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ASPECTS REGARDING AUTOMATION OPTION IN WORKING WITH TOTAL STATION PRISMS

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Abstract

Our project consists in studying the possibilities of increasing the degree of automation in using prisms, measuring with a Total Station, with the purpose of increasing the efficiency of measuring. Basically the project presents an automat-tripod for the prism, which will automatically verticalize the prism pole, bringing it in the correct position for measuring. The automat-tripod has 2 gravitational sensors, a microcontroller and 2 motors that extend the 2 legs of the tripod in order to realize the verticalisation of the pole. Realizing this invention would lead to minimise errors produced by incorrect position of the prism in the moment of the measurement, and also, in case of using more than one prism, a technician can manipulate more prisms on automat-tripod, which means increasing work productivity.

Key words: *Total Station Prism, verticalisation of the pole , invention, minimise errors.*

INTRODUCTION

From the Total stations we can automatically control the stalling, the focusing and targeting signal. The verticalization of the prism is the last element of the measurement process and it is done manually without automatic control. This element may be the principal cause for errors. Supporting the prism is usually performed by unskilled workers so that the most vulnerable place (conceptually error) is most often left for an unprepared person in the field.

MATERIALS AND METHODS

In order to design the automat-prism were used computer-aided design techniques. (C.C. Teresneu, M. Ionescu., 2011). Up to this point have been studied three designs for automatic-prism; for each design calculations and simulation were executed to cover a range for possible implementation. In this paper we will expand the study on one of the three versions.

RESULTS AND DISCUSSIONS

The design we propose for the automat-tripod is using same type of prism pole to which is attached a support. (Figure1.)

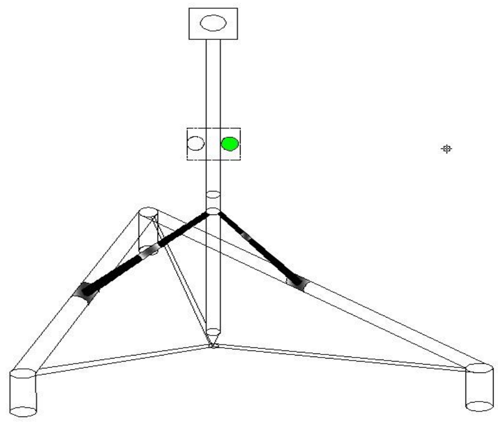

Figure1. Automat prism

The support is describing a triangle shape (without a side) equilateral with sides of 30 cm, in corners with 3 feet high by 10 cm (Figure 2.).

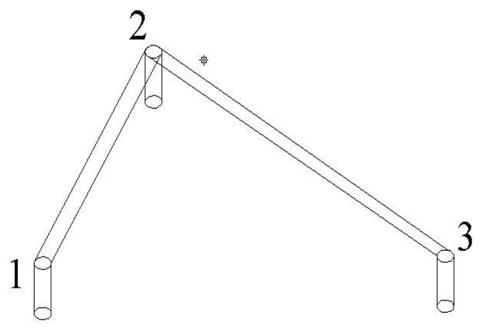

Figure 2. The suport

From the triangle tops go 3 fixed arms that come together in the projection of the orthocentre of the triangle on the ground, point that will be the top of the pole and the point where the prism is installed (Figure 3).

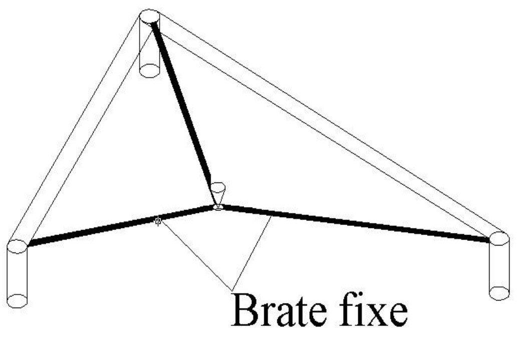

Figure 3. Fixed arms

Initially the prism will be placed in a different position from the vertical, this position will be determined with 2 gravity sensors placed horizontally and perpendicular to each other (Figure 4.) . The microcontroller will process it and send a signal to the 2 motors which will maneuver the 2 extendable arms to make the prism vertical .

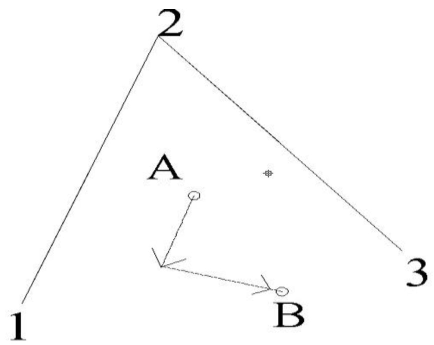

Figure 4. Horizontal section -Moving the Pole from point A to B

The Axes on which the sensors are mounted coincide with the axes of the extendable arms, one of the axes in the direction of the middle line of the triangle and the other the perpendicular to it is high delta (initial position)(Figure 5).

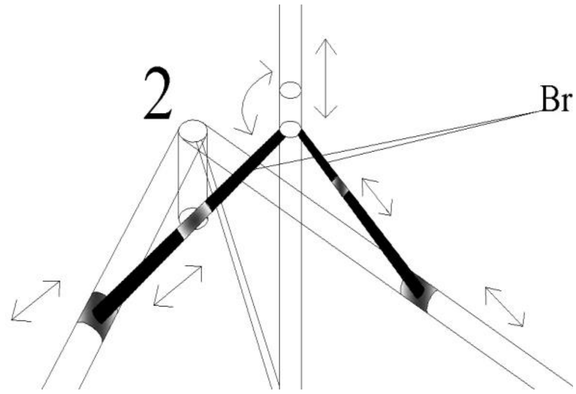

Figure 5. The extendable arms

The two extendable arms have small motors inside that make the extension through remote thread type. Combining these upper arms is made by hinges, arms that are interconnected by a ring/necklace that will slide on the pole, also at the bottom , these arms slide on support staff.

The electronic component will contain a microcontroller or a programabile component that based on numerical values (-3600 + 3600) received from the gravity sensors, will transmit the corresponding numerical values to the engines that in turn, guide the extensibile arms . Until it reaches an upright position a red light will be on (Figure 6.).When leveling will be done, a green light will signal the fitting of the prism, so that the total station operator can target (Figure 7.). The controller, the sensors and LEDs will be mounted at a convenient pole height.

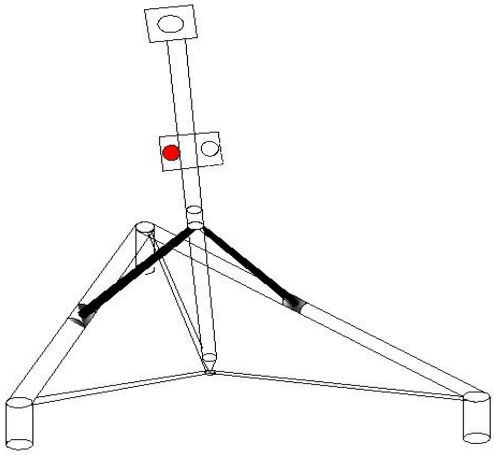

Figure 6. Incorrect position of prism

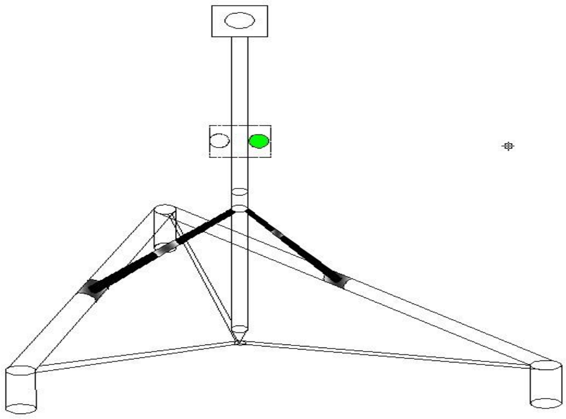

Figure 7. Correct position of prism

The batteries will be placed in the feet, in order to have the centre of gravity be closer to the ground, which will determine a better stability of the tripod (Figure 8).

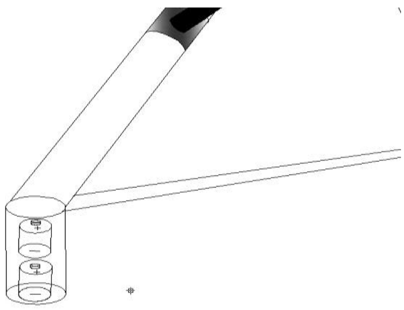

Figure 8. Batteries

CONCLUSIONS

First, using the automated prism, error reduction and error control of the fitting will be accomplished. (Chiţea, Vorovencii, Mihăilă, Chiţea,2011) This last element will eliminate "caused by operator" errors, an important step considering that these errors depended on the person holding the pole (in most cases without topographic qualification). The upright precision of the prism will be established and the errors will be taken into calculation so the total quality of the measurement will be improved. Systematic errors will be more easily identified. (D. Ghitau, 1972)

Secondly, using the smart-prism operators work will be eased. Some mistakes holding the prism upright, were caused by fatigue after several hours of work and because of its repetitive nature. Also if you are working with multiple prisms to which you target successively, a prism-person can install above the points, several prisms (about 3-4) that you can move from place to place. This can save human resources, the most valuable resources.

By increasing the quality of measurements and reducing resource consumption, increasing use of the the automat-prism means a more efficient measurement process

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