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## ABSTRACTS

### *Position Determination of a Moving Reflector in Real Time via Robotic Total Station Angle Measurements*

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#### Abstract

Most Robotic Total Stations (RTS) are capable of measuring an angle more accurate for short distances and with a higher update rate than measuring a distance. In real time kinematic applications that rely on a RTS for positioning, 3D coordinates are determined using angle and distance measurements. This fact that limits the position update rate to the distance measurement rate. In this paper, two Leica high precision RTS that have Automatic Target Recognition (ATR) sensors are used to determine the position of a moving reflector in real time based solely on angles. Both RTS are stationed in the same coordinate reference frame and controlled by a central computer that retrieves the angle measurements and calculates the current position of the moving reflector by angle intersection. To achieve this, a 360° reflector is "locked" and followed by each instrument with the aid of ATR. This increases the positioning frequency of the RTS system up to 20 points/second, which is twice as fast as in the normal tracking mode of these specific RTS. As for the control software, LabView is used in combination with the Leica GeoCOM interface. To distinguish and correctly attribute the angle measurements to corresponding 3D reflector positions, the timestamp is successfully used.

Experiments undertaken in laboratory conditions, present the achieved measurement frequency in comparison with the normal tracking mode, while determining the position of a moving trolley placed on a miniature railway.

This simulates a kinematic application that can resemble guidance and control processes for construction machines or kinematic measurement systems. In the context of building fast and efficient, such systems can be mostly used in infrastructure works that imply linear objects like railways, roads or pipelines.

Some advantages of the presented RTS System are flexibility, high positioning quality through the high angle measurement accuracy and high update rate while facilitating the use with little or no user interference.