The Reliability of Using GNSS Precise Point Positioning (PPP) For Replacing Conventional Network DGPS Positioning Techniques

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- Objectives
- PPP theory and application
- PPP RTKLIB Reliability and accuracy evaluation
- Unified Least Squares to Integrate DGNSS and PPP to Enhance the Accuracy for PPP
- Conclusions and recommendations
Establishing GNSS geodetic control networks for subsequent surveys can be a costly, difficult and/or time consuming process.

- **HARN of Egypt** with Spacing more than 200 km

- Different teams and GNSS Equipment and efficient plan to observe simultaneously GNSS network.
Egyptian Surveying Authority ESA has established the continuous operating reference stations network (CORS) along Nile valley and its Delta.

This CORS network consists of 40 stations spaced by distances that range from 50 km to 70 km.

This network with its limited coverage still available for ESA uses only.
Precise Point Positioning uses both undifferenced code range and carrier phase measurements, with respect to (International GNSS Service), precise GPS orbits, satellite clock corrections.

PPP improve the precision of the point position from “dm” to “cm” level positional accuracy.

PPP could provide useable geodetic survey control points in areas where it would costly, difficult or time consuming.
PPP packages, such as:

- RTKLIB (http://gpspp.sakura.ne.jp/rtklib/rtklib.htm)
- BERNESE
Adopting and Testing PPP to establish base station for geodetic survey control network across a large area.

Evaluating PPP accuracy and reliability with computing correlation coefficients between two pairs of results.

The research suggests and tests the use of GNSS network results with more than one receiver to enhance the accuracy of PPP from RTKLIB.
PPP (Precise Point Positioning)

- PPP is a positioning method that employs widely and readily available International (GNSS) orbit and clock correction products.
- The time a PPP solution takes to achieve sub-decimeter level accuracy is the greatest obstacle for using it as a real time world-wide high-accuracy GNSS positioning tool.
Errors that cancelled in DGPS positioning due to two receiver processing not cancelled in PPP solution and we must make an model to remove its effect

These errors are

- Ionosphere error
- Satellite orbital and clock error
- Tropospheric delay
- Receiver noise and earth tides errors
Undifferenced ionosphere-free linear combination of code and carrier-phase observations is used to remove the first-order ionospheric effect.

This linear combination, however, leaves a residual ionospheric delay of up to a few centimeters representing higher-order ionospheric terms.
Satellite orbital and clock errors can be accounted for using precise orbit and clock products from, for example, International GNSS Service (IGS).

Receiver clock error can be estimated as one of the unknown parameters.
Tropospheric delay

- Tropospheric delay can be accounted for using empirical models (e.g. Saastamoinen or Hopfield models) or by using tropospheric corrections derived from regional GPS networks.
The effects of ocean loading, Earth tide, carrier-phase windup, relativity, and satellite and receiver antenna phase-center variations can sufficiently be modeled or calibrated.
PPP Mathematical models

\[ P_1 = \rho + c(dt^r - dt^s) + T + \frac{q}{f_1^2} + \frac{s}{f_2^3} + c\left(d_{p1}^r - d_{p1}^s\right) + \varepsilon_{p1} \] (1)

\[ P_2 = \rho + c(dt^r - dt^s) + T + \frac{q}{f_2^2} + \frac{s}{f_2^3} + c\left(d_{p2}^r - d_{p2}^s\right) + \varepsilon_{p2} \] (2)

\[ \phi_1 = \rho + c(dt^r - dt^s) + T - \frac{q}{f_1^2} - \frac{s}{2f_1^3} + c\left(\delta_{r\phi1}^r - \delta_{s\phi1}^s\right) + \lambda_1[N_1 + \phi_{\phi1}^r(t_0) - \phi_{\phi1}^s(t_0)] + \varepsilon_{\phi1} \] (3)

\[ \phi_2 = \rho + c(dt^r - dt^s) + T - \frac{q}{f_2^2} - \frac{s}{2f_2^3} + c\left(\delta_{r\phi2}^r - \delta_{s\phi2}^s\right) + \lambda_2[N_2 + \phi_{\phi2}^r(t_0) - \phi_{\phi2}^s(t_0)] + \varepsilon_{\phi2} \] (4)

Where:

- \( P_1, P_2 \): Pseudorange measurements on L1 and L2 respectively
- \( \Phi_1, \Phi_2 \): Carrier-phase measurements on L1 and L2 respectively. Scaled to distance (m)
- \( \rho \): The true geometric range from receiver antenna phase-center at reception time to satellite antenna phase-center at transmission time (m)
- \( f_1, f_2 \): L1 and L2 frequencies, respectively
  \( (L1: f_1=1.57542 \text{ GHz}, \ L2: f_2=1.22760 \text{ GHz}) \)
- \( dt^r, dt^s \): Receiver and satellite clock errors, respectively
- \( T \): Tropospheric delay error
- \( \lambda_1, \lambda_2 \): The wavelengths for L1 and L2 carrier frequencies, respectively
- \( N_1, N_2 \): Integer ambiguity parameters for L1 and L2, respectively
- \( \delta_{r\phi1}^r, \delta_{s\phi1}^s \): Frequency-dependent carrier-phase hardware delay for receiver and satellite, respectively
- \( d_{r\phi1}^r, d_{s\phi1}^s \): Code hardware delay for receiver and satellite, respectively
- \( c \): Speed of light in vacuum
- \( \phi_{r}(t_0), \phi_{s}(t_0) \): Receiver and satellite non-zero initial phase bias, respectively
- \( q \): The total electron content integrated along the line of sight
- \( s \): The second-order ionospheric effect
- \( \varepsilon_{\phi1}, \varepsilon_{\phi2}, \varepsilon_{p1}, \varepsilon_{p2} \): The unmodelled error sources including orbital error, multipath effect and others
The ionosphere is computed by the ionosphere free linear combination between $L_1$ and $L_2$ so called ($L_3$ ionosphere free model),

The troposphere error is modeled using selected model of the following: Hopfield model, Saastamoinen model, and zenith troposphere delay (ZTD) model,

The solid earth tides and atmospheric loading and ocean tides are modeled using the model which recommended by IERS 1996,

The antenna phase center offset and variation for each satellite and receiver is modeled using IGS antenna calibration models.
PPP RTKLIB RELIABILITY AND ACCURACY EVALUATION

• Examine the reliability and assign the proper accuracy of the resulted PPP from RTKLIB.

• PPP solution from RTKLIB gives the position at every epoch with standard deviation of each component.

• Data taken with two dual frequency GNSS receivers (LEICA 1200) that occupied two marked points (base and rover) on a roof of building near Cairo for 24 hours with epochs every 1 second.

• The convergence time of RTKLIB PPP solution and the precision of position were evaluated

| Table 1: Standards deviations for Base and Rover determined using PPP solution |
|--------------------------|------------------|------------------|
| Station      | $\sigma_E$(m)  | $\sigma_N$(m)  | $\sigma_H$(m)  |
| Base         | $\pm0.0033$     | $\pm0.0062$     | $\pm0.015$     |
| Rover        | $\pm0.0033$     | $\pm0.0063$     | $\pm0.0151$    |
Figure 3: Variation of errors in E, N, and H for Rover Using PPP solution
PPP RTKLIB RELIABILITY AND ACCURACY EVALUATION

Figure 2: Variation of errors in E, N, and H for Base Using PPP solution
Table 2: Dates for GNSS observations at Base Station

<table>
<thead>
<tr>
<th>Session</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
<th>Session 6</th>
<th>Session 7</th>
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</thead>
<tbody>
<tr>
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<td>7/9/2012</td>
<td>7/10/2012</td>
<td>7/11/2012</td>
<td>7/12/2012</td>
<td>8/16/2012</td>
<td>8/25/2012</td>
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<table>
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<tr>
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<th>Session 9</th>
<th>Session 10</th>
<th>Session 11</th>
<th>Session 12</th>
<th>Session 13</th>
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<tbody>
<tr>
<td>Date</td>
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<td>8/27/2012</td>
<td>11/18/2012</td>
<td>11/19/2012</td>
<td>12/2/2012</td>
<td>12/3/2012</td>
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</tbody>
</table>

Table 3: Error in Easting Component Every Hour and at Each Day

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<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>One hour</td>
<td>-0.257</td>
<td>0.039</td>
<td>0.058</td>
<td>0.036</td>
<td>0.044</td>
<td>-0.174</td>
<td>0.094</td>
<td>0.054</td>
<td>0.104</td>
<td>0.126</td>
<td>0.095</td>
<td>-0.042</td>
<td>-0.177</td>
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<tr>
<td>two hours</td>
<td>-0.083</td>
<td>-0.035</td>
<td>-0.004</td>
<td>-0.010</td>
<td>-0.006</td>
<td>-0.059</td>
<td>0.063</td>
<td>0.029</td>
<td>0.055</td>
<td>0.086</td>
<td>0.068</td>
<td>-0.040</td>
<td>-0.064</td>
</tr>
<tr>
<td>three hours</td>
<td>-0.062</td>
<td>-0.050</td>
<td>-0.023</td>
<td>-0.025</td>
<td>-0.027</td>
<td>-0.050</td>
<td>0.050</td>
<td>0.028</td>
<td>0.044</td>
<td>0.092</td>
<td>0.070</td>
<td>-0.018</td>
<td>-0.029</td>
</tr>
<tr>
<td>four hours</td>
<td>-0.053</td>
<td>-0.042</td>
<td>-0.023</td>
<td>-0.021</td>
<td>-0.034</td>
<td>-0.044</td>
<td>0.042</td>
<td>0.024</td>
<td>0.040</td>
<td>0.084</td>
<td>0.055</td>
<td>-0.009</td>
<td>-0.018</td>
</tr>
</tbody>
</table>
## PPP RTKLIB RELIABILITY AND ACCURACY EVALUATION

### Table 4: Error in Northing Component Every Hour and at Each Day

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>One hour</td>
<td>-0.028</td>
<td>-0.005</td>
<td>-0.015</td>
<td>0.001</td>
<td>0.003</td>
<td>-0.019</td>
<td>-0.011</td>
<td>-0.016</td>
<td>0.026</td>
<td>-0.045</td>
<td>-0.048</td>
<td>0.076</td>
<td>0.080</td>
</tr>
<tr>
<td>two hours</td>
<td>-0.019</td>
<td>-0.001</td>
<td>-0.020</td>
<td>-0.010</td>
<td>-0.010</td>
<td>-0.007</td>
<td>0.011</td>
<td>0.007</td>
<td>0.036</td>
<td>-0.046</td>
<td>-0.039</td>
<td>0.045</td>
<td>0.054</td>
</tr>
<tr>
<td>three hours</td>
<td>-0.012</td>
<td>-0.003</td>
<td>-0.018</td>
<td>-0.010</td>
<td>-0.006</td>
<td>-0.006</td>
<td>0.015</td>
<td>0.012</td>
<td>0.033</td>
<td>-0.036</td>
<td>-0.034</td>
<td>0.031</td>
<td>0.035</td>
</tr>
<tr>
<td>four hours</td>
<td>-0.009</td>
<td>-0.003</td>
<td>-0.018</td>
<td>-0.010</td>
<td>-0.008</td>
<td>-0.006</td>
<td>0.014</td>
<td>0.012</td>
<td>0.030</td>
<td>-0.030</td>
<td>-0.029</td>
<td>0.027</td>
<td>0.030</td>
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</table>

### Table 5: Error in Height Component Every Hour and at Each Day

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>One hour</td>
<td>-0.227</td>
<td>-0.002</td>
<td>-0.021</td>
<td>0.012</td>
<td>0.001</td>
<td>-0.125</td>
<td>0.012</td>
<td>0.008</td>
<td>0.030</td>
<td>0.173</td>
<td>0.250</td>
<td>0.032</td>
<td>-0.140</td>
</tr>
<tr>
<td>two hours</td>
<td>-0.013</td>
<td>-0.028</td>
<td>-0.055</td>
<td>-0.040</td>
<td>-0.024</td>
<td>-0.065</td>
<td>-0.043</td>
<td>-0.028</td>
<td>0.152</td>
<td>0.158</td>
<td>0.018</td>
<td>-0.010</td>
<td></td>
</tr>
<tr>
<td>three hours</td>
<td>0.017</td>
<td>-0.032</td>
<td>-0.065</td>
<td>-0.056</td>
<td>-0.016</td>
<td>-0.077</td>
<td>-0.055</td>
<td>-0.047</td>
<td>0.151</td>
<td>0.143</td>
<td>0.034</td>
<td>0.017</td>
<td></td>
</tr>
<tr>
<td>four hours</td>
<td>0.022</td>
<td>-0.017</td>
<td>-0.056</td>
<td>-0.053</td>
<td>-0.020</td>
<td>-0.003</td>
<td>-0.079</td>
<td>-0.054</td>
<td>-0.050</td>
<td>0.136</td>
<td>0.114</td>
<td>0.036</td>
<td>0.025</td>
</tr>
</tbody>
</table>

### Table 6: Standard Deviation (Accuracy) for Easting, Northing, and Height for RTKLIB PPP

<table>
<thead>
<tr>
<th>hours</th>
<th>E</th>
<th>N</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>One hour</td>
<td>±0.124</td>
<td>±0.040</td>
<td>±0.123</td>
</tr>
<tr>
<td>two hours</td>
<td>±0.056</td>
<td>±0.030</td>
<td>±0.072</td>
</tr>
<tr>
<td>three hours</td>
<td>±0.050</td>
<td>±0.024</td>
<td>±0.073</td>
</tr>
<tr>
<td>four hours</td>
<td>±0.044</td>
<td>±0.021</td>
<td>±0.066</td>
</tr>
</tbody>
</table>
PPP RTKLIB RELIABILITY AND ACCURACY EVALUATION

\[ r_{xy} = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}} \]

Figure 4: Correlation Coefficients for heights of July9 and July10
Figure 5: Correlation Coefficients for Easting from 78 Pairs
Figure 6: Correlation Coefficients for Northing from 78 Pairs
Figure 7: Correlation Coefficients for Height from 78 Pairs
PPP RTKLIB RELIABILITY AND ACCURACY EVALUATION

Figure 8: Latitude for July 10 versus Latitude for December 2 (Correlation coefficient =0.95)
Figure 9: Latitude for July 8 versus Latitude for August 27 (Correlation coefficient = 0.09)
Table 7: Baselines components $\Delta X$, $\Delta Y$, and $\Delta Z$ observed from DGNSS

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>$\Delta X$ (m)</th>
<th>$\sigma_{\Delta X}$ (m)</th>
<th>$\Delta Y$ (m)</th>
<th>$\sigma_{\Delta Y}$ (m)</th>
<th>$\Delta Z$ (m)</th>
<th>$\sigma_{\Delta Z}$ (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>E</td>
<td>96767.463</td>
<td>0.0027</td>
<td>-47890.021</td>
<td>0.0012</td>
<td>-101386.408</td>
<td>0.0015</td>
</tr>
<tr>
<td>R</td>
<td>B</td>
<td>37181.146</td>
<td>0.0015</td>
<td>-93114.271</td>
<td>0.0011</td>
<td>27841.487</td>
<td>0.0011</td>
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<tr>
<td>R</td>
<td>C</td>
<td>38612.247</td>
<td>0.0005</td>
<td>-35608.304</td>
<td>0.0004</td>
<td>-24818.854</td>
<td>0.0003</td>
</tr>
<tr>
<td>B</td>
<td>C</td>
<td>1431.101</td>
<td>0.0005</td>
<td>57505.968</td>
<td>0.0004</td>
<td>-52660.341</td>
<td>0.0003</td>
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<tr>
<td>E</td>
<td>C</td>
<td>-58155.216</td>
<td>0.0005</td>
<td>12281.717</td>
<td>0.0004</td>
<td>76567.554</td>
<td>0.0003</td>
</tr>
<tr>
<td>E</td>
<td>B</td>
<td>-59586.317</td>
<td>0.0015</td>
<td>-45224.250</td>
<td>0.0011</td>
<td>129227.895</td>
<td>0.0011</td>
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</tbody>
</table>
UNIFIED LEAST SQUARES TO INTEGRATE DGNSS AND PPP TO ENHANCE THE ACCURACY FOR PPP

\[ A\bar{X} + B\bar{L} + W = 0 \]
\[ A(x + V_X) + B(L + V) + W = 0 \]
\[ AV_X + BV + W_t = 0 \]
\[ W_t = W + Ax + BL \]
\[ B_t V_t + W_t = 0 \]

\[ V_t = \begin{bmatrix} V_X \\ V \end{bmatrix} \]
\[ B_t = \begin{bmatrix} A & B \end{bmatrix} \]
\[ Q_t = \begin{bmatrix} Q & 0 \\ 0 & Q_x \end{bmatrix} \]
UNIFIED LEAST SQUARES TO INTEGRATE DGNSS AND PPP TO ENHANCE THE ACCURACY FOR PPP

\[
\Delta \bar{X}_{ij} - \bar{X}_i + \bar{X}_j = 0
\]
\[
\Delta \bar{Y}_{ij} - \bar{Y}_i + \bar{Y}_j = 0
\]
\[
\Delta \bar{Z}_{ij} - \bar{Z}_i + \bar{Z}_j = 0
\]
where, \( i=1,2,3,\ldots \) and \( J=i+1 \)

or:

\[
(\Delta X_{ij} + V\Delta X_{ij}) - (X_i + VX_i) + (X_j + VX_j) = 0
\]
\[
(\Delta Y_{ij} + V\Delta Y_{ij}) - (Y_i + VY_i) + (Y_j + VY_j) = 0
\]
\[
(\Delta Z_{ij} + V\Delta Z_{ij}) - (Z_i + VZ_i) + (Z_j + VZ_j) = 0
\]

which yields:

\[
V\Delta X_{ij} - VX_i + VX_j + WX_{tij} = 0
\]
\[
V\Delta Y_{ij} - VY_i + VY_j + WY_{tij} = 0
\]
\[
V\Delta Z_{ij} - VZ_i + VZ_j + WZ_{tij} = 0
\]
Table 8: Residuals VX, VY, and VZ from Unified Least Squares for PPP Solution of GNSS Control Points After 4 and 3 Hours

<table>
<thead>
<tr>
<th></th>
<th>VX</th>
<th>VY</th>
<th>VZ</th>
<th>VX</th>
<th>VY</th>
<th>VZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>BADR</td>
<td>-0.0157</td>
<td>0.0018</td>
<td>-0.0197</td>
<td>-0.0209</td>
<td>-0.0073</td>
<td>-0.0204</td>
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<tr>
<td>CARO</td>
<td>-0.0040</td>
<td>0.0057</td>
<td>-0.0030</td>
<td>-0.0067</td>
<td>-0.0025</td>
<td>-0.0037</td>
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<tr>
<td>ETSA</td>
<td>0.0046</td>
<td>-0.0234</td>
<td>0.0129</td>
<td>0.0179</td>
<td>-0.0057</td>
<td>0.0159</td>
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<tr>
<td>RMDN</td>
<td>0.0150</td>
<td>0.0159</td>
<td>0.0098</td>
<td>0.0097</td>
<td>0.0155</td>
<td>0.0083</td>
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Table 9: Residuals VX, VY, and VZ from Unified Least Squares for PPP Solution of GNSS Control Points After 2 and 1 Hours

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<tr>
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<th>VX</th>
<th>VY</th>
<th>VZ</th>
<th>VX</th>
<th>VY</th>
<th>VZ</th>
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</thead>
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<tr>
<td>BADR</td>
<td>-0.0208</td>
<td>-0.0155</td>
<td>-0.0232</td>
<td>-0.0288</td>
<td>0.0143</td>
<td>-0.0308</td>
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<tr>
<td>CARO</td>
<td>-0.0125</td>
<td>-0.0172</td>
<td>-0.0117</td>
<td>-0.0230</td>
<td>-0.0150</td>
<td>-0.0290</td>
</tr>
<tr>
<td>ETSA</td>
<td>0.0253</td>
<td>0.0188</td>
<td>0.0311</td>
<td>0.0552</td>
<td>0.0034</td>
<td>0.0771</td>
</tr>
<tr>
<td>RMDN</td>
<td>0.0081</td>
<td>0.0140</td>
<td>0.0038</td>
<td>-0.0034</td>
<td>-0.0026</td>
<td>-0.0174</td>
</tr>
</tbody>
</table>
# Unified Least Squares to Integrate DGNSS and PPP to Enhance the Accuracy for PPP

## Table 10: Standard Deviations $s_X$, $s_Y$, and $s_Z$ from Unified Least Squares for PPP Solution of GNSS Control Points after 4 and 3 Hours

<table>
<thead>
<tr>
<th></th>
<th>4 HOURS</th>
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<th>3 HOURS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$s_X$</td>
<td>$s_Y$</td>
<td>$s_Z$</td>
<td>$s_X$</td>
</tr>
<tr>
<td>BADR</td>
<td>±0.024</td>
<td>±0.010</td>
<td>±0.028</td>
<td>±0.027</td>
</tr>
<tr>
<td>CARO</td>
<td>±0.024</td>
<td>±0.010</td>
<td>±0.028</td>
<td>±0.027</td>
</tr>
<tr>
<td>ETSA</td>
<td>±0.024</td>
<td>±0.010</td>
<td>±0.028</td>
<td>±0.027</td>
</tr>
<tr>
<td>RMDN</td>
<td>±0.024</td>
<td>±0.010</td>
<td>±0.028</td>
<td>±0.027</td>
</tr>
</tbody>
</table>

## Table 11: Standard Deviations $s_X$, $s_Y$, and $s_Z$ from Unified Least Squares for PPP Solution of GNSS Control Points after 2 and 1 Hours

<table>
<thead>
<tr>
<th></th>
<th>2 HOURS</th>
<th></th>
<th>1 HOURS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$s_X$</td>
<td>$s_Y$</td>
<td>$s_Z$</td>
<td>$s_X$</td>
</tr>
<tr>
<td>BADR</td>
<td>±0.030</td>
<td>±0.014</td>
<td>±0.035</td>
<td>±0.054</td>
</tr>
<tr>
<td>CARO</td>
<td>±0.030</td>
<td>±0.014</td>
<td>±0.035</td>
<td>±0.054</td>
</tr>
<tr>
<td>ETSA</td>
<td>±0.030</td>
<td>±0.014</td>
<td>±0.035</td>
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</tr>
<tr>
<td>RMDN</td>
<td>±0.030</td>
<td>±0.014</td>
<td>±0.035</td>
<td>±0.054</td>
</tr>
</tbody>
</table>
GNSS has now become a preferred tool for establishing or upgrading geodetic survey control networks.

These networks are established using many geodetic-quality dual frequency carrier-phase GNSS receivers and antennas, where multiple sites should be occupied simultaneously.

This network-based approach makes the task rather costly in terms of not only equipment and personnel, but also careful pre-planning and in field logistical considerations.

Precise point positioning PPP could provide useable geodetic survey control points in remote areas.

PPP is suitable for current Horizontal control in Egypt, since the available HARN stations or even first order stations (if exist) had distributed in distances exceed 200km.
The accuracy is remarkably enhanced with increasing occupation time from one hour to four hours.

The reliability was evaluated with computing correlation coefficients between two pairs of results.

The estimated correlation coefficients for easting, northing and height for each two pairs of PPP results from RTKLIB range from -1 to +1 with some values close to zero.

The correlation coefficients indicate that only 60% of the easting results, 21% of the northing results and 40% of height results are with high reliability.

PPP solution from RTKLIB is with medium reliability and no guarantee that the solution would be stable if repeated at different time with same occupied time

The results show that the stable correlation coefficients reach after one hour from the start time.
Conclusions

- The research suggested and tested the use of GNSS network results with more than one receiver to enhance the accuracy of PPP from RTKLIB.

- With applying unified least squares for six baselines and four control points, the accuracy of control points from PPP improved by 50% for all coordinates components.

- It is recommended to use One of the control points solved through unified least squares with its enhanced coordinates to be base for DGNSS final solution.

- Finally, Such PPP solution and enhancement is highly recommended specially for the new development regions without available control points.
Thank You