GNSS Data Processing for High-Accuracy MADOCA-PPP using MAD-WIN and MADROID

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Objectives

• Learn how to process GNSS data for MADOCA-PPP using
  • MAD-WIN
    • MADOCA PPP for Windows OS
  • MADROID Software
    • MADDOCA PPP for Android Device
Position Accuracy and Errors

GNSS Position Accuracy:
- Red: Single Point Position
- Blue: DGPS, Code-Phase Observation
- Green: RTK, Carrier Phase Observation

GNSS Errors:
- Satellite Orbit Error
- Satellite Clock Error
- Ionospheric Delay
- Tropospheric Delay
- Receiver Clock Error
- Thermal Noise
- Multipath
Data Observation Methods for High-Accuracy

Data Observation Method for DGPS / RTK / PPK

- Recommended Base-length < 40Km
- Send Observation Data to Rover for Real-Time Position
- Base-Station Antenna is installed at a known-position
- For RTK, both base and rover receivers need to use data from the same satellites
- Use RINEX data for post-processing

Data Observation Method for MADOCA PPP

- QZSS
- GPS

Connection: Data, MADOCA & CLAS Signal

Rover
MAD-WIN Setup
MAD-WIN Setup

- Connect Antenna to the GNSS/MADOCA receiver using the provided antenna cable
- Connect the receiver to a windows PC using a “micro-USB to USB” cable
Install and Run MAD-WIN

➢ Download MAD-WIN software from UT
➢ Unzip the software to a folder
➢ Run “Madoca_win.exe” by double click from the MAD-WIN folder
➢ For easy access, create a Shortcut such as “Madoca_Win - Shortcut”
➢ Copy this “Madoca_Win - Shortcut” to desktop for easy access.
➢ Double click the Shortcut to run the application.
MAD-WIN Setup: Case A
Both GNSS and MADOCA Receivers are connected to your PC

1. Select COM Port for GNSS Receiver
2. Set Baud Rate = 115200
3. Set Data Format Type
   - UBX for u-blox receiver
   - SBF for MOSAIC receiver
   - RTCM3 for other receiver
4. Select COM Port for MADOCA receiver
5. Set Baud Rate = 57600
6. Set Data Format Type
   - UBX for F9/D9 receiver
   - SBF for MOSAIC receiver
   - RTCM3 for other receiver
7. GNSS Receiver
8. MADOCA Receiver
9. MAD-WIN
10. OUTPUT
MAD-WIN Setup: Case B
Only GNSS Receiver is connected to your PC

1. Select COM Port for GNSS Receiver
2. Set Baud Rate = 115200
3. Set Data Format Type
   - UBX for u-blox receiver
   - SBF for MOSAIC receiver
   - RTCM3 for other receiver
4. Input NTRIP Details
   - IP Address: 
   - Port: 
   - Mount Point: 
   - User ID: 
   - Password: 
5. Set Data Format Type
   - UBX for D9C Receiver
6. SBF for MOSAIC Receiver
7. RTCM3 for Other
8. MADOC A 2022
9. MADOCA Correction Data
10. Output
11. Slide: 9
MAD-WIN Setup: Case C

Both GNSS and MADOCA Receivers are located at a remote place

- **GNSS Receiver**
- **MADOCA Receiver**
- **Antenna**
- **GNSS Data**
- **MADOCA Correction Data**
- **MAD-WIN**

**Input NTRIP Details**
- IP Address:
- Port:
- Mount Point:
- User ID:
- Password:

**Set Data Format Type**
- UBX for D9C Receiver
- SBF for MOSAIC Receiver
- RTCM3 for Other

**MADOCA 2022**

- Connection
- Status
- Record
- About
- Rover (RX): Online (GNSS)
- Correction (OX): Online (MADOCA)
- PPP-Static
- PPP-Kinematic

**MADOCA 2022 Settings**

- Start/Stop
- Serial Port
- COM19
- Baud 1200
- NTRIP
- 123.456.78.90
- Port: 2101
- Mount Point: abcd
- User Name: user
- Password: ********

**Correction Settings**

- Input NTRIP Details
  - IP Address:
  - Port:
  - Mount Point:
  - User ID:
  - Password:

**Output**
MAD-WIN Setup: All Cases

1. Select STATUS Tab
   - Check that Solution is PPP or RTK PPP

2. Select RECORD Tab
   - Record Data
MADROID Setup
MADROID Setup: Receiver and Android Device

- Connect Antenna to the GNSS/MADOCA receiver using the provided antenna cable.
- Connect the receiver to an Android device using a “micro-USB to USB” cable and an OTG cable.
- OTG (On-The-Go) cable may be either Type-C or Micro-USB Type depending upon Android device’s connection port.
Install MADROID APP

Install MADROID APK in Android Device

- Get MADROID APK file from UT
- Connect Android device to the PC using an USB cable
- Set the device in Data Transfer mode
- Access Android device from PC
- Go to DOWNLOAD folder of Android device
- Copy MADROID file from PC to DOWNLOAD folder of Android device
- In the Android device, Go to File Manage APP
- Go to Download Folder. MADROID.apk file will be available here
- Tap the file, it will prompt for INSTALL access
- Say Yes and Install the APP
- After installation is done, go to device screens
- You will find the MADROID APP as shown here
- Run the APP and follow the instructions as shown in the next slide.
- Make sure that you have already connected Antenna, receiver etc. to the Android device before running the APP
- If ONLINE correction data will be used, make sure either WiFi or DATA is ON to access the NTRIP server via internet.
MADROID GUI: Use this setting for system test

**Connection**
Select USB (Options are 1. USB 2. Bluetooth)

**Device**
In the device the following must be visible if UT Receiver is connected:
- USB-Serial (Dual Channel) (Port 0)
- USB-Serial (Dual Channel) (Port 1)

**Format**
Select UBX to use GNSS Signals from UT Receiver connected to Android Device

**Correction Format**
Select UBX if MADOCA Correction data from UT receiver to be used
Select other format such as RTCM or BINEX if correction data are provided in RTCM or BINEX format

**Correction Source**
Select DX if correction data from the receiver connected to the Android device to be used
Select ONLINE if correction data from an ONLINE NTRIP server to be used
When ONLINE is selected, it is necessary to provide NTRIP related information such as IP Address, Port, Mount Point, User ID and Password.

**Rover Mode**
Select ROVER MODE either PPP STATIC or PPP KINEMATIC

**Elevation Mask**
Select ELEVATION MASK angle. Normally a mask angle of 10 - 15 degree is set.

**Local Correction**
Do not select Local Correction unless you are provided Local Correction NTRIP information.

**Start Rover**
Once all the settings are completed, select START ROVER. This will begin MADOCA PPP Observation.

**Status**
It shows current MADROCA PPP Status such as Position Data, Position Error etc.

**Skyplot**
Skyplot shows all visible satellites, C/No values and Position Data.
MADROID System Test Screen Shots

<table>
<thead>
<tr>
<th>Connection</th>
<th>USB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>USB-Serial (Dual Channel)</td>
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<tr>
<td>Format</td>
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<tr>
<td>Correction Format</td>
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<td>Processing Settings</td>
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<td>PPP-Static</td>
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<td>Antenna Model</td>
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<tr>
<td>Antenna Height (m)</td>
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</tbody>
</table>

- Use Local Correction

MADOCA PPP Receiver System based on Android
MADROID PPP with Local Correction Setup

NTRIP for MADoca Correction Data

Address: madoca.ntrip-mgm.net
Port: 2101
NTRIP for Local Correction Data

Address: madoca.ntrip-mgm.net
Port: 2101