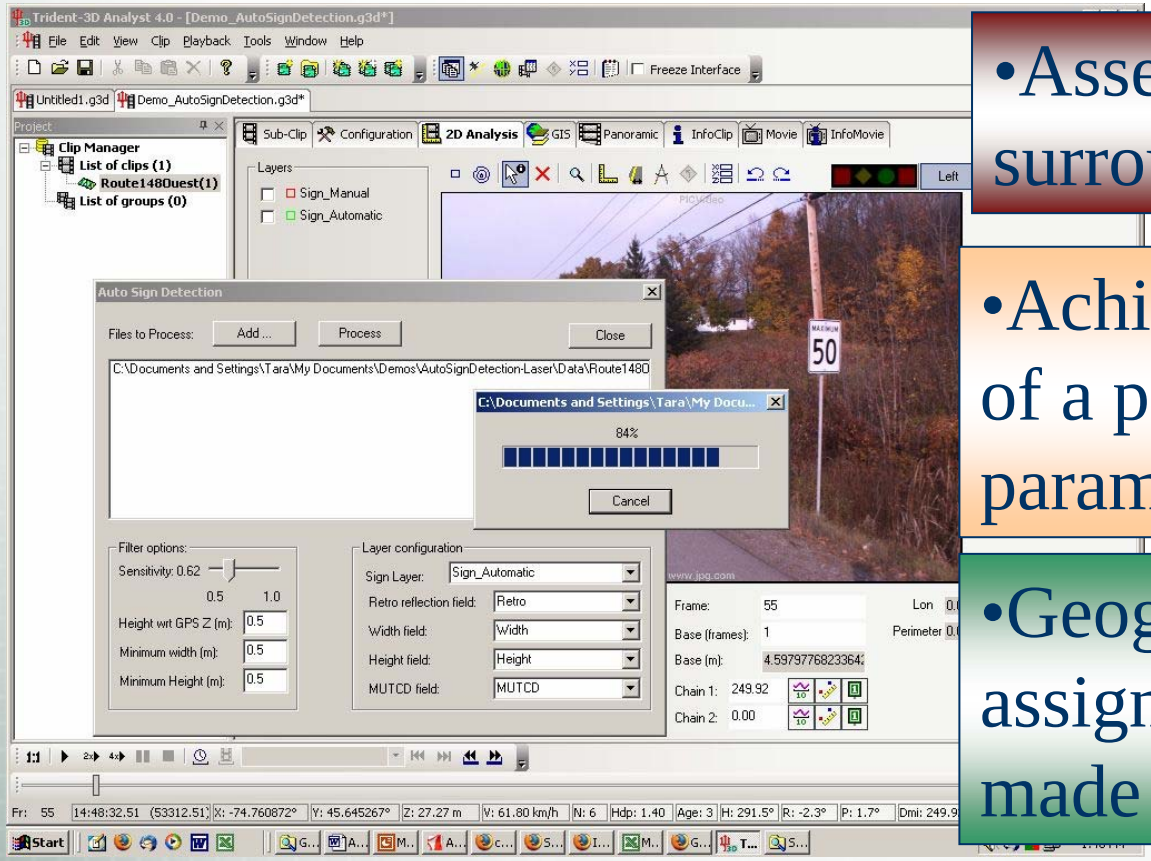
Automatic Asset Detection

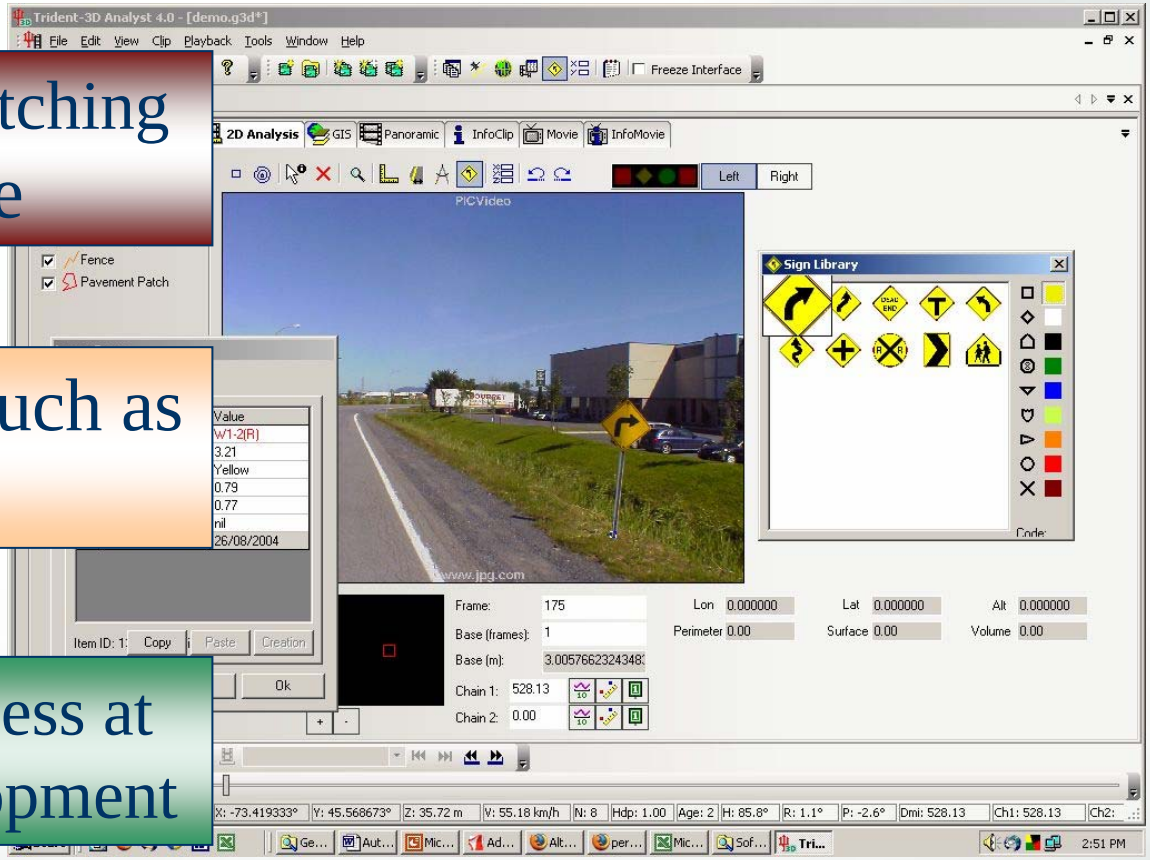


- Assets distinguished from surrounding environment
- Achieved through the use of a plurality of filters and parameters
- Geographical position assigned & measurements made

TRIDENT-3D - ANALYST

Automatic Asset Recognition

- Asset identified as matching template from database
- Road sign libraries such as MUTCD can be used
- Semi-automatic process at current stage of development



Preliminary Testing of Automation

- Survey performed on Route 148 in Quebec, Canada (between Lachute & Gatineau)
- Evaluation of precision, timing, detection and accuracy rates of automated technology vs. manual extraction

Preliminary Testing of Automation

TEST

- Length 23.7 miles (37.8 km)
- 416 signs detected, located and measured
- Processing time 90 sec

Verification + MUTCD

- 16 false detections (<9%)
- 1 missed sign (<1%)
- Time 45 min (15 sec/sign)

Automation
PRELIMINARY RESULTS

	Manual	Automatic
Detection / Locating / Measurement time	120 sec. / sign	15 sec. /sign
Detection rate	100 %	99 %
False detection	0 %	9 % (*urban)
Location precision*	Sub-Meter	Sub-Meter
Measurement accuracy	3% error	H:10% error W:30% error

Case study Projects

City of Tethford Mines, Quebec

- Determine Laser robustness
- Efficiency of solution in urban setting

Road profiling

- Determine street transverse slope
- Determine shoulder and ditches slopes

TRIDENT-3D APPLICATIONS

Other Applications for Automation

- Shoulder profiling
- Curb height measurements
- Clearance measurements
- Reflectivity measurements
- Cross section - Slope
- Limitless possibilities……

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DEMO Time !

TRIDENT-3D APPLICATIONS

- TRANSPORTATION & MUNICIPALITIES:
  - Inventory of infrastructures & assets
  - Automatic road sign detection and inventory
  - Safety equipment (guardrails, reflectors, etc.)
  - Traffic & street lights
  - Pavement lines, markings, etc.

DISTRIBUTION OF ELECTRICITY & TELECOMMUNICATIONS

- Geopositioning of poles
- Identification of plates such as IRD, etc.
- Equipment identification
- Etc.

Benefits

- **Cheaper, faster & safer than traditional surveying methods**
  - Reduces operational costs
  - Does not slow or impede traffic
  - No workers on the roadside
- **Availability**
  - Data is accessible throughout the year
  - Offers high level of operational & project management flexibility

Benefits

- **An integrated approach**
  - Open, modular & portable hardware
  - Tightly coupled link to GIS
  - Parallax created through use of single camera
  - User friendly & based on georeferenced image data
- **QA/QC & quality management**
  - Real time quality control during acquisition & extraction
  - ISO 9001

GEO-3D CONCLUSION

One Technology

CYCLOP-3D

Based on the use of CCD camera(s), positioning systems & photogrammetry

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