GPS SOLUTIONS FOR ROADS:
DIFFERENT GPS OPERATION TYPES AND APPLICATIONS

SOLUTII GPS PENTRU DRUMURI: DIFERITE TIPURI DE OPERATII GPS SI APLICATII

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Abstract: All GPS Surveying is carried out using differential techniques. That is to say a baseline is measured from a fixed point, (a reference station) to an unknown point (a rover station). This is undertaken using one of two methods: - Post Processing - The raw GPS data from the satellites is recorded and processed in the office using software; Real Time - The processing of the data is carried out as you work, giving an instantaneous and accurate position

Rezumat: Toate GPS-urile utilizează diferite tehnici de măsurare. Aceasta este să spunem o bază măsurată de la un punct fix, (stație de referință) către un punct necunoscut( rover mobil). De acea putem discuta de două metode: - Post procesare - Datele brute de la sateliții sunt înregistrate și procesate la birou cu softul specific; Real time - Procesarea datelor de face direct pe teren obținând direct acuratețea de cm.

Key word: Stop and go/kinematics methods, real time, post processing
Cuvinte cheie: metodele stop and go/ cinematica, timp real, post procesare

INTRODUCTION
• Using GPS for Surveying
• Static
• Rapid Static
• Stop and Go/Kinematic
• Real Time
• Accuracy and Observation Time

MATERIAL AND METHOD
Static Survey (STS)
- The classical method for long lines and the highest accuracy 3mm + 1ppm baseline
- The observation time is proportional to the length of the line
- Standard method for lines over 20 Km

Figure 1: Static Survey (STS)
Applications:
- Geodetic control over large areas
- National and continental networks
- Monitoring tectonic movement
- Network adjustments for highest accuracy

**Rapid Static Survey (STS) - 1/2**
- Short observation time for baselines up to 20 km. Accuracy is 5-10 mm + 1 p

![Rapid Static Survey (STS) - 1/2](image1)

Applications:
- Control Surveys, GIS city inventories, detail surveys. Replace traversing and local triangulation. Any job where many points have to be surveyed

Advantages
- Easy, quick, efficient
- Ideal for short range survey

**Rapid Static Survey (STS) - 2/2**
- 1 Reference and 1 Rover

![Rapid Static Survey (STS) - 2/2](image2)
2 References and 1 Rover

![Figure 4. Rapid Static Survey (STS) - 2/2 (2 References and 1 Rover)](image1)

1 Reference and 1 Rover (leap frog)

![Figure 5. Rapid Static Survey (STS) - 2/2 (1 Reference and 1 Rover (leap frog))](image2)

**Stop and Go Survey / Kinematic - 1/2**

Kinematik mode with static intervals Accuracy is 10 - 20 mm + 1 ppm Stop Mode
- Before the survey begins, the rover is required to resolve the ambiguities.
- The ambiguities are resolved using one of three techniques
  - Initialization on the fly
  - Static initialization
  - Initialization on a known point
Stop and Go Survey / Kinematic - 2/2

**Go Mode**
- Once enough data is collected to resolve the ambiguities, user can now move the receiver.
- Lock must be maintained on a minimum of 4 satellites at all time.
- Each point visited requires only 1 epoch of data.
- If lock is lost, the system must re-initialize.

Applications:
- Detail and engineering surveys in open areas.

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Real Time
Real Time Code, Real Time Phase
- No post processing required
- Results are instantly available.
- Can operate in two modes:
  - RTK
  - RT-DGPS
CONCLUSION

Accuracy and Observation Times

Table 1.

### Accuracy and Observation Times

<table>
<thead>
<tr>
<th>Static</th>
<th>Baseline Length</th>
<th>Number of Satellites</th>
<th>GDOP</th>
<th>Observation Time</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 - 50 Km</td>
<td>≥ 4</td>
<td>≤ 6</td>
<td>2 - 3 hr</td>
<td>3 mm + 1 ppm</td>
</tr>
<tr>
<td></td>
<td>50 - 100 Km</td>
<td>≥ 4</td>
<td>≤ 6</td>
<td>min. 3 hr</td>
<td>3 mm + 1 ppm</td>
</tr>
<tr>
<td></td>
<td>&gt; 100 Km</td>
<td>≥ 4</td>
<td>≤ 6</td>
<td>min. 4 hr</td>
<td>3 mm + 1 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rapid Static</th>
<th>Baseline Length</th>
<th>Number of Satellites</th>
<th>GDOP</th>
<th>Observation Time</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 5 Km</td>
<td>≥ 4</td>
<td>≤ 5</td>
<td>5 - 10 min</td>
<td>5 - 10 mm + 1 ppm</td>
</tr>
<tr>
<td></td>
<td>5 - 10 Km</td>
<td>≥ 4</td>
<td>≤ 5</td>
<td>10 - 15 min</td>
<td>5 - 10 mm + 1 ppm</td>
</tr>
<tr>
<td></td>
<td>10 - 20 Km</td>
<td>≥ 4</td>
<td>≤ 5</td>
<td>10 - 20 min</td>
<td>5 - 10 mm + 1 ppm</td>
</tr>
</tbody>
</table>

BIBLIOGRAFY

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