OPTICAL MEASUREMENT OF A GUIDEWIRE DISPLACEMENT DURING PERCUTANEOUS CORONARY INTERVENTIONS

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Key Words: Percutaneous Coronary Intervention, Optics, Biomechanics, Pullback, Guided Surgery

Percutaneous coronary intervention (PCI) is the most common treatment for stenosis of the coronaries. Accurate assessment of stenosis length and location is crucial to achieve optimal PCI outcomes. In the context of complex procedures involving diffuse or tandem lesions, pressure guidewires can be used as a tool to aid clinicians in determining the number of stents and their length. While pressure sensing in coronary arteries is an efficient method to improve PCI, it doesn't provide the surgeons with an objective metric of stent length and location. The *SyncVision* solution from Philips uses co-registration of pressure values and positions of the guidewire on angiogram images to visualize pressure variation and help surgeons in stent positioning and length choice. However, this technology brings new constraints to surgeons like slow and constant pullbacks, while having a weak spatial resolution due to low frequency angiography. It also requires heavy real-time image processing with complex implementation. We developed a novel guidewire motion detection method using compact, low-cost and highly performant optical sensor from computer mouse. With this method, detection is done outside of the body, directly on the guidewire. Since it doesn't rely on angiogram images, it allows for higher accuracy and precision while removing slow and constant pullback constraints to clinicians. Preliminary results suggest a precision of 50 µm with a relative error of 1.6% for a 100 mm pullback (Figure 1, Figure 2). This new detection method, co-registered with pressure values, will facilitate clinicians in achieving unprecedented precision in stent positioning and length selection, thus significantly improving surgery outcomes.

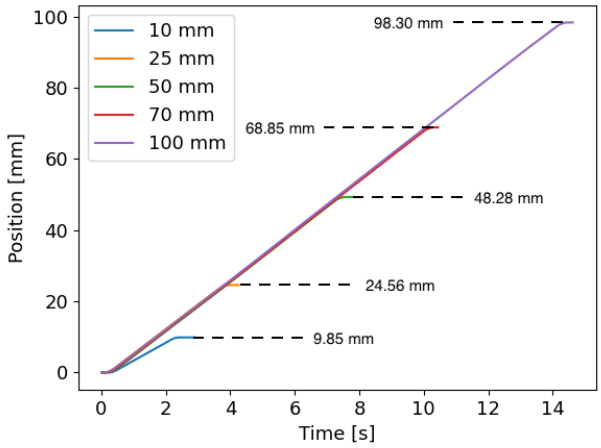

Figure 1 – Accuracy assessment of the optical device performed during a motor-assisted pullback with a 0.14" standard guidewire. The relative error has a constant value of 1.6% for all displacements.

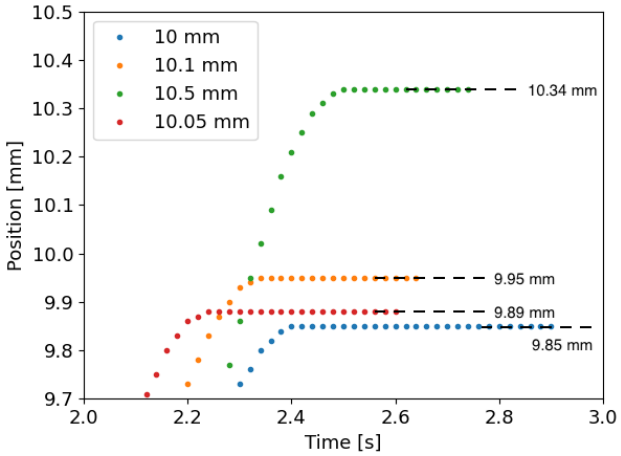

Figure 2 – Precision assessment of the optical device performed during a motor-assisted pullback with a 0.14" standard guidewire. The device can measure displacement variations as low as 50 µm.