BeiDou Application on Precision Agriculture

2013.11

Xie Haizhong

Beidou Navigation Science and Technology Co., Ltd

Outline

- Concept of Precision Agriculture

- Core Unit of Our Product

  – Satellite Navigation Module

  – RTK OEM board

- BeiDou Realtime Precision Positioning Application On Chinese Agriculture

  – Guidance and Auto-Steering

  – Automatic Scraper

Concept of Precision Agriculture

Base on "3S"technology :

- Remote Sensing，RS
- Geography Information Systems，GIS
- Global Navigation Satellite Systems，GNSS

Followed by 5 rules:

- Right Time
- Right Quantity
- Right Location
- Right Manner
- Appropriate Input (Fertilizer, Water, Labor, Machine, Technology, etc.)

Core Unit1：BNGB-01
BD/GPS Dual-System Positioning Module

- BD B1, GPS L1 C/A；SBAS
- Channels: 36
- Accuracy Horizontal Position(RMS)：＜5 m
- Accuracy Altitude Position(RMS)：＜10 m
- Rate accuracy(RMS)：0.1 m/s
- Timing(RMS)1PPS: 100ns
- Time to First Fix (no stored position)：33s
- Time to First PPS (stationary with stored position, e.g., recovery after power outage)：21s
- Re-acquisition after 60-second signal loss : 1S
- Tracking Sensitivity：−157dBm
- Acquisition Sensitivity: -142dBm
- Dimensions : 16mm L×12.2mm W×2.2mm T
- Power Consumption : 125mA @ 3.3V
- Protocols : NMEA0183

Core Unit2: P307 OEM Modules

- Receiver Type: GNSS multi-frecuency RTK with
- carrier phase
- Signals Received: GPS, GLONASS, BeiDou, GALILEO1
- and QZSS
- Channels: 372
- GPS Sensitivity: -142 dBm
- SBAS Tracking: 3-channel, parallel tracking
- Update Rate: 1 Hz standard, 10 or 20 Hz
- optional

Accuracy:	Horizontal (RMS)	Vertical (RMS)
RTK:	10 mm + 1 ppm	20 mm + 2 ppm
SBAS (WAAS):	0.3 m	0.6 m
Autonomous, no SA:	1.2 m	2.5 m

- Timing (1PPS) Accuracy: 20 ns
- Cold Start:4 < 60 s typical (all unknown)
- Warm Start: < 30 s typical (no ephemeris)
- Hot Start: < 10 s typical (all known)
- HeadStart:5 Removeable, auto-recharging onboard
- clock battery
- Maximum Speed: 1,850 kph (999 kts)
- Maximum Altitude: 18,288 m (60,000 ft)
- Correction I/O Protocol: Hemisphere GNSS proprietary, ROX
- Format, RTCM v2.3, RTCM v3.2, CMR,
- CMR+
- Data I/O Protocol: NMEA 0183, Crescent binary

- Input Voltage: 3.3 VDC +/- 5%
- Power Consumption: < 2.55 W nominal dual frequency GPS
- + GLONASS + BeiDou
- Current Consumption: 770 mA nominal dual frequency GPS
- + GLONASS + BeiDou
- Antenna Voltage: 15 VDC maximum
- Operating Temperature: -40°C to +85°C (-40°F to +185°F)
- Storage Temperature: -40°C to +85°C (-40°F to +185°F)
- Dimensions
- P307: 72 L x 41 W x 13 H (mm)
- Weight: < 23 g (< 0.81 oz.)
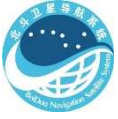
Application On Precision Agriculture

Rino: A series of guidance and auto-steering products

- Combination of BeiDou RTK positioning and auto steering technology
- Centimeter level precision
- Real-time measurement of position & orientation
- Vehicle can be guided to move in a straight line, curve or automated path on users` demands
- Accuracy of ridging, seeding, fertilizing, spraying, harvesting and other repeatable operations is guaranteed

www.unistrong.com

Application On Precision Agriculture

Rino: A series of guidance and auto-steering products

- 24-hour Operational Capability
- Reduce Labor-Intensity
- Reduce the Cost on Time
- Reduce Fuel Consumption
- Operation Data Management
- Increase Effective Arable Land Area

Application On Precision Agriculture

Rino: A series of guidance and auto-steering products

- Rino products have been widely installed in the northern part of China, including Heilongjiang, Xinjiang and Inner-Mongolia provinces.

www.unistrong.com

Application On Precision Agriculture

G110: Area Measurement Handheld

● Measure the area in a graphical view

● Easy to operate, friendly user interface

● Multi – measurement mode supported, Sloping surface supported

● Both AA and Li-ion battery supported

Application On Precision Agriculture

Geco：GNSS Automatic scraper

Advantages compared with the laser scraper:

●GNSS RTK

● Longer working distance (the distance between base station and rover is increased)：>10km

● Dual antennas can be used to measure the blade tilt to reduce the inaccuracy

Application On Precision Agriculture

Geco : GNSS Automatic scraper

- ±2cm+1ppm accuracy
- Increase the production and lower the water consumption
- Support all tractor modules, the height of blade is hydraulic controlled
- The working path can be recorded, and the data can be used for mapping
- 24 hours operation

www.unistrong.com

Conclusion

- Beidou product has been successfully applied on precision agriculture in China
  - The area measure, data collection and auto guidance have increased the farmers income;
  - From the application of scrapper, we have the conclusion: the performance of BD+GPS is much better than single GPS RTK;
- We believe that BD would be applied in many more fields of precision agriculture and China farmer would be benefit with the BD widely applications in future.

Thanks

E-mail: hz.xie@unistrong.com