MUTUAL RADIO COMMUNICATION (BASE AND ROVER ROVER BASE) TYPE IN RTK GPS MEASUREMENTS

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Abstract: *In this article, the authors present some of the new facilities offered by GPS technology producers in RTK (Real Time Kinematic) measurements. This facilities give to the users more flexibility and implicit more efficiency in the field measurements. In the article, are presented especially the practical consequences of the mutual radio communication facilities: rover–base and base-rover. In this article, the authors present some of the new facilities offered by GPS technology producers in RTK (Real Time Kinematic) measurements. This facilities give to the users more flexibility and implicit more efficiency in the field measurements. In the article, are presented especially the practical consequences of the mutual radio communication facilities: rover–base and base-rover. Specific RTK GPS measurements with impressive efficiency. Thus, GPS users will not stay in the point which planimetric and altimetric desired position than is strictly necessary time. Can be 10, 20 seconds or can be 2 or 3 minutes (depending on various factors among which we mention here: the type of receiver used (one or two frequencies, the radio communication uni-directional or bi-directional, etc..) quality radio modems, mobile station distance (rover) GPS base (base) satellite configuration (including geometric) degree of obstruction both in the base and the rover GPS receiver latency (that depends on the frequency of collection data, emission-transmission and reception of differential corrections) and not least the degree of fixation / tracking (tracking) on the same satellites as the base station and rover station. Modern techniques for rapid problem solving ambiguities (on the fly ambiguities Techniques) also allow time to obtain full position (tens of seconds) the stationary point accuracy indicators that can be improved by increasing the retention time. Of course, RTK positioning accuracy measurements depends almost entirely on the accuracy and precision of determining the support network (its points serve as control points for stays basis). In what follows, we start from the premise priori existence of a network to support well designed and well implemented in the measurements.Great GPS equipment manufacturers have implemented solutions bi-directional radio communication mainly due to the need for real-time synchronization of base stations to the rover. The two receivers to simultaneously collect GPS data from the same sources specific space (same satellites) so that synchronization is vital to the whole process. Configuration of satellites received by the base radio is sent as a binary rover's list and it must "comply" and engage in terms of the same satellite signal received from that configuration.*

Key words**:** *mutual radio communication, GPS mesurements*

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There are two possible situations:

1. comunicarea is uni-directional from the base to the rover. In this case, the transmission of satellite configuration must be done continuously (with differential corrections thereto) by the base to allow the rover to synchronize in real time when needed. If an interruption (temporary or not) GPS signal from one or more satellites either by base or the rover, the latter is able to adjust / sync with the base so that the measurement to be equal. The process is deficient to the extent that the rover is in this case fully subordinated basis and also can know the rover's status.

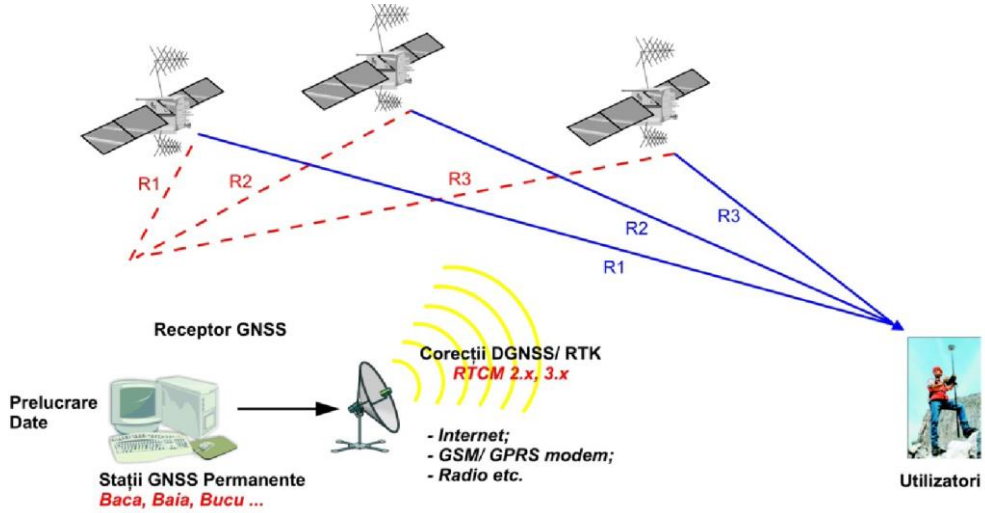

Fig. 1: Radio Communication uni-directional and bi-directional Base-Rover

2. To communicate bi-directionally is the base to the rover and rover to the base. Satellite radio transmission pattern to be followed (the tracking) occurs only when the (configuration) changes. Rover is now able to communicate their base state. Two-way radio communication advantages are many, but in this article we want to highlight in particular one of them a

practical advantage with deeper meanings. If receivers have implemented this feature radio communication reciprocal rover can temporarily play the role of the base. For tens of seconds or minutes rover becomes the transmits basic differential corrections. Base is the same time the rover receives differential corrections. Of course, this makes sense only if the rover GPS receiver has implemented both hardware and software modules for determining and processing differential corrections.

We illustrate this advantage by a particular case, which can be found in geodetic practice everyday.

Whether support network in Figure 2, the optimal network covering the area where you want to raise specific points measurements with RTK (real time positioning). In Figure 2, shows a portion of the support network, which will determine the new points by RTK measurements.

How classic is initialized based on a point of support network. Coordinate differences time differences, differences that are sent to the rover radio to be applied to all stationary points are transformed into three-dimensional vector of the differences. It is immediately measured in RTK mode (see Figure 3).

Corrections are applied each received three-dimensional pseudo-range measurements so that each item measured is corrected by the same three-dimensional vector (see Fig. 4).

The correction makes sense as long as both base and rover receive measurement signals from the same satellites (both relate to the same configuration receivers satellite). Finally, the rover will stop another checkpoint support network to ensure control measurements (see Fig. 4).

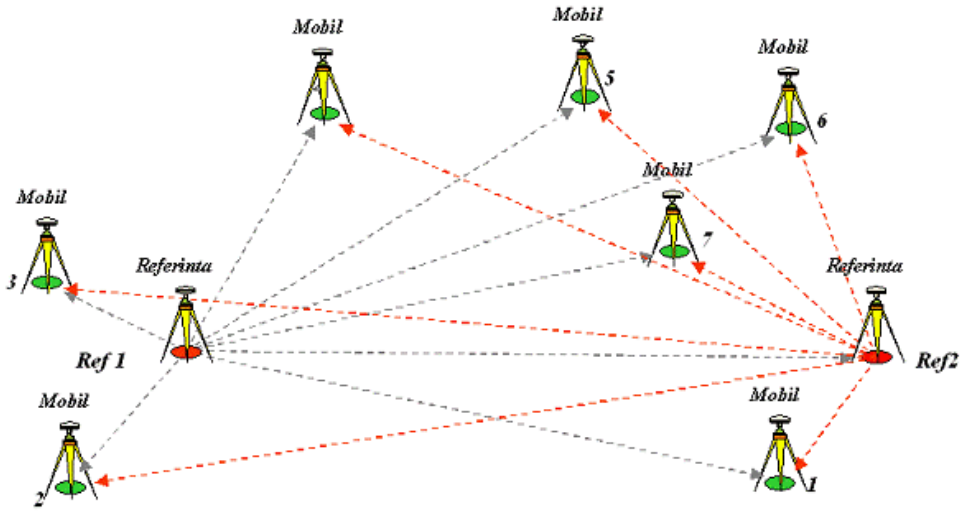

Fig. 2: Support Network RTK measurement type

The following presents a different scenario, the possibility rover's possible just to transmit differential corrections. Suppose that we start from this date measurements even from a new point. Is when the checkpoint (support network) is a few miles (no more than 10 km. Because otherwise violate assumptions in the method of differential corrections) to us and so

the location of a base point also proves to be difficult in terms of resources (time, human resources, material resources, transportation, and so on).

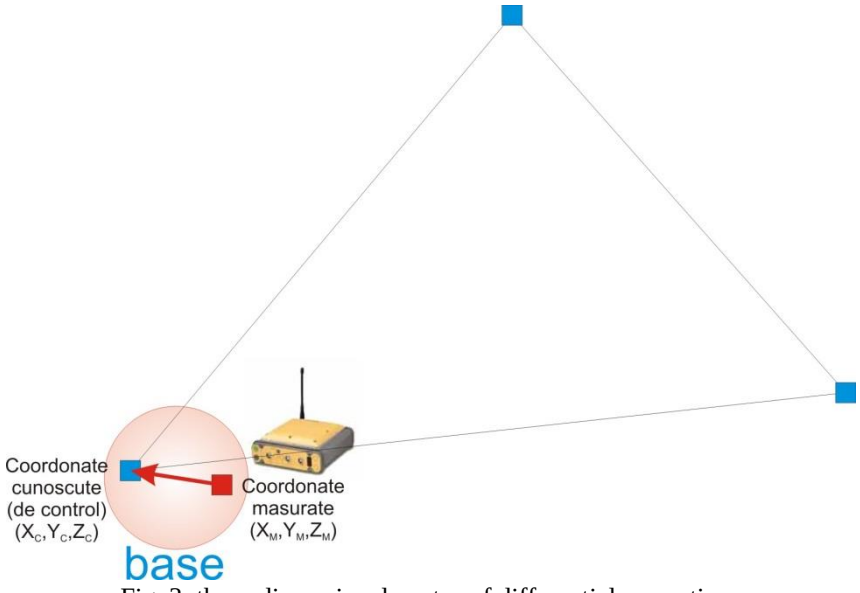

Fig. 3: three-dimensional vector of differential corrections

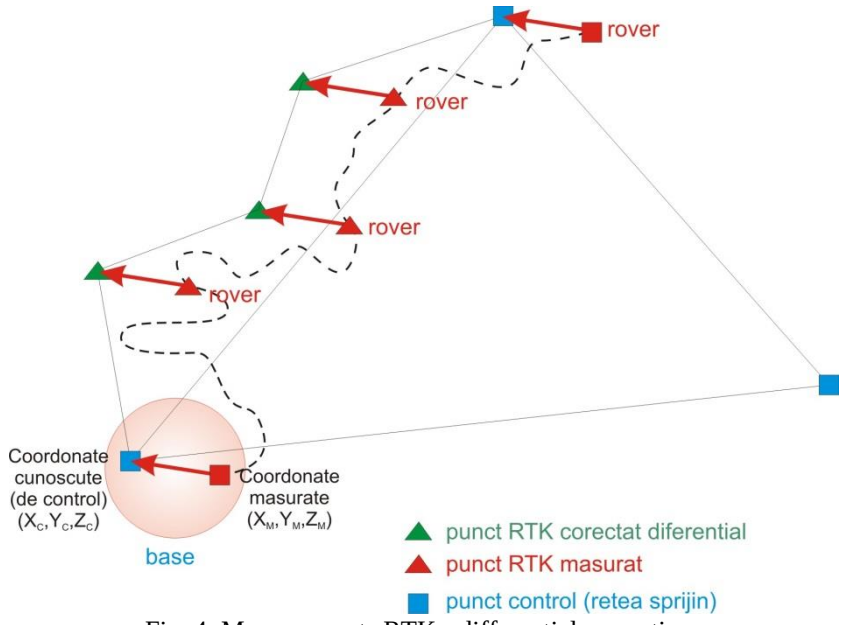

Fig. 4: Measurements RTK - differential corrections

If radio communication receivers allow mutual and implemented both hardware and software modules for determining, processing and transmission of differential corrections, then we can proceed as follows:

1. Coordinates support load controllers GPS using dedicated software provided by the manufacturer company.
2. Located right on a point basis and communicate new software controller that point that we are NOT checkpoint. If the controller in the following figure, choose Autopia (self-positioning - positioning autonomous, non-constrained see Figure 5):

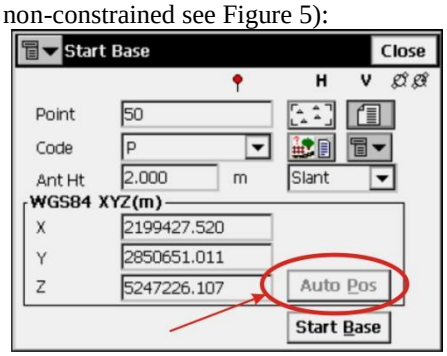

Fig. 5: RTK - differential corrections

3. RTK measurement process is performed for each desired point. In this case we have no differential corrections (see Figure 6).

4. When we reach a point of support network, enter its name as the name of the list even point coordinates loaded (see step 1 above). Controller senses overlap and allows the user to compute three-dimensional vector of differential corrections (see Figure 7). If you choose this option, the rover determined from the vector that transmits the differential correction base. Thus temporarily becomes basic rover and the rover became briefly.

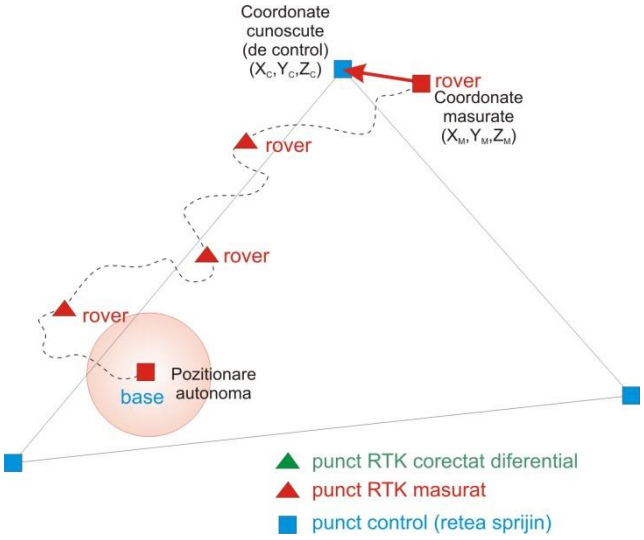

Fig. 6: RTK independent (unconstrained)

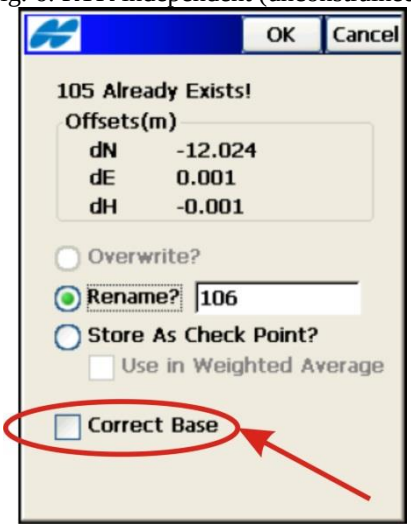

Fig. 7: The correction of base

4. If the user chooses the correct base when the radio receives differential corrections and corrects all previously measured points (see Figure 8);

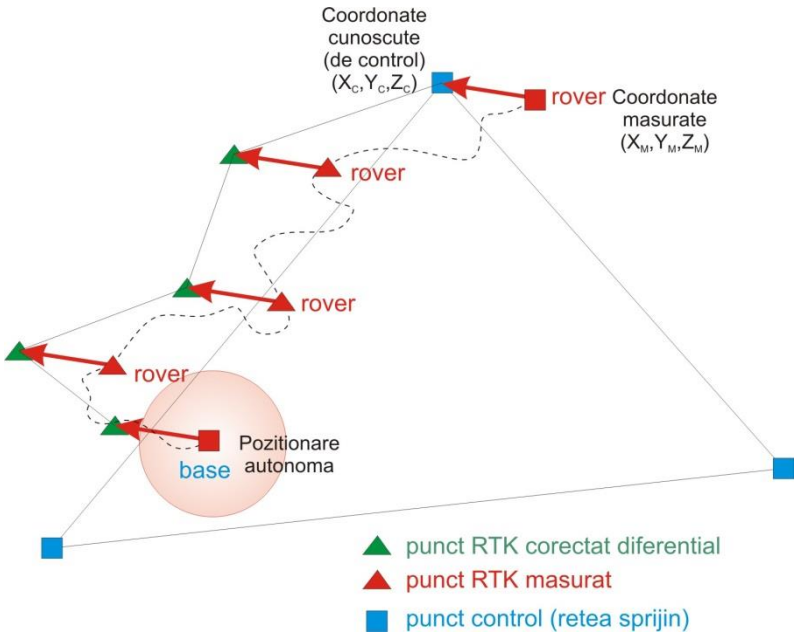

Fig. 8: The correction of any new points

In conclusion, with the support facility RTK GPS receivers to communicate in both directions (base-rover and rover-base) can be useful geodetic engineers, especially in saving resources involved in RTK measurement processes over large areas.

It must however be noted that such a process of reverse correction new points measured by RTK method requires a great deal of attention and in addition, it is mandatory closing another checkpoint support network (other than intermediate used in obtaining differential corrections).

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